

# **CCGS GRIFFON ALONGSIDE REFIT SPECIFICATION**

**F2599-230001**

**REVISION 02 – DATE 2023-03-24**

**WORK PERIOD DATES:  
2023-06-07 TO 2023-08-30**

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## TABLE OF CONTENTS

<b>TABLE OF CONTENTS.....</b>	<b>2</b>
<b>G 1.0 GENERAL NOTES.....</b>	<b>4</b>
G 1.1 VESSEL GENERAL PARTICULARS.....	4
G 1.2 HEALTH AND SAFETY .....	4
G 1.3 FLEET SAFETY MANUAL SAFETY PROCEDURES.....	5
G 1.4 LEAD CONTAINING MATERIALS AND LEAD CONTAINING COATINGS.....	5
G 1.5 ASBESTOS CONTAINING MATERIALS (ACM) .....	6
G 1.6 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) .....	6
G 1.7 SMOKING IN THE WORKSPACE.....	6
G 1.8 VESSEL ACCESS.....	6
G 1.9 CONTRACTOR FURNISHED MATERIALS, EQUIPMENT AND TOOLS .....	6
G 1.10 GOVERNMENT SUPPLIED MATERIALS, EQUIPMENT AND TOOLS.....	6
G 1.11 REGULATORY APPROVAL AND INSPECTION .....	6
G 1.12 ACTS, REGULATIONS, STANDARDS, RULES, CODES, AND GUIDELINE REQUIREMENTS.....	7
G 1.13 PREWORK INSPECTION AND DOCUMENTATION OF WORK IN PROGRESS.....	7
G 1.14 SERVICE CONDITIONS.....	7
G 1.15 DOCUMENTATION.....	7
<b>S 1.0 SERVICES .....</b>	<b>9</b>
S 1.1 BERTHING – NOT USED .....	9
S 1.2 MOORING LINES – NOT USED.....	9
S 1.3 GANGWAYS – NOT USED .....	9
S 1.4 ELECTRICAL POWER – NOT USED.....	9
S 1.5 DECK PROTECTION .....	9
S 1.6 HIGH-SPEED/WI-FI INTERNET ON THE VESSEL – NOT USED.....	9
S 1.7 FIXED FIRE FIGHTING SUPPRESSION SYSTEMS – NOT USED .....	9
S 1.8 FIRE MAIN – NOT USED .....	9
S 1.9 CCG/PSPC OFFICE SPACE – NOT USED .....	9
S 1.10 STORAGE SPACE – NOT USED .....	9
S 1.11 SECURITY – NOT USED .....	9
S 1.12 GARBAGE – NOT USED .....	9
S 1.13 CRANAGE – NOT USED .....	9
S 1.14 BILGE WATER DISPOSAL – NOT USED.....	9
S 1.15 CLEANING .....	9
S 1.16 POTABLE WATER SUPPLY – NOT USED .....	9
S 1.17 SANITARY & HVAC & REFRIGERATION WATER – NOT USED .....	10
S 1.18 BLACK WATER AND GREY WATER SERVICES – NOT USED .....	10
<b>10 SAFETY AND SECURITY .....</b>	<b>11</b>
10.1 BILGE CLEANING.....	11
10.2 ANNUAL FIRE SYSTEM INSPECTION.....	14
<b>11 HULL AND RELATED STRUCTURES [NOT USED] .....</b>	<b>19</b>

<b>12</b>	<b>PROPULSION AND MANEUVERING .....</b>	<b>20</b>
12.1	PROPULSION GENERATORS (SURVEY ITEM).....	20
12.2	PROPULSION MOTORS (SURVEY ITEM) .....	26
12.3	PROPULSION OVERCURRENT PROTECTION (SURVEY ITEM).....	31
12.4	PROPULSION CONTROL SYSTEM (SURVEY ITEM) .....	36
12.5	PROPULSION MOTOR BLOWERS (SURVEY ITEM) .....	43
12.6	PROPULSION GENERATOR AND MOTOR COOLERS (SURVEY ITEM) .....	49
<b>13</b>	<b>POWER GENERATION SYSTEMS [NOT USED] .....</b>	<b>55</b>
<b>14</b>	<b>POWER DISTRIBUTION SYSTEMS .....</b>	<b>56</b>
14.1	ANNUAL MEGGER TESTING OF ELECTRICAL CIRCUITS (SURVEY ITEM).....	56
14.2	AC CIRCUIT BREAKERS (SURVEY ITEM) .....	58
<b>15</b>	<b>AUXILIARY SYSTEMS [NOT USED] .....</b>	<b>63</b>
<b>16</b>	<b>DOMESTIC SYSTEMS .....</b>	<b>64</b>
16.1	REFRIGERATION COOLING WATER DISCHARGE PIPING .....	64
<b>17</b>	<b>DECK EQUIPMENT .....</b>	<b>70</b>
17.1	STORES CRANE INSPECTION (SURVEY ITEM) .....	70
17.2	MAIN CRANE LOAD MONITORING SYSTEM.....	76
<b>18</b>	<b>COMMUNICATION AND NAVIGATION SYSTEMS [NOT USED] .....</b>	<b>82</b>
<b>19</b>	<b>CONTROL SYSTEMS [NOT USED] .....</b>	<b>83</b>
<b>20</b>	<b>SCIENCE EQUIPMENT [NOT USED] .....</b>	<b>84</b>
<b>A</b>	<b>APPENDIX A ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINE REQUIREMENTS .....</b>	<b>85</b>
A.1.0	ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINE REQUIREMENTS.....	85
A.2.0	HIERARCHY AND REFERENCES: ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINES (ARSRC&G) .....	85
A.3.0	REGULATIONS PURSUANT TO THE CANADA SHIPPING ACT 2001 .....	85
A.4.0	MARINE TECHNICAL REVIEW BOARD DECISIONS (MTRB) AND DETERMINATION OF CLOSEST POSSIBLE COMPLIANCE (AS APPLICABLE) 88	
A.5.0	ADDITIONAL ACTS AND REGULATIONS.....	89
A.6.0	STANDARDS, RULES, CODES AND GUIDELINES: .....	89
A.7.0	CCG SPECIFICATIONS, STANDARDS AND FLEET SAFETY MANUAL (FSM) PUBLICATIONS .....	96
A.8.0	INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS) .....	96
A.9.0	SPECIFIED RULES, CODES, STANDARDS OR GUIDELINES.....	96
<b>B</b>	<b>APPENDIX B GENERAL ARRANGEMENT DRAWING .....</b>	<b>99</b>

## G 1.0 GENERAL NOTES

### G 1.1 Vessel General Particulars

Vessel Name:	CCGS Griffon
Type:	High Endurance Multitask Vessel (Icebreaker/Navigational Aids Tender)
Voyage Classification:	Near Coastal 1, Class X Lifesaving Equipment
Year Built:	1970
Length:	234'-0" (71.32 m)
Breadth, molded:	49'-0" (14.94 m)
Draft, loaded:	15'-6.25" (4.731 m)
Displacement, Fresh Water	3096 T
Air Draft	104'-7.9" (30.9 m)
Propulsion	Twin screw, fixed pitch, diesel electric (DC/DC), 2 x 2000 SHP
Gross Registered Tonnage (GRT)	2212
General Arrangement	Appendix B - Drawing 732905_01.dwg and 732905.02.dwg

### G 1.2 Health and Safety

- G 1.2.1 The Contractor must refer to the Fleet Safety Manual (FSM) supplied with this Specification and the Contractor and representatives must attend a vessel safety orientation session provided by CCG personnel as detailed in FSM 10.A.7 Contractor Safety and Security. The orientation session must be attended before beginning work and before vessel custody is transferred (if applicable) to the Contractor. This session will familiarize the Contractor's employees with the dangers specific to the vessel, with the CCG permit systems for work protocols and with the procedures for safety, risk prevention, hazard response and pre-work safety assessments.
- G 1.2.2 During the work period while the vessel is secured at a CCG facility and the vessel is staffed and remains in the custody of the CCG, both the CCG and the Contractor must adhere to the FSM procedures and site-specific work instructions for the vessel. CCG and the Contractor must each designate a point of contact for inquiries. It is noted that the Contractor must also follow requirements governed by Federal, Provincial/Territorial, and Municipal law.
- G 1.2.3 NOT USED
- G 1.2.4 NOT USED
- G 1.2.5 The Contractor must follow the Government of Canada Vaccination policy in effect at the time of the contract.
- G 1.2.6 NOT USED

**G 1.3 Fleet Safety Manual Safety Procedures****S 1.2.1 Diving Operations**

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

**G 1.3.1 Fall Protection**

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

**G 1.3.2 Entry Into Confined Spaces**

- a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.3 Entry into Confined Spaces.
- b) Contractor must provide on-site Confined Space Rescue team during all confined space work and activities.

**G 1.3.3 Hotwork**

- a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.4 Hotwork.
- b) The Contractor must not use the ship's fire extinguishers except in an emergency. Should the Contractor have to discharge a ship's extinguisher, the extinguisher must be recharged and recertified at the Contractor's expense.

**G 1.3.4 Lockout and Tagout**

- a) The Contractor must provide all requirements to meet or exceed FSM Procedure 7.B.5 Lockout and Tagout.
- b) The Contractor must provide the padlocks and locking devices.

**G 1.3.5 Working on Energized Electrical Conductors or Circuit Parts**

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

**G 1.4 Lead Containing Materials and Lead Containing Coatings**

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

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

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

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

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

**G 1.5 Asbestos Containing Materials (ACM)**

- G 1.5.1 The Contractor must not use any asbestos containing materials.
- G 1.5.2 The Contractor must refer to the most recent Asbestos Risk Assessment Report and Asbestos Management Plan supplied with this specification.
- G 1.5.3 The Contractor must identify any suspect materials containing asbestos prior to starting any work. The Contractor must notify the TA of any concerns regarding asbestos containing materials and any required asbestos abatement work for areas that are not identified in the most recent Asbestos Assessment Report and Asbestos Management Plan will follow the PSPC 1379 process.
- G 1.5.4 The Contractor must ensure that handling of any asbestos containing materials is performed by trained personnel and/or a company certified in the removal of asbestos in accordance with Federal, Provincial/Territorial, and Municipal regulations.
- G 1.5.5 The Contractor must provide the TA with disposal certificates for all asbestos containing material removed from the vessel indicating that the disposal was in accordance with Federal, Provincial/Territorial, and Municipal regulations in effect (\*ITP).

**G 1.6 Workplace Hazardous Materials Information System (WHMIS)**

- G 1.6.1 The Contractor must provide the TA with Safety Data Sheets (SDS) for all Contractor and Subcontractor supplied WHMIS controlled products. SDS must be provided in the formats requested in the Documentation section of the General Notes. All SDS must be maintained in accordance with OHS procedures (\*ITP).
- G 1.6.2 The TA will provide the Contractor with access to the SDS for all CCG controlled products on the ship for all specified work items. These are available on request.

**G 1.7 Smoking in the Workspace**

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

**G 1.8 Vessel Access**

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

**G 1.9 Contractor Furnished Materials, Equipment and Tools**

- G 1.9.1 In addition to the requirements of SACC clauses 2030 and 1029 the Contractor must identify items for TA approval where a particular item is not specified or where substitution must be made.

**G 1.10 Government Supplied Materials, Equipment and Tools**

- G 1.10.1 In addition to the requirements of SACC clause 2030 the Contractor must inventory and sign for receipt of all Government Supplied Materials (GSM), equipment, and tools as witnessed by TA (\*ITP).

**G 1.11 Regulatory Approval and Inspection**

- G 1.11.1 The Contractor must coordinate and schedule regulatory approvals, inspections, and surveys with the applicable authorities, such as Transport Canada (TC), Transport Canada Recognized Organization (RO), as indicated by individual specifications and the Contractor's QA/QC and Inspection and Test Plan (\*ITP).
- G 1.11.2 *CCGS Griffon* is enrolled in the Delegated Statutory Inspection Program and the Canadian Coast Guard has retained the American Bureau of Shipping as the RO.
- G 1.11.3 NOT USED.
- G 1.11.4 The TA is responsible for direct payment of all regulatory inspection fees.

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

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

**G 1.13 Pework Inspection and Documentation of Work in Progress**

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

**G 1.14 Service Conditions**

- G 1.14.1 Unless otherwise stated within individual specifications, Contractor Work and Contractor supplied equipment and materials must meet the following service conditions,
- a) in areas that are exposed to the elements:
    - air temperature of minus (-) 40°C to plus (+) 35°C;
    - wind and saltwater spray velocity of up to 50 knots;
    - water temperature of minus (-) 2°C to plus (+) 30°C, and
    - shock loading of 2.5g horizontal, 1.5g vertical.
  - b) in areas that are not directly exposed to the elements:
    - air temperature of minus (-) 40°C to plus (+) 35°C;
    - relative humidity of 0% to 100%, and
    - shock loading of 2.5 g horizontal, 1.5 g vertical.

**G 1.15 Documentation**

- G 1.15.1 Text Documentation: Unless otherwise noted, the Contractor must provide all text documentation in text searchable PDF format. Naming convention for all documents must follow this format: G005 - [Report Title] - [YYYY-MM-DD].
- G 1.15.2 Data Book: Prior to Acceptance the Contractor must provide a "Data Book" in electronic format containing all documentation generated as a result of specified deliverables. The Contractor must index the Data Book by the individual specification titles entries (i.e., G1.0

General Notes) and must include all items from the Documentation section of each individual specification. Two duplicate USB flash drives containing the Data Book must be delivered to TA. The Contractor must label each storage device with “Data Book”, contract number, and vessel name (\*ITP).

- G 1.15.3 Email Naming Convention: Any Contractor generated emails relating to the Work must include the PSPC Contract Number, vessel name and specification title within the email subject line and a brief description of the topic. For example, F259930001/001/MD, CCGS Griffon 12.1 Propulsion Generators – Gasket Material.
- G 1.15.4 Photographs: The Contractor must deliver all photographs in Joint Photographic Experts Group (JPEG) format and named in accordance with specification titles. Two duplicate USB flash drives containing these photographs must be delivered to TA. The Contractor must label each storage device with “Photographs”, contract number, and vessel name.
- G 1.15.5 Test/Inspection Records and Certificates: Original copies of Test and Inspection Records must be provided to the TA, IA, or designate.



## **S 1.0 SERVICES**

### **S 1.1 Berthing – NOT USED**

### **S 1.2 Mooring Lines – NOT USED**

### **S 1.3 Gangways – NOT USED**

### **S 1.4 Electrical Power – NOT USED**

### **S 1.5 Deck Protection**

S 1.5.1 The Contractor must, within two days of commencement of the Contract work period, supply and install 3 mm minimum thickness MDF fiberboard (e.g., Masonite) temporary deck protection to all interior alleyways throughout the ship. This supply and install must include sealant taping edge joints to prevent the ingress of dirt. The Contractor must maintain this temporary deck protection throughout the work period. The Contractor must supply a price per square meter, with an initial contract area to be protected of 150 square meters. The final price for this item will be adjusted via PSPC 1379 process.

S 1.5.2 The Contractor must remove and dispose of all temporary deck protection and sealant upon completion of all work and prior to acceptance of the vessel by Canada. The TA, IA, or designate must be afforded the opportunity to inspect the decks prior to contract completion.

### **S 1.6 High-speed/Wi-Fi Internet on the vessel – NOT USED**

### **S 1.7 Fixed Fire Fighting Suppression Systems – NOT USED**

### **S 1.8 Fire Main – NOT USED**

### **S 1.9 CCG/PSPC Office Space – NOT USED**

### **S 1.10 Storage Space – NOT USED**

### **S 1.11 Security – NOT USED**

### **S 1.12 Garbage – NOT USED**

### **S 1.13 Cranage – NOT USED**

### **S 1.14 Bilge Water Disposal – NOT USED**

### **S 1.15 Cleaning**

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

### **S 1.16 Potable Water Supply – NOT USED**

**S 1.17 Sanitary & HVAC & Refrigeration Water – NOT USED**

**S 1.18 Black Water and Grey Water Services – NOT USED**

## 10 SAFETY AND SECURITY

### 10.1 BILGE CLEANING

#### 10.1.1 IDENTIFICATION

**10.1.1.1** The Contractor must pump out and clean the bilges in the main machinery spaces and the cargo hold bilge wells.

**10.1.1.2** The Contractor must certify the bilges in the main machinery spaces as safe for entry and safe for hotwork as required prior to commencing work that requires the bilges to be certified.

#### 10.1.2 REFERENCES

##### 10.1.2.1 Equipment Data

**10.1.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
N/A	N/A

##### 10.1.2.2 Manuals

**10.1.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
N/A	N/A

##### 10.1.2.3 Drawings

**10.1.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Sheet and Revision
N/A	N/A	N/A

##### 10.1.2.4 Regulations and Standards

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

#### 10.1.3 STATEMENT OF WORK

##### 10.1.3.1 Bilge Cleaning – Main Machinery Spaces

**10.1.3.1.1** All bilge cleaning must be completed before any hotwork commences or any equipment is disassembled and/or exposed as per the following sections of the Alongside Refit Specification.

- 10.1.3.1.2** The cleanliness of the bilges shall be maintained for the duration of the work period. Any subsequent cleaning required due to Contractor work must be cleaned and waste removed at the Contractor's expense.
- 10.1.3.1.3** The Contractor must supply all materials and labour necessary to clean the following bilge areas for certification for hotwork for the duration of the work period:
- a) Engine Room Bilge;
  - b) Motor Room Bilge, and
  - c) Shaft Compartment Bilge.
- 10.1.3.1.4** The Contractor must bid on the removal and disposal ashore of twenty (20) m3 of oily waste from the bilges prior to the start of the cleaning operation.
- 10.1.3.1.5** A volume manifest must be provided to the TA, IA, or designate after the bilges have been pumped and prior to the commencement of the cleaning operation.
- 10.1.3.2 Bilge Cleaning – Cargo Hold**
- 10.1.3.2.1** The Contractor must remove, and reinstall upon completion of the work, the surface grates from the port and starboard cargo hold bilge wells without damaging the bilge well alarm float switches. The bilge wells are located on either side of the cargo hold sludge tank.
- 10.1.3.2.2** The Contractor must supply all materials and labour necessary to clean all internal surfaces of the bilge wells such that the internal structures and coatings can be inspected by the TA, IA, or designate.
- 10.1.3.2.3** The Contractor must bid on the removal and disposal ashore of the following:
- a) Two hundred (200) litres of oily water, and
  - b) Twenty (20) litres of solid oily waste from the cargo hold bilge wells.
- 10.1.3.2.4** A volume manifest shall be provided after the pumping operation is complete and prior to the commencement of the cleaning operation.
- 10.1.3.3 Disposal**
- 10.1.3.3.1** All oily waste and debris removed from the vessel and all waste generated from the bilge cleaning must be disposed of in accordance with all Federal, Provincial/Territorial, and Municipal regulations in effect.
- 10.1.3.3.2** The Contractor must provide a cost per cubic meter for disposal of oily water which will be used to prorate the total volume removed in sections 10.1.3.1 and 10.1.3.2.
- 10.1.3.4 Inspection Points**
- 10.1.3.4.1** The Contractor must notify the TA, IA (Inspection Authority), or designate so they may inspect the bilges and the bilge wells after completion of cleaning and prior to the reinstallation of the bilge well grates in the cargo hold.

**10.1.4**      **DOCUMENTATION AND DELIVERABLES**

**10.1.4.1**      The Contractor must provide the TA, IA, or designate with original copies of the following:

**10.1.4.2**      **Reports**

**10.1.4.2.1**      The Contractor must provide copies of all waste oil manifests showing disposal of the materials removed from the bilges and bilge wells are to be provided to the TA, IA, or delegate. The documentation must be in the format specified in Section G 1.15 (\*ITP).

**10.1.4.3**      **Certificates – NOT USED**

**10.1.4.4**      **Measurements, Calibrations and Readings – NOT USED**

**10.1.4.5**      **Redlined Drawings – NOT USED**

**10.1.4.6**      **Spare parts – NOT USED**

**10.1.4.7**      **Equipment or System Manuals – NOT USED**

**10.1.5**      **TRAINING – NOT USED**

## 10.2 ANNUAL FIRE SYSTEM INSPECTION

### 10.2.1 IDENTIFICATION

- 10.2.1.1.1** The Contractor must provide the services of a marine fire inspection company certified by the Recognized Organization (RO) for the vessel's annual fire system inspection and certification.

### 10.2.2 REFERENCES

#### 10.2.2.1 Equipment Data

- 10.2.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
N/A	N/A

#### 10.2.2.2 Manuals/Reports

- 10.2.2.2.1** The following equipment manuals and reports are provided as Guidance Documents.

Manual Title	Electronic File Name
N/A	N/A
Report Title	Electronic File Name
2022 Griffon Consolidated Fire System Inspection	2022 Griffon Consolidated Fire System Inspection.pdf

#### 10.2.2.3 Drawings

- 10.2.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Sheet and Revision
CMG05-246-MI	Fire Control Plan	Sht. 01/02 Rev. H
CMG05-246-MI	Fire Control Plan	Sht. 02/02 Rev. H

#### 10.2.2.4 Regulations and Standards

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

### 10.2.3 STATEMENT OF WORK

#### 10.2.3.1 General

- 10.2.3.1.1** The Contractor must provide the services of an RO certified Marine Fire Inspection Company to provide the annual inspection and certification of all fire detection systems, fixed suppression equipment, and portable extinguishers.

**10.2.3.1.2** The Contractor must ensure that all inspections and maintenance are performed by technicians who are certified to work on the firefighting systems and equipment mentioned below. The Contractor must provide the certificate of qualification for the marine fire inspector as well as proof of the company's certification by a RO prior to the start of any work on the fire system.

**10.2.3.1.3** The Contractor must give notice to the TA, IA, or designate at least 48 hours in advance prior to working on the fire suppression system. The work must be completed in such manner as to ensure adequate protection of the ship in case of an emergency. The protection of the ship must not be compromised while working on the fire suppression system.

**10.2.3.1.4** Upon completion of work, the Contractor must return all spaces affected by the work to their original functional state and cleanliness.

**10.2.3.2 Fire Detection Systems**

**10.2.3.2.1** The Contractor must provide the services of a certified Kidde and Notifier Factory Service Rep (FSR) and materials to perform the tasks in this section.

**10.2.3.2.2** The Contractor must inspect, test, and certify the Notifier NFS-640 Fire Detection System.

**10.2.3.2.3** The Contractor must supply and install three (3) FSP-951A smoke detectors (GSM) that are due to be replaced in the cargo hold. Note that these detectors are at heights requiring fall protection:

- a) 2D022 – Cargo Hold Port Center;
- b) 2D023 – Cargo Hold Port Forward, and
- c) 2D024 – Cargo Hold Starboard Forward.

**10.2.3.3 Fixed Suppression System – CO2 and FM200**

**10.2.3.3.1** The Contractor must inspect, test, and certify the fixed CO2 Suppression systems:

Qty.	Location	Size	Type
19	Engine/Motor Room	100 lb	CO2
1	Battery Room	25 lb	CO2
1	Paint Locker	35 lb	CO2
2	Emergency Generator Room	50 lb	CO2
4	Engine Room Workshop	50 lb	CO2
2	Upper Fan Room	50 lb	CO2
1	Bosun Stores	75 lb	CO2
3	Buoy Workshop	75 lb	CO2

1	Lower Fan Room	75 lb	CO2
2	Propulsion Generators	75 lb	CO2
2	Steering Gear Compartment	75 lb	CO2
5	Winch Room	75 lb	CO2
1	Red Work Barge Fireboy (dockside in Prescott)	13 lb	FM200
1	Lifeboat Fireboy (dockside in Prescott)	13 lb	FM200
1	Grey Work Barge Fireboy (ashore in Prescott)	13 lb	FM200

**10.2.3.3.2** The Contractor is to note, that under the VFSR and IMO guidelines for fixed CO2 systems, there are no fixed CO2 bottles due for hydrostatic testing in 2023.

**10.2.3.3.3** The Contractor must supply and install the following CO2 flexible hoses that are due to be replaced:

a) Propulsion Generator/Motor bank - 2 x 5/8" x approx. 16-17" hose

**10.2.3.3.4** Hoses must be made from materials manufactured and dated 2023. Fittings must be date stamped with the installation date (month and year). The hose and fittings must meet all applicable standards for use in fixed CO2 fire protection systems. The Contractor must ensure that installed hoses are not kinked, bent, or unduly stressed by installation.

#### **10.2.3.4 Fixed Suppression System - Galley**

**10.2.3.4.1** The Contractor must inspect, test, and certify the galley WHDR™ Wet Chemical Kitchen System (WHDR 260) and all associated systems including:

- a) Fire Door Holdback System;
- b) Gaylord Ventilator Range Hood System;
- c) Fire Alarm System;
- d) Remote Manual Pull;
- e) Galley Equipment Panel NP-31;
- f) Supply and replace four (4) each 360-degree fusible links, and
- g) Supply and replace four (4) each nozzle seals.

#### **10.2.3.5 Fixed Suppression System - Sprinkler**

**10.2.3.5.1** The Contractor must inspect, test, and certify the fixed sprinkler system and all associated components.

#### **10.2.3.6 Portable Extinguishers**

**10.2.3.6.1** The Contractor must inspect, test, and certify all portable fire extinguishers aboard the vessel and associated small craft. Note that for simplicity in consolidating multiple regulations, the vessel voluntarily chooses to certify all portable dry chemical



extinguisher maintenance and portable CO2 extinguisher hydrostatic testing at 5-year intervals, and all portable dry chemical hydrostatic testing at 10-year intervals.

- 10.2.3.6.2** Fire extinguishers removed from service for maintenance or recharging must be replaced by a certified fire extinguisher suitable for the type of hazard being protected and must be of at least equal rating.

- 10.2.3.6.3** The Contractor must have the following fire extinguishers hydrostatically tested:

Ext. #	Location	Size	Type
2	Wheelhouse – Starboard	5 lb	CO2
3	Wheelhouse – Port	5 lb	CO2
9	Bridge Deck Alleyway – By Communications Centre	5 lb	CO2
10	Communications Centre	5 lb	CO2
11	Boat Deck Alleyway – By Engineering Office	10 lb	Dry Chemical
26	Upper Deck – Galley Aft	10 lb	CO2
64	Engine Room – Lower Aft Starboard by Door	10 lb	CO2

- 10.2.3.6.4** The Contractor must have the following fire extinguishers professionally maintained:

Ext. #	Location	Size	Type
11	Boat Deck Alleyway – By Engineering Office	10 lb	Dry Chemical
13	Boat Deck – Flight Deck Locker	20 lb	Dry Chemical
24	Upper Deck – Crew's Mess	5 lb	Dry Chemical
73	Whaler (Small Boat)	5 lb	Dry Chemical
79	Spare – CO2 Room	10 lb	Dry Chemical

**10.2.3.6.5 Inspection Points**

- 10.2.3.6.6** The Contractor must demonstrate to the TA, IA, or designate that all work has been completed as described above and that all systems have been returned to operation.

- 10.2.3.6.7** All inspected fire extinguishers and systems must have labels affixed showing the name of the company who conducted the inspection/maintenance, the date, and the initials of the person who performed the inspection.

**10.2.4 DOCUMENTATION AND DELIVERABLES**

- 10.2.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:

**10.2.4.2 Reports**

- 10.2.4.2.1** The Contractor must provide an annual fire inspection report including the following details in the format specified in Section G 1.15:
- a) The condition of each system or component following initial inspection including all as found defects;
  - b) The test results of each system or component following testing;
  - c) The next due date for the inspection and testing of each system or component based on current regulations in effect, and
  - d) All repairs made to any component or system (\*ITP).
- 10.2.4.3** **Certificates**
- 10.2.4.3.1** The Contractor must provide a copy of the certificate of qualification for the marine fire inspectors performing the tasks in this SOW (\*ITP).
- 10.2.4.3.2** The Contractor must provide a copy of the certificate of the marine fire inspection company's approval by the RO prior to the start of any work on the fire systems (\*ITP).
- 10.2.4.3.3** The Contractor must provide annual certificates for all inspected systems to the TA, IA, or designate (\*ITP).
- 10.2.4.4** **Measurements, Calibrations and Readings – NOT USED**
- 10.2.4.5** **Redlined Drawings – NOT USED**
- 10.2.4.6** **Spare parts – NOT USED**
- 10.2.4.7** **Equipment or System Manuals – NOT USED**
- 10.2.5** **TRAINING – NOT USED**

## **11 HULL AND RELATED STRUCTURES [NOT USED]**

## 12 PROPULSION AND MANEUVERING

### 12.1 PROPULSION GENERATORS (SURVEY ITEM)

#### **12.1.1 IDENTIFICATION**

**12.1.1.1** The four (4) propulsion DC generators are due for Special Continuous Machinery Survey by the RO.

**12.1.1.2** The Contractor must provide a certified electrical service provider to inspect and assess the condition of all four (4) machines. The electrical service provider must be able to demonstrate previous experience in the assessment and survey of DC propulsion generators greater than 1000 kW, and must be acceptable to the RO.

**12.1.1.3** Propulsion Generator #1 (Port Outboard) and #3 (Starboard Inboard) require gasket renewals.

**12.1.1.4** This work must be concurrent with SOW item 12.6 Propulsion Generator and Motor Coolers.

#### **12.1.2 REFERENCES**

##### **12.1.2.1 Equipment Data**

**12.1.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Propulsion Generators	Direct Current x 4
Manufacturer	Westinghouse Canada, Hamilton Plant, 1968
Rating - Continuous	1032 kW, 833 V, 1238 A, 750 RPM
Rating – 2 Hour	1290 kW, 900 V, 1432 A, 750 RPM, 85°C Rise
Wound	Shunt Stabilized
Excitation	Separate
Excitation Volts	206 V
Original Insulation	Class B
Serial #'s	#1, Port Outboard, SN 4-1S5108 #2, Port Inboard, SN 3-1S5108 #3, Starboard Inboard, SN 2-5S108 #4, Starboard Outboard, SN 1-5S108
Carbon Brushes	Manufactured by Mersen Canada Ltd:

	Y6013 assembly: BAR03/Brush complete with PD90-202 Reaction Box  Y6012R.1: grade EG98P, bevels 60/50, 74.61 x 44.45 x 12.7 mm
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**12.1.2.2 Manuals**

**12.1.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
Westinghouse Instr. Book No CD-4530, Part II, Sect. 3, Propulsion Generators	Part II - Section 3 - Propulsion Generators.pdf

**12.1.2.3 Drawings**

**12.1.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
749C089-1	Redrawn Westinghouse Elementary Diagrams	749C089-1.pdf
N/A	Griffon Propulsion Drawings	Griffon Propulsion Drawings.pdf
03-D84702084-1 shts 0-13	Griffon Propulsion Exciters Interconnect Diagram	03D84702084-1.pdf
C-AC-1636AFB-16	Assembly Crankshaft Flexible Coupling to Westinghouse Generator	C-AC-1636AFB-16.pdf
37305/38074/2	Generator Michell Bearing/ Pedestal Assembly	37305.pdf
169D571	Original DC Machine Type QL FRCC 216.5 Shaft and Bar Assembly	169D571.pdf
529F075	DC Generator Assembly/ Outline Drawing	529F075.pdf
549A428	DC Machine Frame Armature Stacking and Armature Banding	549A428.pdf
640J771 shts 1 & 2	DC Machine Type QL CC 216.5 General Assembly	640J771.pdf 640J771-2.pdf
735D861	DC Generator Type QL CC 216.5 Stator Wiring Around Magnet Frame	735D861.pdf

736D088	DC Generator Type Q FR CC 216.5 Devices & Connections	736D088.pdf
6192C88	CCGS Griffon Modified/Updated Typical Generator Shaft Spider Assembly Drawing	6192C88.pdf
759C261	Model QL Machine Type MP FR CC 216-5 Gaskets	759C261.pdf
736D042	Model QL Machine type MP FR CC 216-5 Front Endbell & Filter Assembly	736D042.pdf
45351B3	Rubber, Neoprene Details	Neoprene Rubber W#45351B3.pdf

#### **12.1.2.4 Regulations and Standards**

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

#### **12.1.3 STATEMENT OF WORK**

##### **12.1.3.1 General**

**12.1.3.1.1** All readings must be taken before and after cleaning to indicate the as-found (existing) condition of the machine and the as-left (post-cleaning) condition of the machine.

##### **12.1.3.2 Inspection**

**12.1.3.2.1** The Contractor must perform the following work to obtain RO survey credit for the propulsion generators. The Contractor is responsible for coordinating all RO inspections.

**12.1.3.2.2** The Contractor must perform a visual inspection of each machine and must inspect the following points:

- a) Commutator surface condition;
- b) Degree of brush grooving;
- c) Commutator run-out measurement;
- d) Mica undercut measured;
- e) Armature winding condition - mechanical and insulation condition;
- f) Armature core and spider condition;
- g) Stator winding condition – mechanical and insulation condition;
- h) Stator frame and structure;
- i) Brushes and brush gear – brush length and spring tension to be measured;
- j) Field poles and connections;
- k) Shaft bearings;
- l) All sandwich connections condition;
- m) Lighting circuit condition;

- n) Heating circuit condition;
- o) Sensors and wire lead condition, and
- p) Armature air gap at the front and aft end of each machine.

**12.1.3.2.3** The Contractor must perform and record a Megger reading of each machine's armature, stator windings and main supply cabling to the propulsion switch gear. During the cable check, both line-to-line and line-to-ground reading must be taken for all cables. Megger readings must be corrected to 20°C.

**12.1.3.2.4** The Contractor must take and record the Polarization Index (PI) insulation readings of each machine's armature winding, stator windings and the main supply cabling to the propulsion switchgear. PI readings are to be corrected to 20°C.

**12.1.3.2.5** The Contractor must note that access to the lower brushes of the propulsion generators is challenging, and dexterity is required.

**12.1.3.2.6** The Contractor must report all defects or abnormal results to the TA, IA, or designate within 24 hours of the inspection.

**12.1.3.2.7** The Contractor must prepare a technical report for each machine detailing the findings and readings recorded.

**12.1.3.3 Cleaning**

**12.1.3.3.1** The Contractor must remove and dispose of all filter media from each propulsion generator filter cage.

**12.1.3.3.2** The Contractor must provide materials, equipment, and preparatory work to either contain the carbon dust in a filter box or exhaust it to an appropriate area exterior to the vessel. No carbon dust must be exhausted into the engine room spaces or accommodations.

**12.1.3.3.3** The Contractor must use clean and dry compressed air to remove all loose carbon dust from all propulsion generator components. The Contractor must use appropriate compressed air filters/driers to remove any contaminants, including oil vapour, in the air.

**12.1.3.3.4** Upon completion of compressed air cleaning, the Contractor must use rags soaked with an approved electrical cleaning solvent to wipe down all accessible generator components to remove any remaining carbon dust. The Contractor must demonstrate to the TA, IA, or designate that the electrical cleaning solvent to be used is a product recommended for the cleaning of electric generator windings. The solvent must be suitable for removing grease and carbon deposits and have a high dielectric resistance, be nonconductive, and noncorrosive. The solvent must not corrode or damage cables, insulation, protective varnishes, fiberglass, plexiglass, or rubber parts and must evaporate cleanly, leaving no greasy deposits.

- 12.1.3.3.5** Post cleaning, the Contractor must perform another set of Megger readings of the armature and stator circuits for each generator. This task will ascertain that the cleaning action has not degraded the as-found Megger readings. Where Megger readings are found to be lower than when performed in the as-found condition, the Contractor must carry out a subsequent inspection ensuring that in fact all areas are clean and report any findings to the TA, IA, or designate.
- 12.1.3.3.6** The Contractor must replace the filter media for each propulsion generator with new filter media (GSM).
- 12.1.3.4** **Gasket Renewals Port Outboard (#1) and Starboard Inboard (#3) Generators**
- 12.1.3.4.1** At the last overhaul in 2018, the propulsion generators were assembled with incorrectly sized gasketing materials. This has caused minor alignment issues with the generator housings and may be a source of ingress for dirt and other contaminations.
- 12.1.3.4.2** To correct alignment during this survey, the Contractor must disassemble the generator housings, clean off old gaskets, and reassemble using new gaskets of the correct size and material (CFM – Contractor Furnished Material), sealants (CFM), and fasteners (CFM).
- 12.1.3.4.3** The Contractor must perform the following known work for the disassembly, cleaning, and reassembly of the POG (#1) and SIG (#3) propulsion generators (see attached drawings for work details):
- a) Disassemble and reassemble the air boxes;
  - b) Disassemble and reassemble the air cooler and associated thermostatic valve;
  - c) Disassemble and reassemble the generator air ducting;
  - d) Disassemble, clean, and reassemble the forward upper and lower generator covers;
  - e) Disassemble, clean, and reassemble the aft lower generator cover;
  - f) Disconnection and reconnection of the CO2 bottle and associated Fenwall sensor for each generator;
  - g) Removal and reinstallation of brush gear assembly;
  - h) Protection of internal generator components during cleaning;
  - i) Cleaning sealant from the cover faces and associated mating surfaces on the stator armature, and,
  - j) Supplying and installing a 3/16" Duro hardness 40 neoprene rubber gasket strips between covers as per instructions supplied as reference.
- 12.1.3.5** **Inspection Points**
- 12.1.3.5.1** All work must be inspected and completed to the satisfaction of the Authorized Representative (AR) of the Recognized Organization (RO) and the TA, IA, or designate.
- 12.1.3.5.2** The Contractor must submit the cleaned generators for a final inspection by the TA, IA, or designate prior to fitting the covers.



**12.1.3.6 Testing/Trials**

- 12.1.3.6.1** The propulsion generators must be tested in accordance with the Tests and Trials Plan for the complete propulsion system.

**12.1.4 DOCUMENTATION AND DELIVERABLES**

- 12.1.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:

**12.1.4.2 Reports**

- 12.1.4.2.1** The Contractor must provide a written report of the survey of the propulsion generator, including the as-found condition of each generator, initial Megger readings, PI readings, any photographs taken during the cleaning and inspection process, any abnormalities found, and the final as-left Megger readings for the armature and stator circuits (\*ITP).

- 12.1.4.2.2** The Contractor must provide a copy of the RO Survey Credit with the report as well as the calibration certificates for the test instrumentation used during the work. The reported Megger and PI readings must include the tested component's temperature, measured insulation values, and insulation values corrected to 20°C ambient temperature and relative humidity during the testing (\*ITP).

- 12.1.4.2.3** The Contractor must provide two (2) paper copies and one electronic copy (PDF, unprotected) of the condition report for each propulsion generators prior to end of the work period and sea trials (\*ITP).

**12.1.4.3 Certificates – NOT USED****12.1.4.4 Measurements, Calibrations and Readings**

- 12.1.4.4.1** These must be dated and signed by the person taking the measurements.

**12.1.4.5 Redlined Drawings – NOT USED****12.1.4.6 Spare parts – NOT USED****12.1.4.7 Equipment or System Manuals – NOT USED****12.1.5 TRAINING – NOT USED**

**12.2 PROPULSION MOTORS (SURVEY ITEM)****12.2.1 IDENTIFICATION**

**12.2.1.1** The two (2) propulsion motors are due for Special Continuous Machinery Survey by the RO.

**12.2.1.2** The Contractor must provide a certified electrical service provider to inspect and assess the condition of two (2) machines. The electrical service provider must be able to demonstrate previous experience in the assessment and survey of DC propulsion motors greater than 1000 kW, and must be acceptable to the RO.

**12.2.1.3** This work must be concurrent with SOW item 12.5 Propulsion Motor Blowers and SOW item 12.6 Propulsion Generator and Motor Coolers.

**12.2.2 REFERENCES****12.2.2.1 Equipment Data**

**12.2.2.1.1** The following equipment data is provided for guidance.

Component	Manufacturer/Equipment Details
Propulsion Motors	Direct Current x 2
Manufacturer	Westinghouse
Year Built	1968
Type	Q
Frame	EE 626.6
Rating – Continuous	2000 HP, 833 V, 1910 A, 171/220 RPM
Rating – 2 Hour	2500 HP, 900 V, 2220 A, 185/220 RPM, 85°C Rise
Wound	Shunt
Excitation	Separate @ 232 V
Original Insulation	Class B
Serial #	Port – 1-1S1424 Stbd – 2-1S1424
Carbon Brushes	Mersen X3322 BAR13/BALAI GN110 GRADE 2192

**12.2.2.2 Manuals**

**12.2.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
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Westinghouse Instr. Book No CD-4530, Part II, Sect. I, Propulsion Motors	Part II - Section 1 - Propulsion Motors.pdf
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**12.2.2.3 Drawings**

**12.2.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
749C089-1	Redrawn Westinghouse Elementary Diagrams	749C089-1.pdf
N/A	Griffon Propulsion Drawings	Griffon Propulsion Drawings.pdf
03-D84702084-1 shts 0-13	Griffon Propulsion Exciters Interconnect Diagram	03D84702084-1.pdf
529F077	2000 SHP Propulsion Motor Main Assembly	529F077.pdf
640J774	DC Machine Type Q FR EE 626-6 General Assembly	640J774.pdf 640J774-2.pdf
169D046	DC Motor Stator	169D046.pdf
169D655	DC Motor Devices and Connections	169D655.pdf
38068-3	Michell Horizontal Journal Bearing (Motor)	38068-3.pdf
38069-4	"Certified for Construction" Michell Horizontal Journal Bearing (Motor)	38069-4.pdf

**12.2.2.4 Regulations and Standards**

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

**12.2.3 STATEMENT OF WORK****12.2.3.1 General**

**12.2.3.1.1** All readings must be taken before and after cleaning to indicate the as-found (existing) condition of the machine and the as-left (post-cleaning) condition of the machine.

**12.2.3.2 Inspection**

**12.2.3.2.1** The Contractor must perform the following work to obtain RO survey credit for the propulsion motors. The Contractor is responsible for coordinating all RO inspections.

- 12.2.3.2.2** The Contractor must perform a visual inspection of each machine and must inspect the following points:
- a) Commutator surface condition;
  - b) Degree of brush grooving;
  - c) Commutator run-out measurement;
  - d) Mica undercut measured;
  - e) Armature winding condition – mechanical and insulation condition;
  - f) Armature core and spider condition;
  - g) Stator winding condition – mechanical and insulation condition;
  - h) Stator frame and structure;
  - i) Brushes and brush gear – brush length and spring tension to be measured;
  - j) Field poles and connections;
  - k) Shaft bearings;
  - l) All sandwich connections condition;
  - m) Lighting circuit condition;
  - n) Heating circuit condition;
  - o) Sensors and wire lead condition, and
  - p) Armature air gap at the front and aft end of each machine.
- 12.2.3.2.3** The Contractor must perform and record a Megger reading of each machine's armature, stator windings and main supply cabling to the propulsion switch gear. During the cable check, both line-to-line and line-to-ground reading must be taken for all cables. Megger readings must be corrected to 20°C.
- 12.2.3.2.4** The Contractor must take and record the Polarization Index (PI) insulation readings of each machine's armature winding, stator windings and the main supply cabling to the propulsion switchgear. PI readings are to be corrected to 20°C.
- 12.2.3.2.5** The Contractor must note that access to the lower brushes of the propulsion motors is challenging, and dexterity is required.
- 12.2.3.2.6** The Contractor must report all defects or abnormal results to the TA, IA, or designate within 24 hours of the inspection.
- 12.2.3.2.7** The Contractor must prepare a technical report for each machine detailing the findings and readings recorded for each machine.
- 12.2.3.3** **Cleaning**
- 12.2.3.3.1** The Contractor must remove and dispose of all filter media from each propulsion motor filter cage.
- 12.2.3.3.2** The Contractor must provide materials, equipment, and preparatory work to either contain the carbon dust in a filter box or exhaust it to an appropriate area exterior to the vessel. No carbon dust must be exhausted into the engine room spaces or accommodations.

- 12.2.3.3.3** The Contractor must use clean and dry compressed air to remove all loose carbon dust from all propulsion motor components. The Contractor must use appropriate compressed air filters/driers to remove any contaminants, including oil vapour, in the air.
- 12.2.3.3.4** Upon completion of compressed air cleaning, the Contractor must use rags soaked with an approved electrical cleaning solvent to wipe down all accessible motor components to remove any remaining carbon dust. The Contractor must demonstrate to the TA, IA, or designate that the electrical cleaning solvent to be used is a product recommended for the cleaning of electric motor windings. The solvent must be suitable for removing grease and carbon deposits and have a high dielectric resistance, be nonconductive, and noncorrosive. The solvent must not corrode or damage cables, insulation, protective varnishes, fiberglass, plexiglass, or rubber parts and must evaporate cleanly, leaving no greasy deposits.
- 12.2.3.3.5** Post cleaning, the Contractor must perform another set of Megger readings of the armature and stator circuits for each motor. This task will ascertain that the cleaning action has not degraded the as-found Megger readings. Where Megger readings are found to be lower than when performed in the as-found condition, the Contractor must carry out a subsequent inspection ensuring that in fact all areas are clean and report any findings to the TA, IA, or designate.
- 12.2.3.3.6** The Contractor must replace the filter media for each propulsion generator with new filter media (GSM).
- 12.2.3.4** **Inspection Points**
- 12.2.3.4.1** All work must be inspected and completed to the satisfaction of the AR and the TA, IA, or designate.
- 12.2.3.4.2** The Contractor must submit the cleaned motors for a final inspection by the TA, IA, or designate prior to fitting the covers.
- 12.2.3.4.3** **Testing/Trials**
- 12.2.3.4.4** The propulsion motors must be tested in accordance with the Test and Trials Plan for the complete propulsion system.
- 12.2.4** **DOCUMENTATION AND DELIVERABLES**
- 12.2.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:
- 12.2.4.2** **Reports**
- 12.2.4.2.1** The Contractor must provide a written report of the survey of the propulsion motors, including the as-found condition of each motor, initial Megger readings, PI readings, any photographs taken during the cleaning and inspection process, any abnormalities found, and the final as-left Megger readings for the armature and stator circuits (\*ITP).

- 12.2.4.2.2** The Contractor must provide a copy of the RO Survey Credit with the report as well as the calibration certificates for the test instrumentation used during the work. The reported Megger and PI readings must include the tested component's temperature, measured insulation values, and insulation values corrected to 20°C ambient temperature and relative humidity during the testing (\*ITP).
- 12.2.4.2.3** The Contractor must provide two (2) paper copies and one electronic copy (PDF, unprotected) of the condition report to the TA, IA, or designate for each propulsion motors prior to end of the work period and sea trials (\*ITP).
- 12.2.4.3** **Certificates – NOT USED**
- 12.2.4.4** **Measurements, Calibrations and Readings**
- 12.2.4.4.1** These must be dated and signed by the person taking the measurements.
- 12.2.4.5** **Redlined Drawings – NOT USED**
- 12.2.4.6** **Spare parts – NOT USED**
- 12.2.4.7** **Equipment or System Manuals – NOT USED**
- 12.2.5** **TRAINING – NOT USED**

**12.3 PROPULSION OVERCURRENT PROTECTION (SURVEY ITEM)****12.3.1 IDENTIFICATION**

- 12.3.1.1** The overcurrent protection system for the main propulsion system is due for Special Continuous Machinery Survey by the RO.
- 12.3.1.2** The Contractor must obtain an RO survey credit for the six (6) main DC circuit breakers fitted as part of the system protection.
- 12.3.1.3** This survey requires calibrated shunts to test the circuit breakers using secondary injection. The Westrip DC2000 trip units fitted to each breaker require accurate and calibrated signals to satisfy TC requirements. Four (4) new calibrated shunts (GSM) must be installed at this time.
- 12.3.1.4** The propulsion motor current shunts must also be replaced with two (2) new calibrated shunts (GSM).
- 12.3.1.5** This work must be concurrent with SOW item 12.4 Propulsion Control System.

**12.3.2 REFERENCES****12.3.2.1 Equipment Data**

- 12.3.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Main DC Circuit Breakers	Manufacturer: ITE Type: FB-20 Frame Size: RMV-1000VSC, 2000A Serial Numbers 20-302 through 20-307 Westrip DC-2000 trip units, S/N 22015 through 22020.
Propulsion Generator Shunt	2000 DC Amps, 50 DC mV, Resistance: 25.000 micro-ohms ( $\mu\Omega$ ) $\pm 0.1\%$ K2 at a level of confidence of ~95%.
Propulsion Motor Shunt	3000 DC Amps, 50 DC mV, Resistance: 16.666 micro-ohms ( $\mu\Omega$ ) $\pm 0.1\%$ K2 at a level of confidence of ~95%.

**12.3.2.2 Manuals/Reports**

- 12.3.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
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N/A	N/A
Report Title	Electronic File Name
2013 Report on DC Circuit Breakers	2013 DC Breaker Report.pdf
2018 Report on DC Circuit Breakers	3E028,3E034-3E039 Prop Overcurrent Report for TCMS Griffon 2018.pdf

### 12.3.2.3 Drawings

**12.3.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
N/A	GE Propulsion System Drawings	Griffon Propulsion Drawings.pdf
PRE-314	Shunt (Prop. Generator)	PRE-314.pdf
90000-1277	3000 AMP 50 MV Shunt (Prop. Motor)	9-1277.pdf

### 12.3.2.4 Regulations and Standards

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

### **12.3.3 STATEMENT OF WORK**

#### **12.3.3.1 Main Circuit Breaker Inspection**

**12.3.3.1.1** Prior to removal, the Contractor must clearly mark and label all primary and secondary circuit breaker terminations and connections. All circuit breakers must be returned to the same location from which they were removed.

**12.3.3.1.2** The Contractor must remove all six (6) circuit breakers from the breaker cabinets for inspection.

**12.3.3.1.3** The Contractor must perform a visual check of the circuit breakers. This inspection must include:

- a) Bus bar connections - condition and tightness;
- b) Main contact condition - identify and record any hotspots;
- c) Cleanliness - clean as required;
- d) Arc chute condition;
- e) Wiring connection tightness;
- f) Condition of wiring (note there has been issues with breaking of wires to the moving holding coil);
- g) Condition of insulation components;
- h) Megger testing of electrical components, and,
- i) Correct operation and general physical condition of the auxiliary contacts.



- 12.3.3.1.4** The Contractor must immediately report any mechanical and electrical defects to the TA, IA, or designate. Any agreed to repairs will be negotiated via the 1379 process.
- 12.3.3.1.5** The Contractor must lubricate all moving parts of the circuit breaker as required.
- 12.3.3.2 Main Circuit Breaker Testing**
- 12.3.3.2.1** The Contractor must test the six (6) circuit breakers. The testing may take place aboard or at the Contractor's facility.
- 12.3.3.2.2** If the Contractor removes the circuit breakers from the ship, the Contractor is responsible for all transportation and associated costs. All circuit breakers must be protected from any damage during the time that they are in the care and custody of the Contractor for this portion of the specification. All damage must be repaired by the Contractor at the Contractor's expense.
- 12.3.3.2.3** The Contractor must provide calibration certificates for all test equipment.
- 12.3.3.2.4** The circuit breaker trip setting must be verified and tested in the presence of the AR and the TA, IA, or designate. Secondary injection must be used to verify the setting and working of all circuit breaker trip mechanisms.
- 12.3.3.2.5** Testing must be done to the satisfaction of the AR and the TA, IA, or designate. The Contractor is responsible for coordinating all RO inspections.
- 12.3.3.2.6** For each circuit breaker, a minimum testing will consist of:
- a) Long time, short time, and instantaneous trip functions must be tested. Test results and breaker trip relay indications must be recorded;
  - b) Contact resistance of the two poles must be measured and recorded, and,
  - c) Megger testing of all breakers: phase-to-ground, phase-to-phase when the breaker is closed, and line-to-load when the breaker is open.
- 12.3.3.3 Propulsion Generator Shunt Replacement**
- 12.3.3.3.1** Shunt replacement must take place in conjunction with the survey of the GE Propulsion Control System as the outputs to these shunts also feed into the propulsion generator current/voltage isolators for generator current feedback. The calibration of the current/voltage isolators must take place after the new shunts have been installed.
- 12.3.3.3.2** The Contractor must install four new generator shunts in the propulsion system. These shunts (GSM) will be direct replacements for the four shunts which provide input to the trip units of the circuit breakers.
- 12.3.3.4 Propulsion Motor Shunt Replacement**
- 12.3.3.4.1** Shunt replacement must take place in conjunction with SOW Item 12.4, the survey of the Propulsion Control System, as the outputs to these shunts feed into the propulsion motor current/voltage isolators for current feedback. The calibration of the current/voltage isolators must take place after the new shunts have been installed.

**12.3.3.4.2** The Contractor must install two new motor shunts (GSM) in the propulsion system.

**12.3.3.5 Inspection Points**

**12.3.3.5.1** The Contractor must prove that the propulsion control system is functioning properly upon reinstallation of the main circuit breakers.

**12.3.3.5.2** The Contractor must demonstrate that all circuit breaker controls and interlock functions work. This must be done in the presence of the AR and the TA, IA, or designate.

**12.3.3.6 Testing/Trials**

**12.3.3.6.1** The Contractor must test cycle each breaker operation and trip function a minimum of ten (10) times.

**12.3.3.6.2** The Contractor must use secondary injection to trip the instantaneous trip settings of the breakers.

**12.3.4 DOCUMENTATION AND DELIVERABLES**

**12.3.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:

**12.3.4.2 Reports**

**12.3.4.2.1** The Contractor must provide a written report of all circuit breaker inspections detailing the condition of the circuit breakers and any faults found with the circuit breakers. The report must also detail any repairs made or parts replaced (\*ITP).

**12.3.4.2.2** The Contractor must provide a detailed report of the electrical testing of the circuit breakers. This report must also include the calibration documentation for the test equipment (\*ITP).

**12.3.4.2.3** The Contractor must provide details of the propulsion control system adjustments made after the installation of the generator shunts and motor shunts (\*ITP).

**12.3.4.2.4** The Contractor must provide a copy of the RO survey credit with the report (\*ITP).

**12.3.4.2.5** The Contractor must provide two (2) paper copies of the report as well as an electronic copy in PDF format (unprotected). Copies of the report must be provided to the TA, IA, or designate prior to sea trials (\*ITP).

**12.3.4.3 Certificates – NOT USED**

**12.3.4.4 Measurements, Calibrations and Readings**

**12.3.4.4.1** These must be dated and signed by the person taking the measurements.

**12.3.4.5 Redlined Drawings – NOT USED**

**12.3.4.6 Spare parts – NOT USED**

**12.3.4.7 Equipment or System Manuals – NOT USED**

**12.3.5**      **TRAINING – NOT USED**

**12.4 PROPULSION CONTROL SYSTEM (SURVEY ITEM)****12.4.1 IDENTIFICATION**

- 12.4.1.1** The propulsion control system is due for Special Continuous Machinery Survey by the RO. The survey must involve the various propulsion control system components and eight (8) exciters (drives).
- 12.4.1.2** The Contractor must perform routine maintenance and conduct a condition assessment of the propulsion system components to obtain an RO survey credit.
- 12.4.1.3** As part of the work, the Contractor must inspect and calibrate all twelve (12) fitted system shunts (six (6) current/voltage isolators and six (6) voltage attenuators).
- 12.4.1.4** This work must be concurrent with SOW item 12.3 Propulsion Overcurrent Protection System.

**12.4.2 REFERENCES****12.4.2.1 Equipment Data**

- 12.4.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Generator Exciter	GF2000 x 5
Motor Exciter	ME2000 x 3
Unit Controller	UC2000 x 2
PLC	Logicmaster 90/30 x 2

**12.4.2.2 Manuals**

- 12.4.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
GE Propulsion System Operations Manual (2003)	Griffon Operations manual ver4.pdf
Drive System Propulsion Audit – by GE 2013	2013 Prop System Report by GE.pdf
Drive System Propulsion Audit – by ABB 2018	2018 Prop System Report by ABB_ Rev1.pdf

**12.4.2.3 Drawings**

- 12.4.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
N/A	GE Propulsion System Drawings	Griffon Propulsion Drawings.pdf

GE-100027	Application and Replacement Instructions for SVIA Shunt Isolator Board	GE SVIA Shunt Isolator Board.pdf
GE-100187	Replacement Procedure for SVAA Voltage Attenuator Board	GE SVAA Attenuator Board.pdf
03-D84702084-1 shts 0-13	Griffon Propulsion Exciters Interconnect Diagram	03D84702084-1.pdf

#### **12.4.2.4 Regulations and Standards**

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

#### **12.4.3 STATEMENT OF WORK**

##### **12.4.3.1 General**

**12.4.3.1.1** The Contractor must provide the TA, IA, or designate with a backup copy of all propulsion control and PLC files (master and slave) prior to commencing this work. This will provide a snapshot of the system as-found condition prior to any inspections and calibrations.

**12.4.3.1.2** The Contractor must provide the TA, IA, or designate with a backup copy of all propulsion control and PLC files (master and slave) at the completion of this work. This will provide a snapshot of the system as-left condition after the trials are complete.

**12.4.3.1.3** The Contractor must perform routine maintenance and conduct a condition assessment of the propulsion motor and generator exciters.

**12.4.3.1.4** The Contractor must perform routine maintenance and conduct a condition assessment of the port and starboard propulsion systems.

**12.4.3.1.5** As part of the work, the Contractor must inspect and calibrate all fitted system current/voltage isolators (6 x DS200SVIA Shunt Isolator Board (SVIA)) and voltage attenuators (6 x DS200SVAA Voltage Attenuator Board (SVAA)).

##### **12.4.3.2 Propulsion Generator Exciters and Propulsion Motor Exciters**

**12.4.3.2.1** The Contractor must clean all exciter cabinets, five (5) GF2000 and three (3) ME2000 drives, and associated components of all visible dust.

**12.4.3.2.2** The Contractor must verify all electrical connections to the exciter as being secure. In the event of broken connections, the entire ribbon cable must be replaced and will be negotiated under 1379 action. All connections must have Nyogel electrical lubricant and protection grease applied. All connections must be potted secure to resist vibration.

**12.4.3.2.3** The Contractor must replace the cooling fans on each exciter drive unit, except the two spare units. Note that these fans are located within the circuit boards and are difficult to reach. Extreme caution must be exercised. This section does not refer to the cabinet

door fans, which do not require maintenance at this time. The cooling GF2000 and ME2000 fans fan model to be equivalent to as-fitted:

- a) Two (2) each x six (6) exciters for a total of twelve (12) fans;
- b) Listed part #: GE model Fan, Muffin, rack cooling, heat sink, 104X215CA 003 or equivalent, and
- c) Current model: Orion Fan OA109AP-11-1TB.

**12.4.3.2.4** The Contractor must test all exciter units for correct operation, including:

- a) Spare propulsion generator exciter unit to be shown fully functional in parallel operation with each propulsion generator. Load balance between all units and the spare exciter must be the best possible average;
- b) Spare propulsion motor exciter to be shown fully functional in operation with each motor;
- c) Correct operation of the cross-connection capability of both the starboard engines on both propulsion motors and port engines on both propulsion motors to be proven during dock trials and sea trials;
- d) Verification that software installed on GF/GM drives is properly backed up to the vessel's laptop computer, and
- e) A report of all findings on each exciter is to be prepared and provided to the TA, IA, or designate.

**12.4.3.2.5** The Contractor must provide RO survey credit for each exciter.

**12.4.3.3 Port and Starboard Propulsion Control**

**12.4.3.3.1** The Contractor must clean the port and starboard UC2000 units of visible dust.

**12.4.3.3.2** The Contractor must verify all electrical connections to the UC units as secure.

**12.4.3.3.3** The Contractor must replace the cooling fan on each UC:

- a) One (1) each x two (2) units for a total of two (2) fans, and
- b) Current model: Sprite DC SD24B2.

**12.4.3.3.4** The Contractor must verify all electrical connections to be GE90-30 PLCs and I/O modules are secure.

**12.4.3.3.5** The Contractor must replace the batteries of the two GE90-30 PLCs:

- a) All batteries must have a recent date code (within 1 year), and
- b) Two (2) spare batteries are also to be supplied to the TA, IA, or designate.

**12.4.3.3.6** The Contractor must test all UC units for correct operation:

- a) The redundancy of the UC2000 communication must be tested by operation of the system on only one UC. This must be verified on both the Port and Starboard UC;

Note that the cable to connect for this redundancy option is laying loose at the bottom of the exciter cabinets containing the UCs, and

- b) Verification that the software installed on UCs and PLCs is properly backed up to the vessel's laptop computer and provided to the TA on a portable USB drive.

**12.4.3.3.7** The Contractor must inspect, verify, and calibrate as required the propulsion control system of any circuit protective devices within the system. Upon completion of the inspection, the Contractor must provide a written statement indicating that the propulsion control system is fully functional, calibrated, and operating within its parameters as designed.

**12.4.3.3.8** The Contractor must calibrate the generator and motor tachogenerator speed signal inputs into the propulsion control system. The Contractor must note that speed of each motor and generator must be verified using an independent tachometer (i.e., handheld laser tachometer or equivalent) and not the local ship gauges.

**12.4.3.3.9** The Contractor must provide a report of all findings on the propulsion control system to the AR and the TA, IA, or designate.

**12.4.3.3.10** The Contractor must provide RO survey credit for the propulsion control system.

**12.4.3.4 Propulsion System Current Isolators and Voltage Attenuators**

**12.4.3.4.1** The Contractor must verify the calibration of the six (6) SVIA Shunt Isolator Boards in the motor room breaker cabinets (port and starboard):

- a) The SVIA boards are GE Cat #336A348G2;
- b) The six (6) current shunts are to be renewed as part of SOW Item 12.3 Propulsion Overcurrent Protection System. Calibration of the SVIA Shunt Isolator board must be take place after the new shunts are installed, and
- c) The isolators must be verified functional and properly calibrated as per the reference documentation. Note that the reference document is from 2003.

**12.4.3.4.2** The Contractor must verify the accuracy of the six (6) SVAA Voltage Attenuators in the motor room breaker cabinets (port and starboard) as per reference documentation:

- a) The SVAA boards are GE Cat #336A3459G2.
- b) The attenuators are to be verified functional and providing the rated attenuation. The actual attenuation of each unit must be noted, and adjustments made at the respective exciter DCFB boards to accommodate for attenuation inaccuracy.
- c) If the attenuation error is outside of the specification for the unit, the attenuator must be replaced by a Contractor supplied new unit under 1379 action.

**12.4.3.5 Inspection Points**

**12.4.3.5.1** The Contractor must demonstrate:

- a) Initial file back up;

- b) Exciter board cleanliness and potting, and
- c) Motor and generator speed calibration.

#### **12.4.3.6 Testing/Trials**

**12.4.3.6.1** The Contractor must prove that the propulsion control system is functional in the presence of the AR and the TA, IA, or designate. This must include a sea trial. This sea trial must demonstrate the following conditions functional (for acronyms see table below in 12.4.3.6.3):

- a) POG alone;
- b) POG master with PIG slave;
- c) PIG alone (port side);
- d) PIG master with POG slave;
- e) PIG alone (cross connected to starboard side);
- f) SOG alone;
- g) SOG master with SIG slave;
- h) SIG alone (starboard side);
- i) SIG master with SOG slave;
- j) SIG alone (cross connected to port side);
- k) AXG on single POG on motor @ 1/2 ahead;
- l) AXG on single PIG on motor @ 1/2 ahead;
- m) AXG on single SIG on motor @ 1/2 ahead;
- n) AXG on single SOG on motor @ 1/2 ahead;
- o) AXG on POG, 4 engines @ full speed;
- p) AXG on PIG, 4 engines @ full speed;
- q) AXG on SIG, 4 engines @ full speed;
- r) AXG on SOG, 4 engines @ full speed;
- s) PME online;
- t) SME online;
- u) AME as PME on motor @ 1/2 ahead, and
- v) AME as SME on motor @ 1/2 ahead.

**12.4.3.6.2** For each condition, the Contractor must record:

- a) Generator voltage, current, and field current, and
- b) Motor voltage, current, field current, and RPM.

**12.4.3.6.3** Table of acronyms:



POG	Port Outboard Generator
PIG	Port Inboard Generator
SIG	Starboard Inboard Generator
SOG	Starboard Outboard Generator
P-MOT	Port Motor
S-MOT	Starboard Motor
PME	Port Motor Exciter
SME	Starboard Motor Exciter
AXG	Auxiliary Generator Exciter
AME	Auxiliary Motor Exciter

#### **12.4.4 DOCUMENTATION AND DELIVERABLES**

**12.4.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:

##### **12.4.4.2 Reports**

**12.4.4.2.1** The Contractor must provide two (2) paper copies and one electronic (PDF) copy of the report which must include a minimum of:

- a) The condition, findings, and settings of the propulsion control system as-found;
- b) The results and settings of the current isolator and voltage attenuator calibration;
- c) The propulsion readings recorded during sea trials;
- d) The condition, findings, and settings of the propulsion control system as-left, and
- e) All miscellaneous repairs made (\*ITP).

**12.4.4.2.2** The Contractor must provide a copy of the RO survey credit with the report (\*ITP).

**12.4.4.2.3** The Contractor must provide the TA, IA, or designate with a portable USB drive containing all backup copy files. File name format must include the date taken i.e., 20230712backupPLCMaster.xxx (\*ITP).

##### **12.4.4.3 Certificates – NOT USED**

##### **12.4.4.4 Measurements, Calibrations and Readings**

**12.4.4.4.1** These must be dated and signed by the person taking the measurements.

##### **12.4.4.5 Redlined Drawings – NOT USED**

##### **12.4.4.6 Spare parts – NOT USED**

**12.4.4.7        Equipment or System Manuals – NOT USED**

**12.4.5        TRAINING – NOT USED**

**12.5 PROPULSION MOTOR BLOWERS (SURVEY ITEM)****12.5.1 IDENTIFICATION**

- 12.5.1.1** The four (4) blower assemblies fitted to the propulsion motors are due for Special Continuous Machinery Survey by the RO.
- 12.5.1.2** The assemblies (blower fan and electric motor) are to be disassembled by the Contractor to be transported to the Contractor's facility for cleaning, overhaul, dynamic balancing, testing and reassembly prior to reinstallation in their original locations on the propulsion motors.
- 12.5.1.3** This work must be concurrent with SOW item 12.1 Propulsion Motors and 12.6 Propulsion Generator and Motor Coolers.

**12.5.2 REFERENCES****12.5.2.1 Equipment Data**

- 12.5.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Blower Fan	Manufacturer: Westinghouse Centrifugal Fan Sturtevant Div., Galt, ON Model: 3022 Special Blower Styles: 717D805 Fig. 1 and Fig. 5 Ser. No.: Port Outboard – 60-12645-2 Port Inboard – 60-12645-1 Starboard Inboard – 60-12645-2 Starboard Outboard – 60-12645-1
Blower Electric Motor	Manufacturer: General Electric Induction Motor, Peterborough, ON Model: 117121 Power: 10 HP Volts: 440, 3 Phase, 60 Hz Amps: 14.5 Speed: 1750 RPM Service Factor: 1.0 600C Rise Cont. CEMA Design: B, Type K, Frame 254DZ DE Bearing: 40BC03J ODE Bearing: 35BC02J

	Marine Class B Insulation Original Motors; last overhauled in 2018 Serial #'s: Port Outboard – 966867 Port Inboard – 966869 Starboard Inboard – 966868 Starboard Outboard – 966870
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### 12.5.2.2 Manuals/Reports

**12.5.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
Westinghouse Instr. Book No CD-4530, Part II, Sect. I, Propulsion Motors	Part II - Section 1 - Propulsion Motors.pdf
Report Title	Electronic File Name
2018 Port Blower #1 Survey Report	3E005 Port Blower 1 for TCMS Griffon 2018.pdf
2018 Port Blower #2 Survey Report	3E006 Port Blower 2 for TCMS Griffon 2018.pdf
2018 Stbd Blower #1 Survey Report	3E010 Starboard Blower 1 for TCMS Griffon 2018.pdf
2018 Stbd Blower #2 Survey Report	3E011 Starboard Blower 2 for TCMS Griffon 2018.pdf

### 12.5.2.3 Drawings

**12.5.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
529F077	2000 SHP Propulsion Motor Main Assembly	529F077.pdf
640J774	DC Machine Type Q FR EE 626-6 General Assembly	640J774.pdf 640J774 -2.pdf
766401 Rev. B0	Electrical Plant Schematic Wiring Diagram	Updated-766401-Griffon SLD- Rev B0-11x17.pdf
N/A	Griffon Propulsion Drawings	Griffon Propulsion Drawings.pdf

### 12.5.2.4 Regulations and Standards

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

**12.5.3**      **STATEMENT OF WORK****12.5.3.1**      **General**

**12.5.3.1.1**      This specification item must be completed in conjunction with SOW items for 12.2 Propulsion Motors, 12.3 Propulsion Overcurrent Protection System, and 12.4 Propulsion Control System. Additionally, ship's crew will be surveying one Main Air Compressor located in the aft, port corner of the Upper Propulsion Motor Room.

**12.5.3.1.2**      The Contractor must supply all labor, material, and equipment to complete the work including all rigging required to remove and remount the blowers.

**12.5.3.1.3**      The Contractor must remove all interference items to complete the work. Items removed must be clearly tagged as to their location. Upon completion of the work, the Contractor must reinstall all interference items in their original locations and working order.

**12.5.3.1.4**      All replacement blower parts must be Contractor supplied.

**12.5.3.1.5**      All components of the blower assemblies must be thoroughly degreased and cleaned using an approved electrical cleaning solvent prior to reassembly. The Contractor must demonstrate to the TA, IA, or designate that the electrical cleaning solvent to be used is a product recommended for the cleaning of electric motor windings. It must be suitable for removing grease and carbon deposits. It must have a high dielectric resistance, be nonconductive, and noncorrosive. It must not corrode or damage cables, insulation, or rubber parts. It must evaporate cleanly, leaving no greasy deposits.

**12.5.3.1.6**      All measuring devices, including the Megger tester, must have been calibrated within the last twelve (12) months. Proof of valid and current calibration must be a deliverable for this specification item.

**12.5.3.1.7**      The Contractor must trial the blower assemblies in the presence of the AR and the TA, IA, or designate and provide a survey credit from the RO. The Contractor is responsible for arranging all RO inspections.

**12.5.3.2**      **Removals**

**12.5.3.2.1**      Prior to removal, the Contractor must bump test each of the blowers and mark the direction of rotation.

**12.5.3.2.2**      The Contractor must electrically isolate, disconnect, and remove each of the blowers from the propulsion motors to facilitate cleaning and inspection of the blower, blower shrouds and ducting. Isolation and disconnection must be completed through an approved lockout and tagout system as per FSM 7.B.5.

**12.5.3.2.3**      The Contractor must disassemble each blower assembly for transportation, cleaning, and inspection.

**12.5.3.2.4**      The Contractor must unship the blowers from the vessel.

- 12.5.3.2.5** The Contractor must transport the electric motors to the Contractor's facility for overhaul. The Contractor must ensure the electric motors and blower assemblies are protected from damage during the manipulation and transportation of these components. Any damage resulting from the work/transportation must be repaired at the Contractor's expense.
- 12.5.3.3 Motor Inspection and Overhaul**
- 12.5.3.3.1** The blower motors are to be dismantled, Meggered, cleaned, and assembled with new bearings installed.
- 12.5.3.3.2** The Contractor must provide a photographic record of each electric motor showing the condition of the motor after disassembly, after cleaning, and upon reassembly. The photos must be linked to the serial numbers of each motor.
- 12.5.3.3.3** The Contractor must perform mechanical inspection of each motor including:
- a) Shaft runout readings, and,
  - b) Renewing all bearings with new bearings (CFM).
- 12.5.3.3.4** The Contractor must conduct electrical testing of the windings of each motor before disassembly and after reassembly including:
- a) Resistance testing of each phase;
  - b) Megaohm resistance of each phase to ground (tested at 1000V);
  - c) Polarization Index (PI);
  - d) Hi-Pot Testing, and
  - e) Surge Testing, including peak to peak and EAR%.
- 12.5.3.3.5** After cleaning, the Contractor must dynamically balance each blower to ISO 21940 G2.5, or better, to ensure that it will run true and not induce vibrations into the motor shaft.
- 12.5.3.3.6** Upon reassembly, the Contractor must bench test each motor with the fan blades installed. The motors must be run and monitored for one (1) hour at minimum. Motor current, drive end (DE) casing temperature, and opposite drive end (ODE) casing temperatures must be recorded every fifteen (15) minutes.
- 12.5.3.4 Installation**
- 12.5.3.4.1** All components must be cleaned prior to reassembly. The Contractor must check the cleanliness and condition of each component prior to reassembly.
- 12.5.3.4.2** The Contractor must reinstall all components removed in good order.
- 12.5.3.4.3** The motor casing must be reinstalled with new solid neoprene rubber gaskets.
- 12.5.3.4.4** The Contractor must reconnect the electrical supply to each motor with new connectors approved for marine applications. Except for the thread cutting type of connector, twist-on type connectors must not be used for making joints in cables.

**12.5.3.4.5** The Contractor must verify that the 3-phase supply is correctly connected for the correct rotation for each blower motor before testing.

**12.5.3.5 Inspection Points**

**12.5.3.5.1** The Contractor must submit the electric motor components to inspection by the AR and the TA, IA, or designate prior to reassembly. The Contractor must afford the TA, IA, or designate the opportunity to witness the bench test of the electric motor.

**12.5.3.5.2** The Contractor must submit the cleaned and overhauled components to inspection by the TA, IA, or designate prior to reassembly onto the propulsion motors.

**12.5.3.6 Testing/Trials**

**12.5.3.6.1** The Contractor must perform an operational test of each blower after all have been reinstalled on the propulsion motors and all other concurrent survey items have been completed on the propulsion motors.

**12.5.3.6.2** The operational test must be of four (4) hours duration and must be separate from the sea trial of the propulsion system. Motor current and DE/ODE casing temperatures must be recorded every hour.

**12.5.3.6.3** This SOW item must be included on the Tests and Trials Plan.

**12.5.4 DOCUMENTATION AND DELIVERABLES**

**12.5.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:

**12.5.4.2 Reports**

**12.5.4.2.1** The Contractor must submit a report (one electronic (PDF) copy and two (2) paper copies) to the TA, IA, or designate for each blower assembly. A work order is not considered acceptable. The report must contain detailed information including:

- a) Company details;
- b) Work performed;
- c) Readings taken;
- d) Photographs of the equipment in various stages of disassembly/reassembly;
- e) Calibration certificates of all measuring devices used;
- f) Bill of materials for all parts used including part numbers;
- g) Specification and product sheets for the electric motor degreaser used, and,
- h) Deficiencies, corrective measures taken, and recommendations (\*ITP).

**12.5.4.2.2** The Contractor must provide a copy of the RO survey credit with the report (\*ITP).

**12.5.4.3 Certificates – NOT USED**

**12.5.4.4 Measurements, Calibrations and Readings**

**12.5.4.4.1** These must be dated and signed by the person taking the measurements.

**12.5.4.5 Redlined Drawings – NOT USED**

**12.5.4.6 Spare parts – NOT USED**

**12.5.4.7 Equipment or System Manuals – NOT USED**

**12.5.5 TRAINING – NOT USED**



**12.6 PROPULSION GENERATOR AND MOTOR COOLERS (SURVEY ITEM)****12.6.1 IDENTIFICATION**

- 12.6.1.1** The four (4) propulsion generator coolers and two (2) propulsion motor coolers, for a total of six (6) units, are due for a Special Continuous Machinery Survey by the RO.
- 12.6.1.2** The six (6) air/water heat exchanger type coolers must be overhauled and inspected in place.
- 12.6.1.3** Survey of the propulsion generator coolers must be concurrent with SOW 12.1 Propulsion Generator.
- 12.6.1.4** Survey of the propulsion motor coolers must be done concurrent with SOW item 12.2 Propulsion Motors and SOW item 12.5 Propulsion Motor Blowers.

**12.6.2 REFERENCES****12.6.2.1 Equipment Data**

- 12.6.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
N/A	N/A

**12.6.2.2 Manuals**

- 12.6.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
N/A	N/A

**12.6.2.3 Drawings**

- 12.6.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
529F075	DC Generator – Type QL Main Assembly	529F075.pdf
529F077	2000 SHP Propulsion Motor Main Assembly	529F077.pdf
640J771 shts 1 & 2	DC Machine Type QL CC 216.5 General Assembly	640J771.pdf 640J771-2.pdf
640J774 shts 1 & 2	DC Machine Type Q FR EE 626-6 General Assembly	640J774.pdf 640J774-2.pdf
664-4207-1	Raw Water Circulating Diagram	664-4207-1.pdf

664-4207-10 shts 1 & 2	Raw & Fresh Water Circulating Piping Arrg.	664-4207-10 SH1.pdf 664-4207-10 SH2.pdf
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#### **12.6.2.4 Regulations and Standards**

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

#### **12.6.3 STATEMENT OF WORK**

##### **12.6.3.1 General**

**12.6.3.1.1** The Contractor must supply all labor, material, and equipment to complete the work including all rigging required to remove and remount the cooler covers.

**12.6.3.1.2** The Contractor must remove all interference items for the completion of this work. Upon completion of the work, the Contractor must reinstall all interference items in the original location and working order.

**12.6.3.1.3** The dimensions provided below are considered approximate. It is the Contractor's responsibility to verify all dimensions before disassembling the coolers.

**12.6.3.1.4** The propulsion generator coolers (Unifin) are of the air/water, double wall marine, with internal provision for preventing air pockets. The headers are interchangeable, and water connections are on the right side of each unit as viewed from the generator coupling.

- a) The units are constructed of 70/30 cupro-nickel tubes and tube sheets, bronze headers, zinc anti-corrosion rods, and with connections to space between double wall tubing fitted with leak indicators and drains;
- b) Each generator cooler has seventy-four (74) tubes, arranged in a staggered pattern of seven (7) columns by ten (10) or eleven (11) rows;
- c) The water side is a four-pass system. Inlet and outlet water connections terminate at nominal 1-1/2" bronze flanged pipe fittings. The bronze flanges are flat faced, and
- d) Approximate dimensions of the assembled units are 86" x 19" x 13".

**12.6.3.1.5** The propulsion motor coolers (Unifin) are of the air/water, double wall marine, leak detecting water tube type, with internal provision for preventing air pockets. The headers are interchangeable, and water connections are on the outboard side of each unit. The leak indicators are on the right side when viewed from the propulsion shaft coupling.

- a) The units are constructed of 70/30 cupro-nickel tubes and tube sheets, bronze headers, zinc anti-corrosion rods, and with connections to space between double wall tubing fitted with leak indicators and drains.

- b) Each propulsion motor cooler has approximately one hundred fourteen (114) tubes, arranged in a staggered pattern of six (6) columns by eighteen (18) or nineteen (19) rows.
- c) The water side is a four-pass system. Inlet and outlet water connections terminate at nominal 2" bronze flanged pipe fittings. The bronze flanges are flat faced.
- d) Approximate dimensions of the assembled unit are 96" x 36" x 13".

- 12.6.3.1.6** The Contractor must thoroughly clean all components of the heat exchangers to the satisfaction of the TA, IA, or designate.
- 12.6.3.1.7** The Contractor must demonstrate to the TA, IA, or designate that any chemicals used for cleaning the coolers are non-acid, non-caustic, and will not harm or damage the coolers and their associated components.
- 12.6.3.1.8** The Contractor must follow the recommended manufacturer's procedures for any cleaning chemicals, including preparation, use, removal, and disposal.
- 12.6.3.1.9** The Contractor must not use high pressure methods for cleaning the air side of the cooler, as this may damage the cooler fins.
- 12.6.3.1.10** Any damage to the tubes, tube sheets, fins, headers, flanges, water regulator, piping and flexible hose connections that occurs during this work must be repaired to the satisfaction of the TA, IA, or designate at the Contractor's expense.
- 12.6.3.1.11** The Contractor must pressure test each of the coolers. Testing must be performed at 20 psi for eight (8) hours.
- 12.6.3.1.12** All measuring devices, including the pressure gauge used for the pressure test, must have been calibrated within the twelve (12) months prior to testing. Proof of valid and current calibration must be a deliverable for this SOW item.
- 12.6.3.2** **Removals**
  - 12.6.3.2.1** The Contractor must isolate the inlet and outlet raw water valves for each of the six (6) coolers.
  - 12.6.3.2.2** The Contractor must drain and contain the water from the isolated systems to prevent recontamination of the previously cleaned bilges. The Contractor must dispose of the water in the vessel's grey water system. As work on the propulsion generators, propulsion motor blowers, and propulsion motors is concurrent, the Contractor is responsible to prevent for any water contamination of those systems and their auxiliaries.
  - 12.6.3.2.3** The electrical connection boxes mounted on the side of the propulsion motors and propulsion generators are fitted with old gaskets and may not be watertight. They are located below the coolers and are open to the inside of the propulsion motors and propulsion generators. The Contractor must ensure that no water enters the propulsion generators or propulsion motors during removals, installation, or trials of the coolers.

The Contractor is responsible for repairs due to water contamination of those systems and their auxiliaries.

- 12.6.3.2.4** The Contractor must clearly identify, by means of a punch stamp, each of the six (6) coolers. The Contractor must use the following codes to represent:
- a) POG - port outboard generator;
  - b) PIG - port inboard generator;
  - c) SIG - starboard inboard generator;
  - d) SOG - starboard outboard generator;
  - e) P-MOT - port motor, and,
  - f) S-MOT - starboard motor
- 12.6.3.2.5** The Contractor must use this coding to identify all the components and pieces of the cooling systems.
- 12.6.3.2.6** The Contractor must clearly identify each thermostatic water-regulating valve before removal. The valves must be identified with respect to location, orientation, and temperature set point. The Contractor must release the water-regulating valve and its capillary tube and place it safely aside for reuse. All securing items are to be bagged, identified, and kept with the associated valve. The Contractor must take care not to damage or kink the capillary tubes during removal, storage, or installation. Any loss of or damage to the thermostatic water-regulating valves and their auxiliaries must be repaired or replaced at the Contractors expense.
- 12.6.3.2.7** The Contractor must identify and remove the cooler inlet and outlet piping back to the most convenient flange. The Contractor must blank the flange with Contractor supplied blank flanges and new gaskets. The Contractor must determine how much piping to remove, as some of the piping is an interference item for other sections of the SOW. Upon installation of each cooler, the Contractor must install new gaskets at all flanged connections. The gasket material used must be suitable for its application.
- 12.6.3.3 Cleaning and Testing**
- 12.6.3.3.1** Prior to disassembly, each of the cooler headers must be clearly marked for position and alignment.
- 12.6.3.3.2** The Contractor must clean both the exterior and interior of the tube bundle and header assemblies. Any deficiencies must be brought to the attention of the TA, IA, or designate.
- 12.6.3.3.3** After disassembly and cleaning, the coolers must be made available for inspection by the TA, IA, or designate.
- 12.6.3.3.4** The Contractor must assemble the coolers with new gaskets, brass drain plugs, zinc anodes, and brass anode holders (all CFM).

- 12.6.3.3.5** The Contractor must pressure test each cooler. The pressure test must consist of filling the water side with fresh water, applying a pressure of 20 psi for 8 (eight) hours, and observing the air side and sealing surfaces for leaks. Any deficiencies must be brought to the attention of the TA, IA, or designate.
- 12.6.3.3.6** Upon the successful completion of the pressure tests, the Contractor must empty the water from each cooler.
- 12.6.3.3.7** The Contractor must prepare a condition report for each of the six (6) coolers. It should be noted that in certain cases the AR may wish to witness the pressure tests and thus the Contractor must communicate with the RO as to the exact requirements for the inspection and pressure testing of the cooler assemblies.
- 12.6.3.4** **Installation**
- 12.6.3.4.1** The Contractor must demonstrate to the TA, IA, or designate that the air side of each cooler is thoroughly dry before installation.
- 12.6.3.4.2** The Contractor must secure each cooler cover in place. Securing fasteners that have been deemed unsuitable for reuse by the TA, IA, or designate will be disposed of by the Contractor and replaced with new fasteners (CFM).
- 12.6.3.5** **Inspection Points**
- 12.6.3.5.1** The Contractor must submit the completed work for inspection by the AR and the TA, IA, or designate.
- 12.6.3.6** **Testing/Trials**
- 12.6.3.6.1** The Contractor must perform a full flow test of the cooling water through the coolers once the coolers have been reinstalled on the vessel. The Contractor must repair any leaks resulting from the work at the Contractor's expense.

**12.6.4** **DOCUMENTATION AND DELIVERABLES**

- 12.6.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:
- 12.6.4.2** **Reports**
- 12.6.4.2.1** The Contractor must provide a report (one electronic (PDF) copy and two paper copies) detailing the work performed on each of the coolers and their overall condition from the as-found condition to the as-left condition. The Contractor must also detail all parts replaces, any deficiencies and corrective measures taken (\*ITP).
- 12.6.4.2.2** The Contractor must provide a copy of the RO survey credit with the report (\*ITP).
- 12.6.4.3** **Certificates – NOT USED**
- 12.6.4.4** **Measurements, Calibrations and Readings**
- 12.6.4.4.1** These must be dated and signed by the person taking the measurements.

**12.6.4.5 Redlined Drawings – NOT USED**

**12.6.4.6 Spare parts – NOT USED**

**12.6.4.7 Equipment or System Manuals – NOT USED**

**12.6.5 TRAINING – NOT USED**

## **13        POWER GENERATION SYSTEMS [NOT USED]**

## 14 POWER DISTRIBUTION SYSTEMS

### 14.1 ANNUAL MEGGER TESTING OF ELECTRICAL CIRCUITS (SURVEY ITEM)

#### 14.1.1 IDENTIFICATION

**14.1.1.1** The Contractor must perform a complete Megger survey as per RO and TCMS requirements for all electrical circuits onboard the vessel.

#### 14.1.2 REFERENCES

##### **14.1.2.1 Equipment Data**

**14.1.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
N/A	N/A

##### **14.1.2.2 Manuals/Reports**

**14.1.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
N/A	N/A
Report Title	Electronic File Name
2022 Griffon Megger Report	10172-IRT-CCGS Griffon 2022.xlsx

##### **14.1.2.3 Drawings**

**14.1.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
766401 Rev. B0	Electrical Plant Schematic Wiring Diagram	Updated-766401-Griffon SLD-Rev B0-11x17.pdf

##### **14.1.2.4 Regulations and Standards**

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

#### 14.1.3 STATEMENT OF WORK

##### **14.1.3.1 General**

**14.1.3.1.1** The Contractor must Megger test all electrical circuits on the vessel and must record the readings obtained. The Contractor must update the vessel's 2022 electronic copy of the Megger report file.



- 14.1.3.1.2** Testing must be from power leads to ground. All motor circuits must be tested from the main distribution panel to the motor starter and from the motor starter to the motor. The test voltage required for the circuit must be as per the requirements of TP 127.
- 14.1.3.1.3** Power cables to sensitive electronics (navigation equipment, VFD, etc.) must be disconnected at the load so the cable run can be tested. The Contractor must ensure that sensitive electronics equipment is not subjected to any Megger testing.
- 14.1.3.1.4** Any equipment that becomes non-functional as a result of this testing must be repaired by the Contractor at the Contractor's expense.
- 14.1.3.1.5** The Contractor must submit a copy of the updated Megger Report to the TA, IA, or designate within two (2) weeks of completion of the work.

**14.1.4**      **DOCUMENTATION AND DELIVERABLES**

- 14.1.4.1**      The Contractor must provide the TA, IA, or designate with original copies of the following:
- 14.1.4.2**      **Reports**
  - 14.1.4.2.1**      The Contractor must provide the TA, IA, or designate with updated copies of the ship's electronic Megger report in electronic MS Excel and PDF format. The report must clearly identify all circuits which do not meet Megger requirements set in TP 127 (\*ITP).
- 14.1.4.3**      **Certificates**
  - 14.1.4.3.1**      The Contractor must provide the certificate of a qualified marine electrician to complete the Megger testing (\*ITP).
  - 14.1.4.3.2**      The Contractor must provide a valid calibration certificate for the Megger instrument used for testing (\*ITP).
- 14.1.4.4**      **Measurements, Calibrations and Readings**
  - 14.1.4.4.1**      These must be dated and signed by the person taking the measurements.
- 14.1.4.5**      **Redlined Drawings – NOT USED**
- 14.1.4.6**      **Spare parts – NOT USED**
- 14.1.4.7**      **Equipment or System Manuals – NOT USED**

**14.1.5**      **TRAINING – NOT USED**

## 14.2 AC CIRCUIT BREAKERS (SURVEY ITEM)

### 14.2.1 IDENTIFICATION

**14.2.1.1** There are five (5) rack-out AC breakers due for Special Continuous Machinery Survey by the RO. There is a requirement to inspect, clean, test, and certify these circuit breakers.

**14.2.1.2** It is the Contractor's responsibility to coordinate circuit breaker work with other sections of the specification to maintain power aboard with minimal blackouts. Note that there are two spare breakers that can be set-up to replace the Shore Power and Emergency Generator breakers during the survey.

### 14.2.2 REFERENCES

#### 14.2.2.1 Equipment Data

**14.2.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Emergency Generator (EG2) Breaker	Emergency Switchboard Type – ITE K-600 (upgraded) Serial # 46732-M12-1-7A Rating – 540A Suretrip RMS2007AF
Ship Service Generator #1 (SSG-1) Breaker	Main Switchboard – FR 1 Type – ITE K-600 (upgraded) Serial # 93186 Rating – 540A Westrip RMS-2000
Ship Service Generator #2 (SSG-2) Breaker	Main Switchboard – FR2 Type – ITE K-600 (upgraded) Serial # 93179 Rating – 540A Suretrip RMS2007A F (1)
Ship Service Generator #3 (SSG-3) Breaker	Main Switchboard – FR3 Type – ITE K-600 (upgraded) Serial # 93177 Rating – 540A Digitrip RMS/R500
Shore Supply (SP) Breaker	Main Switchboard – FR4

	Type – ITE K-600 (upgraded) Serial # 93180 Rating – 300A Suretrip RMS2007A F (1)
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#### 14.2.2.2 Manuals and Reports

14.2.2.2.1 The following equipment manuals and reports are provided as Guidance Documents.

Manual Title	Electronic File Name
N/A	N/A
Report Title	Electronic File Name
Emergency Generator Breaker (EG2) 2018 Survey Report	2018-09-18 - 46732-M12-1-7A Circuit Breaker Report.pdf
Ship Service Generator #1 Breaker (SSG-1) 2018 Survey Report	2018-09-18 - 93186 Circuit Breaker Report.pdf
Ship Service Generator #2 Breaker (SSG-2) 2018 Survey Report	2018-09-18 - 93179 Circuit Breaker Report.pdf
Ship Service Generator #3 Breaker (SSG-3) 2018 Survey Report	2018-09-18 - 93177 Circuit Breaker Report.pdf
Shore Supply (SP) Breaker 2018 Survey Report	2018-09-18 - 93180 Circuit Breaker Report.pdf

#### 14.2.2.3 Drawings

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

Drawing Number	Drawing Title	Electronic File Name
766401 Rev. B0	Electrical Plant Schematic Wiring Diagram	Updated-766401-Griffon SLD-Rev B0-11x17.pdf

#### 14.2.2.4 Regulations and Standards

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

### 14.2.3 STATEMENT OF WORK

#### 14.2.3.1 General Notes

14.2.3.1.1 The Contractor must use the services of qualified marine electricians and follow OEM recommendations for the cleaning, inspection, repair, and testing of the circuit breakers.

14.2.3.1.2 All labour, equipment, rigging, crantage, transport and materials required to perform the work must be Contractor supplied.

- 14.2.3.1.3** The Contractor must inspect, test, and certify all removed circuit breakers.
- 14.2.3.1.4** The Contractor is responsible for removal/installation of the breakers from the vessel and transportation to/from the Contractor's test and repair facility.
- 14.2.3.1.5** The breakers must be protected from weather and damage prior to transport from the vessel and while in the care of the Contractor.
- 14.2.3.1.6** Any damage to the circuit breakers incurred while handling and transporting the breakers must be repaired at the Contractor's expense.
- 14.2.3.2** **Details of Testing and Inspection**
- 14.2.3.2.1** All aspects of the inspection and testing of the circuit breaker must be recorded by the Contractor and summarized in a report to the TA, IA, or designate.
- 14.2.3.2.2** All replacement parts must be Contractor supplied and will be covered via PWGSC 1379 action.
- 14.2.3.2.3** The Contractor must inspect the referenced circuit breakers for proper mechanical and electrical operation.
- 14.2.3.2.4** The Contractor must inspect the circuit breakers and provide a report for the as-found and as-left physical condition.
- 14.2.3.2.5** The Contractor must test all circuit breaker control circuits for proper resistance and must verify proper main contact resistance. The circuit breaker must be Meggered for proper insulation resistance.
- 14.2.3.2.6** The Contractor must test the circuit breaker for proper sequencing of all contacts, verify all interlocks, and verify all visual indicators. The electronic trip unit must be verified for proper trip operation.
- 14.2.3.2.7** The Contractor must cycle the circuit breaker a minimum of ten (10) times to verify that all mechanical mechanisms are functioning properly.
- 14.2.3.2.8** The Contractor must use primary injection to verify all circuit breaker operations and trip settings as per the trip curves.
- 14.2.3.2.9** The Contractor must perform the primary injection test in the presence of the TA, IA, or designate.
- 14.2.3.2.10** The Contractor must notify the TA, IA, or designate within twenty-four (24) hours of inspection of any deficiencies found during the inspections and testing so that a repair plan can be agreed upon.
- 14.2.3.3** **Spare K-600 Circuit Breakers**
- 14.2.3.3.1** The two (2) spare circuit breakers were inspected and certified in 2020. One is currently set to be used as a spare Emergency Generator breaker, and the other is set as spare Upper Tie breaker.

- 14.2.3.3.2** The Contractor must note and record the current digital trip settings on the spare breakers. These values will be noted as the “as found” condition.
- 14.2.3.3.3** The Contractor must verify that the spare breakers are suitable to be installed in place of the Shore Power and Emergency Generator breakers. This includes verification of UV trips where required.
- 14.2.3.3.4** The Contractor must adjust the spare breaker digital trip units to match the two breakers removed.
- 14.2.3.3.5** The Contractor must install the vessel’s two spare K-600 circuit breakers in the switchboards to maintain the Shore supply and the Emergency generator.
- 14.2.3.3.6** Upon reinstallation of the Shore and Emergency Generator circuit breakers, the two spare circuit breakers must have their digital trips reset to the “as found” condition.
- 14.2.3.3.7** The Contractor must return the spare breakers to their storage location on the vessel.
- 14.2.3.4** **Inspection Points**
- 14.2.3.4.1** The Contractor must demonstrate the Primary Injection test of each breaker to the TA, IA, or designate.
- 14.2.3.4.2** The Contractor must present the trip settings to the TA, IA, or designate for each breaker before it is installed for use, as a temporary spare, or as a ships spare.
- 14.2.3.4.3** The Contractor must demonstrate to the TA, IA, or designate that any UV trips removed from breakers have been reinstalled correctly.

**14.2.4** **DOCUMENTATION AND DELIVERABLES**

- 14.2.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:
- 14.2.4.2** **Reports**
- 14.2.4.3** The Contractor must provide the TA, IA, or designate copies of the inspection, test, and repair reports for each breaker. The reports must clearly identify the breaker by model and serial number (\*ITP).
- 14.2.4.4** **Certificates**
- 14.2.4.5** The Contractor must provide the TA, IA, or designate copies of certificates of calibration for each test instrument used by the Contractor (\*ITP).
- 14.2.4.6** **Measurements, Calibrations and Readings**
- 14.2.4.6.1** These must be dated and signed by the person taking the measurements.
- 14.2.4.7** **Redlined Drawings – NOT USED**
- 14.2.4.8** **Spare parts – NOT USED**
- 14.2.4.9** **Equipment or System Manuals – NOT USED**

**14.2.5**      **TRAINING – NOT USED**

## **15      AUXILIARY SYSTEMS [NOT USED]**

## 16 DOMESTIC SYSTEMS

### 16.1 REFRIGERATION COOLING WATER DISCHARGE PIPING

#### **16.1.1 IDENTIFICATION**

- 16.1.1.1** The vessel requires that a portion of domestic refrigeration plant cooling water overboard discharge piping be renewed with new galvanized piping that is flanged for serviceability.

#### **16.1.2 REFERENCES**

##### **16.1.2.1 Equipment Data**

- 16.1.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Two refrigeration condensing units in parallel with raw water-cooled condensers	Ref Plus MCS 100K7-9
Two refrigeration cooling water supply electric motor/pump sets in parallel	Summit FM 1.5X2-6 336106

##### **16.1.2.2 Manuals**

- 16.1.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
N/A	N/A

##### **16.1.2.3 Drawings**

- 16.1.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
N/A	N/A	N/A

##### **16.1.2.4 Regulations and Standards**

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

#### **16.1.3 STATEMENT OF WORK**

##### **16.1.3.1 General**

- 16.1.3.1.1** For Lockout and Tagout procedures, the Contractor shall supply locks and locking devices for the Contractor's employees in addition to those provided by the TA, IA, or designate.



- 16.1.3.1.2** During the work period, the Contractor shall maintain the work area and access in a clean condition, free from debris.
- 16.1.3.1.3** The Contractor must ensure replacement material such as gaskets, insulation, hardware, paints/coatings, etc. are new and unused and in accordance with modern marine standards.
- 16.1.3.1.4** The Contractor shall provide all equipment, devices, tools, and machinery such as welding machines, cranes, staging, scaffolding, and rigging necessary for the completion of the tasks in this SOW.
- 16.1.3.1.5** Any piping, air vent trunking, and/or interference items that must be moved to facilitate this SOW are the responsibility of the Contractor. Any interference items removed to facilitate this work shall be returned to good working condition at the end of this SOW.
- 16.1.3.1.6** Any damage incurred as a result of the Contractor's work and that is attributable to the Contractor's work performance shall be repaired by the Contractor at the Contractor's expense. Materials used in any replacement or repairs must be approved by the TA.
- 16.1.3.1.7** All equipment that is moved or removed as a result of this SOW, unless noted otherwise, shall remain the property of CCG.
- 16.1.3.2 Equipment Protections**
- 16.1.3.2.1** The piping to be renewed is in the Upper Motor Room where there is sensitive electrical equipment such as propulsion breakers/exciters fitted with ventilation passages. Grinding, welding, and the creation of dust must be avoided in this area.
- 16.1.3.2.2** The Contractor shall protect all equipment and surrounding areas to avoid the ingress of dust, paint dust, and machining fragments into the port and starboard breaker panels and the exciters in the starboard forward Upper Motor Room. The breaker panels are fitted with cooling fans and ducting to allow the circulation of air. Temporary covers to work areas must be installed where necessary.
- 16.1.3.2.3** The Contractor is to take steps to protect the trip devices attached to the forward panel of starboard propulsion breakers and the aft panel of the port propulsion breakers. The Contractor is to consult with the TA, IA, or designate prior to commencing work to ensure that these trip units are suitably protected during the conducting of this SOW.
- 16.1.3.3 System Info**
- 16.1.3.3.1** The vessel utilizes two seawater cooled refrigeration condensing units located at frame 32 in the upper starboard motor room. The condensing units are supplied with seawater from two electric motor driven pumps located at frame 35. Alternate cooling seawater is available from the sanitary water system.
- 16.1.3.3.2** The Contractor must provide seven (7) days notice to the TA prior to the commencement of this work in order that the crew can provide a temporary line to maintain the refrigeration system in operation while the piping is being fabricated.

**16.1.3.3.3** The Contractor must release and remove the ship's existing refrigeration overboard discharge piping from the vessel. The Contractor is responsible for the disposal of any used piping removed from the system.

**16.1.3.4 Installation - New Piping**

**16.1.3.4.1** The Contractor is to avoid the in-place welding of piping. The Contractor must fabricate and install the new piping with flanges and butt-welded fittings to follow the track of the current piping and reuse the existing pipe hangers. It is acceptable if the Contractor deems that additional flanged joints are beneficial to be added for accessibility.

**16.1.3.4.2** New sections of piping shall be black iron ASTM A53, schedule 80 seamless steel black pipe complete with new flanges of required size. All butt-welded elbows are to Schedule 80 ASTM A53, seamless steel black pipe.

**16.1.3.4.3** The Contractor must provide for new piping to be hot dip galvanized, install the new piping using new fasteners and gaskets appropriate for the service, and commission the new piping into service.

**16.1.3.5 Pipe Sections**

**16.1.3.5.1** Seawater is supplied and discharged from the condensing units in 1.5" Schedule 40 galvanized steel piping. Note that the crew has renewed one section of pipe on the discharge from the condensing units located overhead of the units at approx. 9 feet inboard from the ship's side.

**16.1.3.5.2** The remaining discharge piping to be renewed is located overhead at a height of 7-9 feet in the Upper Motor Room and extends from the starboard side to the port ship's side overboard discharge valve located at frame 30. The piping consists of two sections of piping, one inboard section being approximately forty-five (45) feet long and the second outboard section being approximately eight (8) feet long.

**16.1.3.5.3** Inboard section (approx. 45 feet):

- a) Is to be renewed is fitted with two welded socket couplings and flanges on each end. The starboard flange pair is located overhead inboard of the refrigeration condensing units and the port flange pair is located above the sprinkler tank on the port side of the Upper Motor Room behind ventilation trunking.
- b) Is supported by pipe hangers which are to be reused when renewing and installing the piping. The current pipe is constructed with two 45° bends, four 90° elbows, and two welded pipe couplings. There are four pipe hangers to be reused.
- c) For identification, the pipe sections have been identified with number tags attached to the piping. The 45-foot pipe's photos are broken into three sections:
  - (i) #1 section extends from the starboard flange pair to the first pipe coupling inboard and has two 45° bends and a pipe hanger;
  - (ii) #2 section extends from the first pipe coupling to two 90° bends, then to the second welded pipe coupling located above the port propulsion breakers. The #2 section has one pipe hanger;

- (iii) #3 section extends from the second welded pipe coupling above the port propulsion breakers to two 90° bends, then to the flange located above the sprinkler tank. It has two hangers.

**16.1.3.5.4** Outboard section (approx. 8 feet):

- a) For identification, the 8-foot section of piping to be renewed is tagged as #4. It is the outboard of the ship's sprinkler tank and runs from above the tank to the ship's side valve located at frame 30 on the port side of the Upper Motor Room.
- b) From the #3 section, the #4 pipe consists of a flange to 90° elbow, then a short length of pipe, a 45° elbow, then second short length of pipe, a 45° elbow, then a third short length of pipe and a 90° elbow. From the 90° elbow, there is a final short length of pipe with a flange attached.

**16.1.3.6** **Welding**

**16.1.3.6.1** For any item requiring the application of fusion welding for steel structures, the Contractor or Subcontractors shall be certified in accordance with the Canadian Welding Bureau, CSA/ACNOR W47.1: Division 2.1 certification (latest revision).

**16.1.3.6.2** The Contractor shall provide documentation to the TA clearly identifying the welding certification of all employees performing any welding included in this SOW.

**16.1.3.7** **Pressure Testing Prior to Galvanizing**

**16.1.3.7.1** The Contractor shall submit the fabricated piping and welds to inspection by the TA prior to be sent for galvanizing.

**16.1.3.7.2** All new piping is to be pressure tested to 100 psi for twenty (20) minutes in the presence of the TA.

**16.1.3.8** **Galvanizing and Painting**

**16.1.3.8.1** All new piping sections are to be hot dipped galvanized, unless otherwise noted, on completion of fabrication.

**16.1.3.8.2** The Contractor shall apply two coats of galvanized metal primer (CFM) and two coats of Interlac 665 White (GSM) to all new piping.

**16.1.3.8.3** The Contractor shall supply and apply two coats of marine primer compatible with the vessel's existing coating system to all new and/or disturbed metal surfaces. The Contractor shall prepare all new and disturbed steelwork to the paint manufacturer's standards prior to painting.

**16.1.3.9** **Final Testing**

**16.1.3.9.1** The new installation shall be tested for leaks in place in the presence of the TA with the assistance of the vessel's engineering staff by operating the refrigeration cooling water pumps at the normal working pressure. The minimum acceptable test acceptance will include ensuring that piping lines up and flanges are bolted in without any tension or excess misalignment.

**16.1.4**      **DOCUMENTATION AND DELIVERABLES**

**16.1.4.1**      The Contractor must provide the TA, IA, or designate with original copies of the following:

**16.1.4.2**      **Reports**

**16.1.4.2.1**      The Contractor shall submit all Mill Test Certificates for the supplied piping (\*ITP).

**16.1.4.2.2**      The Contractor shall provide a galvanizing report for all fabricated sections that were hot dip galvanized (\*ITP).

**16.1.4.3**      **Certificates**

**16.1.4.3.1**      Prior to commencing any welding work; the Contractor must provide copies of the Contractor Certification, Welding Supervisor Certification, and Welder Certification in accordance with the Documentation section of the General Notes (\*ITP).

**16.1.4.3.2**      Prior to commencing any welding work; the Contractor must provide a copy of the welding procedures (WPS) in accordance with CSA W47.1 and CSA W59 "Welded Steel Construction" (\*ITP).

**16.1.4.3.3**      The Contractor must be certified by CWB to CSA Standard W47.1 "Fusion Welding of Steel Company Certification" in Division 1 or Division 2 (\*ITP).

**16.1.4.3.4**      Welding Supervisors must be qualified by CWB to CSA Standard 47.1 (\*ITP).

**16.1.4.3.5**      Welders must be qualified by CWB to CSA Standard 47.1 for the Mode and Class of weld being used (\*ITP).

**16.1.4.3.6**      The Contractor must provide a copy of the Visual Inspector's qualifications in accordance with the Documents section of the General Notes (\*ITP).

**16.1.4.3.7**      The Contractor must provide a copy of the Visual Inspection report as detailed in section 5.6.13 "Inspection Reports" of the CCG Welding Specification, and in accordance with the Documents section of the General Notes (\*ITP).

**16.1.4.3.8**      The Contractor must provide a copy of the NDT Inspector's certification in accordance with the Documents section of the General Notes (\*ITP).

**16.1.4.3.9**      The Contractor must provide a copy of the NDT Inspection report as detailed in Section 5.6.13 "Inspection Reports" of the CCG Welding Specification, and in accordance with the Documents section of the General Notes (\*ITP).

**16.1.4.3.10**      Persons performing and interpreting Visual Inspection (VI) of welds must be certified by the CWB in accordance with CSA Standard W178.2 and must be Level 2 or 3 with the following endorsement: Ships and Marine Structures. Level 1 personnel may observe or assist (\*ITP).

**16.1.4.3.11**      Persons performing and interpreting NDT inspections of welds i.e., Penetrant Testing (PT), Magnetic Testing (MT), Ultrasonics Testing (UT), Eddy Current Testing (ET), or

Radiographic Testing (RT) must be currently certified by Natural Resources Canada (NRCan) to CAN/CGSB-48.9712 Level 2 or 3. Level 1 personnel may observe or assist (\*ITP).

**16.1.4.3.12** The Contractor must provide the TA with a copy of the calibration certificate for the pressure testing gauge (\*ITP).

**16.1.4.4 Measurements, Calibrations and Readings**

**16.1.4.4.1** Pressure test results must be dated and signed by the person taking the measurements (\*ITP).

**16.1.4.5 Redlined Drawings – NOT USED**

**16.1.4.6 Spare parts – NOT USED**

**16.1.4.7 Equipment or System Manuals – NOT USED**

**16.1.5 TRAINING – NOT USED**

## 17 DECK EQUIPMENT

### 17.1 STORES CRANE INSPECTION (SURVEY ITEM)

#### 17.1.1 IDENTIFICATION

**17.1.1.1** The stores crane requires a 5-year survey inspection, NDT testing, and certification that must be conducted in accordance with the Canada Shipping Act Cargo, Fumigation, and Tackle Regulations (SOR/2007-128).

**17.1.1.2** The Contractor must provide a valid “Form T2 - Certificate of Test and Thorough Examination of Lifting Appliances”. This form must be signed by a “competent person” under the Regulations. In this case a competent person must be the accredited field representative acting as “a person engaged in the manufacture and repair of the gear” (paragraph 300 (2)).

**17.1.1.3** The approved local FSR for this crane is listed below. Any other service provider must be an approved dealer by the manufacturer.

Atlas Polar  
60 Northline Rd., Toronto, Ontario, M4B 3E5  
T: 416-751-7740  
E: jeffbirchard@atlaspolar.com

#### 17.1.2 REFERENCES

##### **17.1.2.1 Equipment Data**

**17.1.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
HIAB Seacrane	Model: 200SC Manuf. Date: 1994 Serial #: 610 Last Inspected: 15/01/2019 by Atlas Polar
Hydraulic Pump	2PL090
Electric Motor	Hansen 30 HP, 3 Ph, 460 VAC, 60 Hz Cat No. 2424215H-00M Frame: HLF286TC Nr. A447564JC502-002

##### **17.1.2.2 Manuals / Reports**

**17.1.2.3** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
HIAB Sea Crane 200 Instruction Manual	Sea Crane 200 Manual.pdf
Polar 2100B Manual for Remote Control	POLAR 2100B MANUAL.pdf
Polar 2100B Marine Parts Manual	POLAR 2100B PARTS.pdf
Report Title	Electronic File Name
20190115 - G005 - HIAB Crane Inspection Report - Atlas Polar	20190115 - G005 - HIAB Crane Inspection Report - Atlas Polar.pdf

#### 17.1.2.4 Drawings

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

Drawing Number	Drawing Title	Electronic File Name
N/A	N/A	N/A

#### 17.1.2.5 Regulations and Standards

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

### **17.1.3 STATEMENT OF WORK**

#### 17.1.3.1 General

17.1.3.1.1 Unless clearly stated otherwise, the Contractor must supply all labour, tools, and materials to perform the work. CCG will provide the weights required for the load tests.

17.1.3.1.2 The Contractor must provide an allowance of \$20 000 in its bid to cover the cost of the OEM technician(s), including any living expenses (accommodations, meals, transportation, etc.) The Contractor must submit the OEM's final invoice, along with copies of all supporting documentation attesting to actual costs in accordance with the Contract. The \$20 000 allowance will be increased or decreased using a 1379 form.

#### 17.1.3.2 Prework Load Test

17.1.3.2.1 The Contractor/FSR must perform a load test of the crane prior to commencing any work on the crane. The load test must at a minimum meet the requirements of Schedule 4 of the Cargo, Fumigation, and Tackle Regulations. The test weight (dead load only) must be slewed for the full slewing range of the crane. This test must be witnessed by the TA, IA, or designate. Upon completion of all work, the Contractor must complete another load test.

17.1.3.2.2 The load test must be done with the boom fully extended and the test load suspended from the end of the boom. A test load of 125% of the safe working load (SWL) must be

used and the boom angle must not to exceed 15° above the horizontal. The test load must be 2313 kg (1850 kg x 125%) fully extended @ 9.9 m.

- 17.1.3.2.3** The Contractor/FSR must note that this test load exceeds the SWL of the winch wire and thus the CCG supplied test load must be attached to the end of the boom via a CCG supplied shore side mobile crane and attachment devices.

**17.1.3.3 Lockout and Tagout**

- 17.1.3.3.1** The Contractor/FSR must electrically isolate and secure the power supplies to the two hydraulic pumping units, the hydraulic reservoir tank heater, the hydraulic tank bypass filter, and the hydraulic control unit as per FSM 7.B.5 – Lockout and Tagout.

**17.1.3.4 Hydraulic Reservoir**

- 17.1.3.4.1** The Contractor/FSR must drain and dispose of the HIAB crane's hydraulic reservoir tank oil into CCG supplied waste oil tank receptacle.

- 17.1.3.4.2** The Contractor/FSR must open, clean, and inspect the hydraulic reservoir tank. Access into the reservoir tank is through a 12" hand hole.

- 17.1.3.4.3** The Contractor/FSR must renew the breather filter and hydraulic return filter must be renewed (GSM).

- 17.1.3.4.4** The Contractor/FSR must replace the hydraulic tank hatch gasket with a new OEM approved Vescor 5801 Buna-N gasket (CFM).

- 17.1.3.4.5** The Contractor/FSR must provide the necessary hydraulic oil quantity to fill the oil reservoir on the crane to their working levels (approx. 250 L). Currently Hydrex AW 32 hydraulic oil is used for this crane. Oil must be prefiltered to ISO Standard 4406 cleanliness 19/16/11 with filtering at H10XL/10um or better.

**17.1.3.5 Winch and Slewing Housing**

- 17.1.3.5.1** The Contractor/FSR must drain and dispose of the HIAB crane's winch oil and slewing housing oil into CCG supplied waste oil tank receptacle.

- 17.1.3.5.2** The Contractor must provide the necessary gear oil quantity to fill the winch and slewing housing on the crane to their working levels (approx. 1 L for the winch and approx. 20 L for the gearbox). Currently Traxon 80W90 gear oil is used for this crane.

**17.1.3.6 Pump Motors**

- 17.1.3.6.1** The Contractor/FSR must identify, label, and disconnect the power leads at each hydraulic pump motor. Care must be taken to note and record the direction of rotation for each motor prior to electrically disconnecting them. The motors must be Meggered between phases and phase-to-ground and the Megger instrument must have a valid calibration certificate.

**17.1.3.7 Hydraulic Crane**



- 17.1.3.7.1** The Contractor/FSR must clean and inspect the crane and its various components according to manufacturer's recommendations and all components must be examined for evidence of permanent deformation, wear, and general overall condition.
- 17.1.3.7.2** The Contractor/FSR must seal all opened hydraulic components, including hoses with plugs, seals and covers to prevent contamination of any part of the hydraulic system after disassembly. The Contractor must clean up all hydraulic oil leakage and spillage that occurs during this work. The Contractor must dispose of all oil and oily waste generated during this work to CCG provided tanks/receptacles.
- 17.1.3.7.3** The Contractor/FSR must ensure inspection of the crane includes the following items:
- a) Hydraulic reservoir oil level;
  - b) Slewing housing oil level;
  - c) Pivot pins and locks;
  - d) Linkages;
  - e) Hold-down bolts and nuts;
  - f) Hoses/connections;
  - g) Pins/connections;
  - h) Swivels;
  - i) Valve assembly and additional valves;
  - j) Swing cylinder;
  - k) Inner boom cylinder;
  - l) Outer boom cylinder;
  - m) Extension cylinder;
  - n) Crane Base;
  - o) Crane Post;
  - p) Inner boom;
  - q) Outer boom;
  - r) Extension boom;
  - s) Winch, snatch block, and hoist wire;
  - t) Load plate;
  - u) Lever symbols;
  - v) Hose reels;
  - w) Check main relief valve;
  - x) Hydraulic pumps/shaft;
  - y) Hook and safety latch, and,
  - z) Marine controller, three (3) of.
- 17.1.3.7.4** The Contractor/FSR must perform and record all measurements required by the manufacturer to ascertain that individual components of the crane are within the recommended tolerances. These measurements must be available for inspection by the AR and the TA, IA, or designate.

- 17.1.3.7.5** The Contractor/FSR must inspect the hook and block assembly for corrosion and wear of the threads. The hook nut must be marked with the date of inspection.
- 17.1.3.7.6** The Contractor shall perform Ultrasonic or Magnetic Particle testing of the critical welds of the crane as per manufacturer's recommendations. The inspection shall include non-destructive inspection of the interior welds within six (6) feet of each end of each boom section.
- 17.1.3.7.7** The Contractor shall prepare the components and welds for examination. Where the Contractor removes the coating system for the NDT examinations, CCG will repair the coatings after the work is completed.
- 17.1.3.7.8** The Contractor must replace any worn or deformed parts under 1379 action. All replacement parts must be Contractor supplied and must be OEM parts.
- 17.1.3.7.9** Once the inspection of all components has been completed the Contractor must reassemble the crane and perform a full functional test proofing that the crane functions as designed.
- 17.1.3.8** **Inspection Points**
- 17.1.3.8.1** Upon disassembly, cleaning, and measuring; the Contractor must present above mentioned components of the crane for inspection to the AR and the TA, IA, or designate. Any defects must be pointed out to the TA, IA, or designate so that corrective action can be taken.
- 17.1.3.9** **Testing/Trials**
- 17.1.3.9.1** Prior to testing the crane after the dismantling and component inspections the Contractor must verify that the hydraulic oil pressure circuits are oil tight.
- 17.1.3.9.2** Prior to testing the crane after installation of the hydraulic pumps and motors, the Contractor must perform a bump test of each motor to ensure direction of rotation is correct. The Contractor must not run the hydraulic pumps without sufficient oil.
- 17.1.3.9.3** CCG will supply weights for the functional and load tests.
- 17.1.3.9.4** The functionality of the crane must be proven to the TA, IA, or designate. The functional test must include all articulations possible with the crane with a load of 1850kg from remote control and locally. Winch operation and braking must be verified. All stop buttons must be tested and all safety systems must be proven functional. Testing must be conducted through a minimum of one hour and must include a varied range of lifting weights through a range of heights and extensions from the maximum upper and lower limits of the operation of the crane within the restraints of the ship. Any leaks that develop during the testing must be repaired by the Contractor.
- 17.1.3.9.5** After functional testing results have been accepted by the TA, IA, or designate, the Contractor must perform a load test to 1.25 times the SWL. This load test must be done in the presence of the person signing the T2 Certificate.

**17.1.4**      **DOCUMENTATION AND DELIVERABLES**

**17.1.4.1**      The Contractor must provide the TA, IA, or designate with original copies of the following:

**17.1.4.2**      **Reports**

**17.1.4.2.1**      Unless otherwise specified, all documentation must be provided to the TA, IA, or designate in the format specified in the Documentation Section G 1.5.

**17.1.4.2.2**      Inspection and Testing report for the HIAB Sea Crane including, at a minimum:

- a) Name of the person(s) performing this work;
- b) Detailed condition of the equipment;
- c) Details of the work completed;
- d) All measurements taken as per the Inspection Points section;
- e) Deficiencies and details of any repairs taken;
- f) NDT results;
- g) All recommendations for future repairs and maintenance, and,
- h) Details of the operational test of the HIAB (\*ITP).

**17.1.4.2.3**      Completed Form T2, signed as a competent person under the Cargo, Fumigation, and Tackle Regulations, (SOR/2007-128) after inspection and testing (\*ITP).

**17.1.4.3**      **Certificates**

**17.1.4.3.1**      The NDT technician shall be certified and current to CAN/CGSB-48.9712-latest edition, Qualification and Certification of Non-Destructive Testing Personnel Level II for the appropriate method. The Contractor shall provide copies of the operator's certificates to the TA, IA, or designate (\*ITP).

**17.1.4.4**      **Measurements, Calibrations and Readings**

**17.1.4.4.1**      These must be dated and signed by the person taking the measurements.

**17.1.4.5**      **Redlined Drawings – NOT USED**

**17.1.4.6**      **Spare parts – NOT USED**

**17.1.4.7**      **Equipment or System Manuals – NOT USED**

**17.1.5**      **TRAINING – NOT USED**

## 17.2 MAIN CRANE LOAD MONITORING SYSTEM

### 17.2.1 IDENTIFICATION

- 17.2.1.1** CCG has procured an OEM load monitoring system for the main buoy crane. The Contractor must install the load monitoring system with assistance of the manufacturer's FSR.

### 17.2.2 REFERENCES

#### 17.2.2.1 Equipment Data

- 17.2.2.1.1** The following equipment data is provided for guidance.

Equipment	Manufacturer/Equipment Details
Crane Make	ARVA
Crane Model	AR16520M
Crane Serial No.	1804-171535
Crane Main Hoist	30000 lb SWL @ 40 ft radius 17000 lb SWL @ 60 ft radius
Crane Auxiliary Hoists (Two)	10000 lb SWL each

#### 17.2.2.2 Manuals

- 17.2.2.2.1** The following equipment manuals are provided as Guidance Documents.

Manual Title	Electronic File Name
Arva Crane Operator's, Maintenance, Spare Parts & Service Pack Manual A172180 Rev. C	Arva Manual A172180 Revision C July 2012.pdf
i4500 System Custom Application for ARVA Crane (Sc125008) Ref. CCGS Griffon	PI-00176 Rev. 01 CCGS Griffon Arva Crane.pdf
Quotation for 4507 Lattice Crane, Hoist System WO/RLD System I4507 Rated Capacity Indicator for ARVA Marine Crane on CCGS Griffon	QU-09884.pdf

#### 17.2.2.3 Drawings

- 17.2.2.3.1** The following Drawings are to be considered as Guidance Drawings.

Drawing Number	Drawing Title	Electronic File Name
EP1506	AR16520M Rev B	EP1506.pdf
766401 Rev. B0	Electrical Plant Schematic Wiring Diagram	Updated-766401-Griffon SLD-Rev B0-11x17.pdf

**17.2.2.4 Regulations and Standards**

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

**17.2.3 STATEMENT OF WORK****17.2.3.1 General**

**17.2.3.1.1** The Contractor must provide the services of the load monitoring system OEM representative to conduct the work defined below.

**17.2.3.1.2** The Contractor must provide an allowance of \$20 000 in its bid to cover the cost of the OEM technician(s), including any living expenses (accommodations, meals, transportation, etc.). The Contractor must submit the OEM's final invoice, along with copies of all supporting documentation attesting to actual costs in accordance with the Contract. The \$20 000 allowance will be increased or decreased using a 1379 form.

**17.2.3.1.3** FSR Contact Information:

Rayco Wylie Systems

2440 Avenue Dalton, Sainte-Foy, Québec, G1P 3X1

T: 418-266-6600 ext. 230

E: Christian.Roy@raycowylie.com

**17.2.3.1.4** Prior to working on the crane, the Contractor perform proper lockout and tagout procedures from Fleet Safety Manual 7.B.5 to ensure that all equipment and systems are properly isolated.

**17.2.3.1.5** All work conducted on the crane and load monitoring system must be in accordance the manufacturer's recommendations and procedures.

**17.2.3.1.6** All required cabling and electrical components such as transits, cableways, junction boxes, etc. are to be provided by the Contractor. All installed components must be marine grade as per TP 127, IEEE Std 45, and IEC 60092-350. Cables are to be IEC-60092-3 compliant.

**17.2.3.1.7** The Contractor must install all cabling and mark them with a stamped stainless steel metal tag for all outside cabling and an appropriate label type for all inside cabling after their installation. The labels must be securely affixed to the cable at each end and through any deck, deck head, and/or gland penetration with the designation for each cable as provided by the FSR.

**17.2.3.1.8** The Contractor must ensure that all areas have been thoroughly cleaned and free of any debris resulting from the performance of this SOW item.

**17.2.3.1.9** The Contractor must use all stainless-steel mounting hardware (CFM) for the mounting of all equipment within this SOW item.

- 17.2.3.1.10** The Contractor is responsible for unpacking/repacking all cable transits/glands.
- 17.2.3.1.11** For cable installation, the Contractor must follow the existing cable trays throughout the vessel where they are fitted. Once installed, all cabling must be secured as per TP 127E.
- 17.2.3.1.12** The Contractor is to note that the main crane pedestal is considered a confined space. FSM procedure 7.B.3 is to be followed for entry to perform work in this space.
- 17.2.3.2** **Sensors and Interfaces:**
- 17.2.3.2.1** The Contractor/FSR must install the following components:
- a) One load cell for main hoist: Rayco Wylie model 12te (customized);
  - b) Two load cells for auxiliary hoists: Rayco Wylie model 22K (customized);
  - c) One boom angle sensor: Rayco Wylie marine rated IP67;
  - d) One list angle sensor: Rayco Wylie CAN bus model 33A0049 85 rated IP67;
  - e) Three load interfaces: Rayco Wylie CAN bus marine rated; and
  - f) Three anti two-block (A2B) sensors: Rayco Wylie A2B devices including weight and chains.
- 17.2.3.3** **Displays and Warning Light Stacks**
- 17.2.3.3.1** The Contractor must ensure that the FSR installs the following components (GSM):
- a) Two Rayco Wylie I4507 Flexible Rated Capacity Indicator (RCI) System:
    - i. 7-inch color screen;
    - ii. Rated IP67;
    - iii. Screen Ratio 16/9;
    - iv. Screen Resolution 800 x 480;
    - v. In accordance with SAE J159;
    - vi. CAN bus protocol J1939;
    - vii. High resolution LCD screen readable in direct sunlight; and
    - viii. Custom load chart programming capability.
  - b) Two Rayco Wylie warning light stacks with red, yellow, and green lights mounted on the exterior aft side of the port and starboard boom cabs.
- 17.2.3.4** **Terminal**
- 17.2.3.4.1** The Contractor/FSR must install the following components (GSM):
- a) One Rayco Wylie I4599 Terminal Unit:
    - i. Offshore Type;
    - ii. CAN bus interface;
    - iii. Power supply 110 VAC to 24 VDC;
    - iv. DIN Rail capability;
    - v. One external override key box (Rayco Wylie Model 33J0090);
    - vi. Three lockout outputs dedicated to each hoist; and
    - vii. Nine outputs available for future requests.

**17.2.3.5 Welding**

- 17.2.3.5.1** The Contractor must supply a welder to assist the FSR in permanently attaching brackets, components, during the installation as required. For estimating purposes, the Contractor shall apply ten (10) hours of labour for this work. The final price for this labour will be adjusted via the PSPC 1379 process, depending on the actual requirement.
- 17.2.3.5.2** The Contractor must be certified by CWB to CSA Standard W47.1 "Fusion Welding of Steel Company Certification" in Division 1 or Division 2.
- 17.2.3.5.3** Welding Supervisors must be qualified by CWB to CSA Standard 47.1.
- 17.2.3.5.4** Welders must be qualified by CWB to CSA Standard 47.1 for the Mode and Class of weld being used.
- 17.2.3.5.5** Persons performing and interpreting Visual Inspection (VI) of welds must be certified by the CWB in accordance with CSA Standard W178.2 and must be Level 2 or 3 with the following endorsement: Ships and Marine Structures. Level 1 personnel may observe or assist.
- 17.2.3.5.6** Persons performing and interpreting NDT inspections of welds i.e., Penetrant Testing (PT), Magnetic Testing (MT), Ultrasonics Testing (UT), Eddy Current Testing (ET), or Radiographic Testing (RT) must be currently certified by Natural Resources Canada (NRCAN) to CAN/CGSB-48.9712 Level 2 or 3. Level 1 personnel may observe or assist.

**17.2.3.6 Testing/Trials**

- 17.2.3.6.1** Once completed with installation, the Contractor/FSR must test the full system, including the factory programmed software with the TA in attendance.
- 17.2.3.6.2** The Contractor/FSR must demonstrate that the display shows proper values for:
- a) Continuous boom angle;
  - b) Continuous capacity of each hoist;
  - c) Continuous load on hook for each hoist;
  - d) Continuous list of the ship;
  - e) Each load on hook is compared to each hoist's maximum capacity, and
  - f) The total load of the three hooks compared to the total maximum capacity.
- 17.2.3.6.3** The Contractor/FSR must demonstrate that the software limits only the hoist that is in overload or two-block condition, not the other two hoists if they are operating within their safe range. During the overload condition, the software must allow for the load to be lowered but not raised.
- 17.2.3.6.4** The Contractor/FSR must demonstrate that the software limits all hoists when the sum of the loads has reached the total maximum crane capacity.

- 17.2.3.6.5** The Contractor/FSR must demonstrate that the warning lights on the displays and external warning light stacks are programmed to show the load condition in the following format:
- a) Green: less than 85% of crane capacity;
  - b) Yellow: between 85% and 100% (inclusive) of crane capacity, and
  - c) Red (with audible alarm): exceeds 100% of the crane capacity.
- 17.2.3.6.6** The Contractor/FSR must demonstrate that the load is limited to 100% with a manual override key box that includes a manual reset. This option must allow for removal of the maximum load limit to allow for testing and inspections by the RO or other regulatory agencies. When activated, a message (i.e., Bypass Active) must be displayed in the center of the two screens.
- 17.2.3.6.7** The Contractor/FSR must demonstrate that the software allows for an adjustable low boom angle limit.
- 17.2.3.6.8** The Contractor/FSR must demonstrate that the load charts, software, and calibration files are downloadable by USB flash drive.

**17.2.4**      **DOCUMENTATION AND DELIVERABLES**

- 17.2.4.1** The Contractor must provide the TA, IA, or designate with original copies of the following:
- 17.2.4.2**      **Reports**
- 17.2.4.2.1** The Contractor must provide copies of the weld procedures and NDT inspections in accordance with the Documentation section of the General Notes (\*ITP).
- 17.2.4.2.2** The Contractor must supply any OEM documentation such as the operator manual, technical manual, maintenance manual, service manual, guides, etc. (\*ITP).
- 17.2.4.2.3** The Contractor must supply (two (2) copies – one (1) electronic and one (1) paper copy) of the commissioning and testing report to the TA, signed, and dated by the attending FSR. This report must include all the tests performed during the commissioning with their brief description, applicable parameters, as well as the result and values collected during each test (\*ITP).
- 17.2.4.3**      **Certificates**
- 17.2.4.3.1** Prior to commencing any welding work; the Contractor must provide copies of the Contractor Certification, Welding Supervisor Certification, and Welder Certification in accordance with the Documentation section of the General Notes (\*ITP).
- 17.2.4.3.2** Prior to commencing any steel welding work; the Contractor must provide a copy of the welding procedures (WPS) in accordance with CSA W47.1 and CSA W59 “Welded Steel Construction” (\*ITP).



- 17.2.4.3.3** The Contractor must provide a copy of the Visual Inspector's qualifications in accordance with the Documents section of the General Notes (\*ITP).
- 17.2.4.3.4** The Contractor must provide a copy of the Visual Inspection report as detailed in section 5.6.13 "Inspection Reports" of the CCG Welding Specification, and in accordance with the Documents section of the General Notes (\*ITP).
- 17.2.4.3.5** The Contractor must provide a copy of the NDT Inspector's certification in accordance with the Documents section of the General Notes (\*ITP).
- 17.2.4.3.6** The Contractor must provide a copy of the NDT Inspection report as detailed in Section 5.6.13 "Inspection Reports" of the CCG Welding Specification, and in accordance with the Documents section of the General Notes (\*ITP).
- 17.2.4.4** **Measurements, Calibrations and Readings – NOT USED**
- 17.2.4.5** **Drawings**
- 17.2.4.5.1** The Contractor must provide OEM engineering drawings to capture system installation details. This will include, but not limited to, wiring drawings and system schematics (\*ITP).
- 17.2.4.6** **Spare parts – NOT USED**
- 17.2.4.7** **Equipment or System Manuals**
- 17.2.4.7.1** The Contractor must provide a copy of the backup calibration data and capacity graphs to the TA based on commissioning data (\*ITP).
- 17.2.5** **TRAINING**
- 17.2.5.1** The Contractor shall provide the services of an FSR to provide instructions to the vessel's crew in the proper operation and maintenance of the load monitoring system.
- 17.2.5.2** Training is to take place after installation has completed and shall constitute four (4) hours only for the crew that is aboard at that time. Training must be made available for six (6) persons.
- 17.2.5.3** Training shall consist of a familiarization package, maintenance procedures, and operational training in the function of the load monitoring system. Training materials shall be provided in a hard copy (binder) to each participant and on one (1) USB drive to the TA during the training (\*ITP).

## **18        COMMUNICATION AND NAVIGATION SYSTEMS [NOT USED]**

## **19 CONTROL SYSTEMS [NOT USED]**

## **20        SCIENCE EQUIPMENT [NOT USED]**

## **A APPENDIX A ACTS, REGULATIONS, STANDARDS, RULES, CODES AND GUIDELINE REQUIREMENTS**

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

*CCGS Griffon* was built in Canada and was registered on 1970-09-16. The ship is delegated to the American Bureau of Shipping and is “not In-Class” in accordance with Transport Canada Marine Safety and Security (TCMSS) Delegated Statutory Inspection Program (DSIP). The vessel is certified for Near Coastal 1 in accordance with the Vessel Safety Certificate Regulations of the Canada Shipping Act 2001 as per the Regulations, Standards and Codes referenced therein.

Inspection of the vessel in accordance with the Canada Shipping Act 2001 must be conducted by the American Bureau of Shipping as required for the purposes of the Alongside Refit.

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

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

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

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

Individual specifications may draw attention to specific requirements prescribed in reference documents; however, this does not limit the application of the ARSRC&G referenced in this Appendix.

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

The term ‘Approved’ (including the expression ‘Class Approved’) for the purposes of this specification is defined as meeting all the requirements under the ARSRC&G referenced in sections A.2.0 to A.6.0 of this Appendix and Transport Canada Marine Safety approval requirements applicable to the vessel.

### **A.3.0 Regulations pursuant to the Canada Shipping Act 2001**

Ref	Regulation
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1.	<p>Vessel Construction and Equipment Regulations (VCER): It is anticipated that the proposed Vessel Construction and Equipment Regulations will be in force pursuant to the CSA 2001 prior to the contract date (2023). The proposed Regulations are intended to adopt the construction and inspection standards of SOLAS and referenced IMO Standards and Codes with Canadian modifications.</p> <p>In anticipation of these regulations coming into force, Transport Canada Marine Safety and Security (TCMSS) may consider issuing a Marine Technical Review Board (MTRB) to use the draft Vessel Construction and Equipment Regulations (VCER) and associated amended Technical Publications (TP's) as a regulatory regime subject to review of an application by CCG through the Recognized Organization (ABS).</p> <p>As per the draft VCER section 9(1) Grandfathered Vessels; the <i>CCGS Griffon</i> must continue to meet previous Regulations as applicable; however, all modifications to be completed must meet the VCER in accordance with sections 10 and 11 limited by section 12 of the VCER.</p>
2.	<p>Marine Machinery Regulations (SOR/90-264) – These regulations were amended in June of 2021. Among other amendments Parts II to IV of Schedules I to XV of the Regulation were repealed. TP 15456 'Canadian Vessel Plan Approval and Inspection Standard' contains the TCMS plan approval and inspection requirements.</p>
3.	<p>Hull Construction Regulations (C.R.C., c. 1431)</p> <p>Part VII and Part VIII remain in force as applicable.</p> <p>These regulations were amended in June 2021 to have the inspection requirements migrated to TP 15456 Canadian Vessel Plan Approval and Inspection Standard.</p>
4.	<p>Lifesaving Equipment Regulations (C.R.C., c. 1436)</p> <p>The <i>CCGS Griffon</i> is considered a Class X vessel in accordance with the LSE.</p>
5.	<p>Vessel Fire Safety Regulations (SOR-2017-14)</p> <p>Particular attention is drawn to the following:</p> <p>Section 1(7) For the purposes of these Regulations, any guidelines, recommendations, requirements, and similar matters set out in a document referred to in a footnote to a document that is incorporated by reference into these Regulations are to be considered mandatory.</p> <p>Approvals required by the Minister of Transport as per sections 2 &amp; 3. Reference; 'TCMSS Notice to industry: Type Approval Certification to the Marine Equipment Directive (MED) on Canadian Vessels'.</p>
6.	<p>Arctic Shipping Safety and Pollution Prevention Regulations (SOR/2017-286) – DOES NOT APPLY</p>
7.	<p>Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)</p> <p>Note, these regulations do not apply to government vessels as per section 3(3) however CCG opts to comply and have certificates issued accordingly unless otherwise indicated within the specification.</p> <p>With regards to MARPOL, I to VI inclusive as well as the Antifouling Convention:</p>

	For the purposes of this contract the <i>CCGS Griffon</i> will fully comply except where otherwise noted.
8.	<p>Ballast Water Regulations (SOR/2021-120)</p> <p>The new Ballast Water Regulations were published in the Canada Gazette Part II on June 23, 2021. These regulations impose the Ballast Water Management convention as well as Canadian specific requirements on domestic vessels operating in Canadian waters only.</p> <p>In accordance with the applicable section 3(3)(b), the Regulations do not apply to vessels that are owned or operated by a state and used only in government non-commercial service. However, for the purposes of this contract the <i>CCGS Griffon</i> will fully comply except where otherwise noted.</p>
9.	Cargo, Fumigation and Tackle Regulations (SOR/2007-128)
10.	Collision Regulations (C.R.C., c. 1416)
11.	Crew Accommodation Regulations (C.R.C., c. 1418)
12.	Fire and Boat Drills Regulations (SOR/2010-83)
13.	Load Line Regulations (SOR/2007-99)
14.	Marine Personnel Regulations (SOR/2007-115)
15.	<p>Navigation Safety Regulations, 2020 (SOR/2020-216)</p> <p>Note: References to TP 127E within this Regulations are applicable to all ships</p>
16.	<p>Regulations Excluding Certain Government Ships from the Application of the Canada Shipping Act (SOR/2000-71)</p> <p>Includes exemptions from certain provisions of the Canada Shipping Act</p>
17.	Safe Working Practices Regulations (C.R.C., c. 1467)
18.	<p>Safety Management Regulations (SOR/98-348)</p> <p>Apply in accordance with Chapter IX of SOLAS, Reg. 2.2</p> <p>This chapter does not apply to government-operated ships used for non-commercial purposes</p> <p>CCG vessels comply voluntarily and are issued a Safety Management certificate by the RO.</p>
19.	Steering Appliances and Equipment Regulations (SOR/83-810)
20.	Towboat Crew Accommodation Regulations (C.R.C., c. 1498) – DOES NOT APPLY
21.	<p>Vessel Safety Certificates Regulations (SOR/2021-135) (VSCR)</p> <p>The Vessel Safety Certificates Regulations were Published in the Canada Gazette Part II on June 23, 2021. This vessel will be certified for Near Coastal 1 Voyages.</p>
22.	Vessel Registration and Tonnage Regulations (SOR/2007-126) - Incorporates ITC 69 as applicable.

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

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

1.	<p>M11143:</p> <p>Effective Date: February 12, 2013</p> <p>Expiry Date: July 01, 2032</p> <p>Decision Summary: This Marine Technical Review Board Decision authorizes the GRIFFON to operate in a manner that does not comply with 57(3)(a) of the Fire Detection and Extinguishing Equipment Regulations</p> <p>Conditions:</p> <p>a. The vessel is fitted with steel hatch covers, and that all other openings leading to the cargo holds have effective means of closing.</p>
2.	<p>M15116:</p> <p>Effective Date: April 16, 2018</p> <p>Expiry Date: Life of the Vessel</p> <p>Decision Summary: This Marine Technical Review Board Decision authorizes the Minister of Fisheries and Oceans, as the authorized representative of the GRIFFON, to fulfill his obligations under paragraph 106(1)(a) of the Canada Shipping Act, 2001, in a manner that does not comply with paragraph 8(1)(b) and Schedule VI, subsection 20(1) of the Fire Detection and Extinguishing Equipment Regulations, if:</p> <p>Conditions:</p> <p>a. The sprinkler shore connection is fitted with a globe valve and piping and branch service connections to allow the shore connection to be used to distribute cooling water throughout the vessel;</p> <p>b. The globe valve and piping and branch service connections are isolated with a blank flange when the vessel is not in dry-dock.</p>
3.	<p>2022-00022-406:</p> <p>Effective Date: May 31, 2022</p> <p>File # 10647</p> <p>Determination of Closest Possible Compliance</p> <p>Pursuant to Rule 1(e) of Schedule 1 to the Collision Regulations and of the Convention on the International Regulations for Preventing Collisions at Sea, 1972, the Minister of Transport has determined that the above mentioned vessel is a vessel of special construction or purpose that cannot comply fully with the provisions of Rule Schedule 1, Annex I Section 3(a) with respect to: the number, position, range or arc of visibility of lights or shapes; or the disposition and characteristics of sound-signalling appliances.</p>



	<p>In accordance with Rule 1(e) of Schedule 1 to the Collision Regulations, the Minister has further determined that the following provisions are the closest possible compliance with these Rules in respect of this vessel:</p> <p>Provisions</p> <p>The main aft mast light is located at Fr.52 and the forward mast light is located at Fr.105 which is not meeting the minimal requirement for the horizontal distance (35.7m) between both masts.</p> <p>The existing Horizontal Distance between Fwd Masthead light and Aft Masthead light is 30.5 Metres.</p> <p>Rule 1(e) of Schedule 1 to the Collision Regulations and of the Convention on the International Regulations for Preventing Collisions at Sea, 1972 states that the vessel shall comply with the provisions of this determination.</p>
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Any requests for exemptions to CSA 2001 Regulations/IMO Conventions/ IMO Codes (except for Collision Regulation exemptions) are subject an MTRB decision by TCMS. Any exemption or equivalency identified or being proposed by the Contractor must be brought to the attention of the owner who may, after consideration, make application for an MTRB to TCMS through the RO.

#### **A.5.0 Additional Acts and Regulations**

<b>Ref</b>	<b>Act and Regulation</b>
1.	Canada Labour Code, R.S.C., 1985, c. L-2 Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
2.	Marine Transportation Security Act, S.C. 1994, c. 40 Marine Transportation Security Regulations (SOR/2004-144) 201.2.a. Does not apply to government vessels on government non-commercial service.
3.	Canadian Environmental Protection Act Federal Halocarbon Regulations, 2003 (SOR/2003-289) Ozone-depleting Substances and Halocarbon Alternatives Regulations (SOR/2016-137) EPS Report 1/RA/2 – Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems
4.	Transportation of Dangerous Goods Act (S.C. 1992, c. 34) Transportation of Dangerous Goods Regulations (SOR/2001-286)
5.	All work must be completed by contractors in accordance with the local workers' safety regulation of the province or territory where work is performed. For guidance information can be found at: <a href="http://www.ccohs.ca/oshanswers/information/wcb_canada.html">http://www.ccohs.ca/oshanswers/information/wcb_canada.html</a>

#### **A.6.0 Standards, Rules, Codes and Guidelines:**

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

#### A.6.1 IMO International Conventions

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

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

#### A.6.2 IMO Instruments

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

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

Ref	IMO Instruments
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1.	FSS – Fire Safety Systems Code (as referenced in Vessel Fire Safety Regulations (SOR-2017-14) and SOLAS)
2.	FTP Code – International Code for Application of Fire Test Procedures (as referenced in Vessel Fire Safety Regulations (SOR-2017-14) and SOLAS)
3.	LSA Code – International Life-Saving Appliance Code (as Referenced in Life Saving Equipment Regulations and SOLAS)
4.	2008 IS Code – International Code on Intact Stability, 2008 (as Referenced in SOLAS)
5.	Noise Levels – Code on Noise Levels on Board Ships (as referenced in SOLAS)
6.	Code of Safe Practice for the Carriage of Cargoes and Persons by Offshore Supply Vessels (OSV Code) (as referenced in SOLAS) – DOES NOT APPLY
7.	International Maritime Dangerous Goods (IMDG) Code, (as referenced in the Cargo Fumigation and Tackle Regulations SOR-2007-128)
8.	NOx Technical Code (2008) – Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines (as referenced in the Vessel Pollution and Dangerous Chemicals Regulations SOR/2012-69)
9.	Cargo Stowage and Securing (CSS) Code (as referenced in Cargo Fumigation and Tackle Regulations SOR-2007-128 and SOLAS)
10.	Polar Code – International Code for Ships Operating in Polar Waters (as referenced in the Arctic Shipping Safety and Pollution Prevention Regulations SOR/2017-286 and SOLAS) – DOES NOT APPLY
11.	IMO Resolution MSC.81(70), Revised Recommendation on Testing of Life-Saving Appliances (as referenced in SOLAS, the LSA Code)
12.	MSC/Circ.504 Guidance on design and construction of sea inlets under slush ice conditions (as referenced in TP 15211)
13.	IMO Guidelines for the design and construction of offshore supply vessels, 2006 (resolution MSC.235(82), as amended by resolution MSC.335(90)) (as Referenced in SOLAS) (as applicable) – DOES NOT APPLY
14.	MSC/Circ. 848 – Revised guidelines for the approval of equivalent fixed gas fire extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump rooms (as referenced in the Vessel Fire Safety Regulations and SOLAS) – DOES NOT APPLY
15.	MSC/Circ.884 Guidelines for Safe Ocean Towing– Does not apply
16.	MSC/Circ.1082 Unified interpretations of the Guidelines for the approval of fixed water-based local application fire-fighting systems (MSC/Circ.913) (as per Vessel Fire Safety Regulations and SOLAS II-2) – DOES NOT APPLY

17.	MSC/Circ.1165, Revised Guidelines for The Approval of Equivalent Water-Based Fire-Extinguishing Systems for Machinery Spaces and Cargo Pump-Rooms as amended by MSC.1/Circ.1237 (as per Vessel Fire Safety Regulations and SOLAS II-2) – DOES NOT APPLY
18.	MSC.1/Circ. 1267 Amendments to Revised Guidelines for The Approval of Equivalent Fixed Gas Fire-Extinguishing Systems, As Referred to In SOLAS 74, For Machinery Spaces and Cargo Pump-Rooms (MSC/Circ.848) (as referenced in the Vessel Fire Safety Regulations and SOLAS) – DOES NOT APPLY
19.	MSC.1/Circ.1269 Amendments to The Revised Guidelines for The Approval of Equivalent Water-Based Fire-Extinguishing Systems for Machinery Spaces and Cargo Pump-Rooms (MSC/Circ.1165) (as per Vessel Fire Safety Regulations and SOLAS II-2) – DOES NOT APPLY
20.	MSC/Circ.913 (As amended by MSC.1/Circ.1387) - Guidelines for The Approval of Fixed Water-Based Local Application Fire-Fighting Systems for Use in Category A Machinery Spaces (as per Vessel Fire Safety Regulations and SOLAS II-2) – DOES NOT APPLY
21.	MSC.1/Circ.1387 Revised Guidelines for The Approval of Fixed Water Based Local Application Fire-Fighting Systems for Use in Category A Machinery Spaces (MSC/Circ.913) (as per Vessel Fire Safety Regulations and SOLAS II-2) – DOES NOT APPLY
22.	MSC.1/Circ.1276 – Unified interpretations of SOLAS chapter II-2.
23.	MSC.1/Circ. 1386 Amendments to The Revised Guidelines for The Approval of Equivalent Water-Based Fire-Extinguishing Systems for Machinery Spaces and Cargo Pump-Rooms (MSC/Circ.1165) (as per Vessel Fire Safety Regulations and SOLAS II-2) – DOES NOT APPLY
24.	MSC. 1/Circ. 1580 Guidelines for vessels and units with dynamic positioning (DP) systems (as applicable for DP System) – DOES NOT APPLY

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

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

Ref	TCMSS Technical Publications (TP)
1.	TP 127, Ships Electrical Standards - Note for the purposes of the specification all electrical work is to be completed in accordance with TP127 and referenced codes as well as where TP 127 is referenced in the Regulations noted in sections 1.2 to 1.5. Additionally, the inspection requirements in accordance with TP 15456 that reference TP 127E must be carried out.
2.	TP 7301 – Stability, Subdivision and Load Line Standards
3.	TP 14612 – Procedures for Approval of Life-saving Appliances and Fire Safety Systems, Equipment and Products (as referenced in the Life Saving Equipment Regulations and the Vessel Fire Safety Regulations)
4.	TP 13430 – Standard for the Tonnage Measurement of Vessels
5.	TP 13617 – List of Canada's Alternate Ballast Water Exchange Areas and Fresh Waters

6.	TP 3231 – Ship Safety Bulletins, Available at the following URL: <a href="https://tc.gc.ca/eng/marinesafety/bulletins-menu.htm">https://tc.gc.ca/eng/marinesafety/bulletins-menu.htm</a>
7.	TP 13585 – Marine Safety Management System
8.	TP 14475 – Canadian Life Saving Appliance Standard (as referenced in the Life Saving Equipment Regulations)
9.	TP 15211 – Canadian Supplement to the SOLAS Convention
10.	TP 15456 – Canadian Vessel Plan Approval and Inspection Standard was adopted by TCMSS in conjunction with the Vessel Safety Certificates Regulations coming into force, June 2021. The standard incorporates many of the requirements formerly contained within the Hull Inspection Regulations and Parts II-IV of Schedules I to XV of the Marine Machinery Regulations as well as TP 127.
11.	TC SSB 20-2021 – Hydrostatic testing of pressure containers under the Vessel Fire Safety Regulations

#### A.6.4 Recognized Organization Rules and Codes

All modifications to the ship and systems, including component supply, plan approval and onsite survey must be completed in accordance with TCMSS Rules and Codes. The ship is delegated to ABS in accordance with Transport Canada's Delegated Statutory Inspection program but is not "In-Class".

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

Ref	ABS Rules and Codes
1.	ABS Marine Vessel Rules (2021)
2.	ABS Guide for Nondestructive Inspection (2020)
3.	Generic Rules for Conditions of Classification, Materials and Welding, and Surveys After Construction (2021)
4.	Guidance Notes on the Application and Inspection of Marine Coating Systems (2017)
5.	Certification of Lifting Appliances (2020)

#### A.6.6 Electrical Codes and Standards

As noted, TP 127 applies where referenced within an applicable Regulation or TP 15456 (or otherwise within a specification).

Ref	Electrical Codes and Standards are to be complied with as applicable
1.	ABS may refer to other regulations and standards when deemed necessary. These include the International Electrotechnical Commission (IEC) publications, notably the IEC 60092 series.
2.	Other IEC publications as referenced in ABS Rules are considered guidance

3.	CSA Electrical Codes are applicable as listed in section A.6.7 below
4.	TP 127 – Ships Electrical Standards are to be used instead of ABS rules

**A.6.7 CSA Standards**

The following CSA Standards apply:

Ref	CSA Standards
1.	CSA W47.1 – Certification of Companies for fusion welding of steel, Division 1 or 2, and Annex M
2.	CSA W47.2-11 – Certification of Companies for fusion welding of aluminum, Division 1 or 2
3.	CSA W59 – Welded Steel Construction
4.	CSA W59.2 – Welded Aluminum Construction
5.	CSA W178.2 – Welding Inspector Certification
6.	CSA B52-99 – Mechanical refrigeration code
7.	CSA Code B64.10.17 – Selection and installation of backflow preventers – NOT USED
8.	Also note the CCG Welding Specification CT-043-EQ-EG-001-E (EKME#3049715 latest version) applies in addition to CSA and RO standards
The following CSA Standards also apply as referenced below:	
1.	CSA Standard CAN3-Z11-M81 (R2005), Portable Ladders (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
2.	CSA Standard CAN/CSA-B311-02, Safety Code for Manlifts (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
3.	CSA Standard CAN/CSA-Z185-M87 (R2021), Safety Code for Personnel Hoists (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
4.	CSA Standard Z259.3-99 (R2004), Descent Control Devices (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
5.	CSA Standard CAN/CSA-Z259.2.1-98 (R2008), Fall Arresters, Vertical Lifelines and Rails (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
6.	CSA Standard CAN/CSA-Z107.56-06, Procedures for the Measurement of Occupational Noise Exposure (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
7.	CSA Standard CAN/CSA-Z460-20, Control of Hazardous Energy – Lockout and Other Methods (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))

8.	CSA Standard CAN/CSA-C22.2 NO. 144-M91 (R2006), Ground Fault Circuit Interrupters. (As referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120)
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**A.6.8 Other Applicable Standards and Codes**

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

Ref	Standard
1.	ANSI/ASSE Standard A10.8-2001, Scaffolding Safety Requirements (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
2.	ANSI/ALI Standard A14.7-2006, American National Standard for Mobile Ladder Stands and Mobile Ladder Stand Platforms (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
3.	ANSI/ASSE Standard A10.11-1989 (R1998), Safety Requirements for Safety Nets (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
4.	ANSI/IES RP-7-01, Lighting Industrial Facilities (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
5.	ANSI Standard ANSI/AMT B15.1-2000 (R2008), Safety Standard for Mechanical Power Transmission Apparatus (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
6.	ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Material (as referenced in the VFSR)
7.	CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies (as referenced in the VFSR)
8.	CAN/ULC-S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials (as referenced in the VFSR)
9.	Food Safety Code of Practice, published by the Canadian Restaurant and Foodservices Association (as referenced in the Maritime Occupational Health and Safety Regulations (MOHS) (SOR/2010-120))
10.	Guidelines for Canadian Drinking Water Quality, prepared by the Federal-Provincial-Territorial Committee on Drinking Water and published by the Department of Health (as referenced in the Maritime Occupational Health and Safety Regulations, s. 73(2) (MOHS) (SOR/2010-120))
11.	ISO 1716:2002, Reaction to the fire tests for building products – Determination of the heat of combustion (as referenced in SOLAS II-2/9.7.1.1.1)

12.	NSF/ANSI/CAN/61, 2020 Drinking Water System Components – Health Effects (as referenced in CCG FSM 7.A.12 & 7.A.13)
13.	United States Environmental Protection Agency [US EPA] Method 24 – Surface Coatings (as referenced in CCG FSM 7.A.13)

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

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

<b>Ref</b>	<b>Canadian Coast Guard Specifications, Standards and Fleet Safety Manual (FSM) Publications</b>
1.	Canadian Coast Guard Welding Specification CT-043-EQ-EG-001-E (EKME#3049715 latest version)
2.	Canadian Coast Guard Marine Engineering AutoCAD Template and User Guide (EKME# 263153)
3.	CCG Trim and Stability Book Production - MECTS# 3350860 – DOES NOT APPLY
4.	CCG Paint and Coating Standard – CCG-18-080-000-SG-003
5.	CCG Color Coding Standard for Piping Systems – 30-000-000-ES-TE-001
6.	Canadian Coast Guard Fleet Safety Manual (FSM). Note, the applicable requirements in accordance with the Regulations as per sections A.2.0 to A.5.0 must be met and take precedence over the guidance contained within the Fleet Safety Manual.
7.	Paint Containing Lead on CCG Vessels – CCG/8001 03-2020
8.	Vessel Specific Asbestos Management Plan – CCG/8006

#### **A.8.0 International Association of Classification Societies (IACS)**

IACS publishes unified interpretations or guidelines that may be consulted for guidance in cases where the applicable regulations do not set out specific requirements in respect of the design, construction, installation, or inspection. However, compliance with the regulatory requirements must be met and guidance must be accepted by CCG, the RO and TCMS.

For guidance, IACS No.47 Shipbuilding and Repair Quality Standard is to be referenced, as amended.

#### **A.9.0 Specified Rules, Codes, Standards or Guidelines**

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

<b>Ref</b>	<b>Referenced Document</b>
1.	IEC 60092 – Electrical Installations in Ships



2.	IEEE 45-2002 - Recommended Practice for Electrical Installations on Shipboard
3.	CSA Z462-18 - Workplace electrical safety
4.	UL 1309 - Marine Shipboard Cable
5.	ISO 4406 – Hydraulic fluid power -- Fluids -- Method for coding the level of contamination by solid particles
6.	ISO 21940 – Mechanical vibration – Rotor balancing
7.	ASTM E1729-05 - Standard Practice for Field Collection of Dried Paint Samples for Subsequent Lead Determination
8.	ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
9.	CAN/CGSB 48.9712 - Non-destructive testing – Qualification and certification of NDT Personnel
10.	CAN/CSA-Z1001-18 (R2020) - Occupational health and safety training
11.	CSA Z94.1-15 (R2020) Industrial protective headwear - Performance, selection, care, and use
12.	CSA Z94.2-14 (R2019) Hearing protection devices - Performance, selection, care, and use
13.	CSA Z94.3:20 Eye and face protectors
14.	CSA-Z94.4:18 Selection, use, and care of respirators
15.	CSA Z150:20 Safety code on mobile cranes
16.	CSA Z259.1-05 (R2020) Body belts and saddles for work positioning and travel restraint
17.	CSA Z259.2.2-17 (R2022) Self-retracting devices
18.	CSA Z259.13-16 (R2020) Manufactured horizontal lifeline systems
19.	CSA Z1000:14 (R2019) Occupational health and safety management
20.	CAN/CSA-Z1002-12 (R2017) Occupational health and safety - Hazard identification and elimination and risk assessment and control
21.	CSA Z1006:16 (R2020) – Management of work in confined spaces

22.	CSA Z259.16:21 – Design of active fall-protection systems
23.	EACO Environmental Abatement Council of Canada (Formerly ‘Environmental Abatement Council of Ontario’) – Lead Guideline for Construction, Renovation, Maintenance or Repair October 2014
24.	NFPA 306 2014 – Standard for the Control of Gas Hazards on Vessels
25.	NFPA 10 – Standard for portable fire extinguishers
26.	Society of Naval Architects and Marine Engineers (SNAME) (Bulletin 3-39) - Guide for Shop and Installation Tests (2018)
27.	SNAME (Bulletin 3-47) - Guide for Sea Trials

## **B APPENDIX B GENERAL ARRANGEMENT DRAWING**

<b>Drawing Number</b>	<b>Drawing Title</b>	<b>Sheet and Revision</b>
732905	General Arrangement	Sht. 01/02 Rev. K
732905	General Arrangement	Sht. 02/02 Rev. J