



**RETURN BIDS TO:  
RETOURNER LES SOUMISSIONS À:**

**Bid Receiving - PWGSC / Réception des  
soumissions - TPSGC**

**Place Bonaventure, portail Sud-Est  
Place Bonaventure, Portail South-Eas  
800, rue de La Gauchetière Ouest  
Bureau 7300 / Suite 7300  
Montréal  
Québec  
H5A 1L6**

**REQUEST FOR PROPOSAL  
DEMANDE DE PROPOSITION**

**Proposal To: Public Works and Government  
Services Canada**

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

**Proposition aux: Travaux Publics et Services  
Gouvernementaux Canada**

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

**Comments - Commentaires**

<b>Title - Sujet</b> Henry Larsen Propulsion upgrade	
<b>Solicitation No. - N° de l'invitation</b> F7049-160210/A	<b>Date</b> 2016-11-03
<b>Client Reference No. - N° de référence du client</b> F7049-16-0210	
<b>GETS Reference No. - N° de référence de SEAG</b> PW-\$MTE-150-14103	
<b>File No. - N° de dossier</b> MTE-6-39220 (150)	<b>CCC No./N° CCC - FMS No./N° VME</b>
<b>Solicitation Closes - L'invitation prend fin</b> <b>at - à 02:00 PM</b> <b>on - le 2017-01-18</b>	
<b>Time Zone</b> <b>Fuseau horaire</b> Eastern Daylight Saving Time EDT	
<b>F.O.B. - F.A.B.</b> <b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input checked="" type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>	
<b>Address Enquiries to: - Adresser toutes questions à:</b> Giguère, Réjean	<b>Buyer Id - Id de l'acheteur</b> mte150
<b>Telephone No. - N° de téléphone</b> (514) 496-3346 ( )	<b>FAX No. - N° de FAX</b> ( ) -
<b>Destination - of Goods, Services, and Construction:</b> <b>Destination - des biens, services et construction:</b> MINISTERE DES PECHEES ET DES OCEANS CCGS Henry Larson Canada	

**Instructions: See Herein**

**Instructions: Voir aux présentes**

**Vendor/Firm Name and Address**

**Raison sociale et adresse du  
fournisseur/de l'entrepreneur**

**Issuing Office - Bureau de distribution**

TPSGC/PWGSC  
Place Bonaventure, portail Sud-Est  
Place Bonaventure, Portail S. E.  
800, rue de La Gauchetière Ouest  
800 de La Gauchetière Street West  
Bureau 7300/Suite 7300  
Montréal  
Québec  
H5A 1L6

<b>Delivery Required - Livraison exigée</b>	<b>Delivery Offered - Livraison proposée</b>
<b>Vendor/Firm Name and Address</b> <b>Raison sociale et adresse du fournisseur/de l'entrepreneur</b>	
<b>Telephone No. - N° de téléphone</b> <b>Facsimile No. - N° de télécopieur</b>	
<b>Name and title of person authorized to sign on behalf of Vendor/Firm</b> <b>(type or print)</b> <b>Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b>	
<b>Signature</b>	<b>Date</b>

# REQUEST FOR PROPOSAL

## PROPULSION SYSTEM UPGRADE FOR THE CCGS HENRY LARSEN

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## **PART 1 - GENERAL INFORMATION**

### **1.1 Introduction**

The bid solicitation is divided into seven (7) parts plus attachments and annexes, as follows:

- Part 1 General Information: provides a general description of the requirement;
- Part 2 Bidder Instructions: provides the instructions, clauses and conditions applicable to the bid solicitation;
- Part 3 Bid Preparation Instructions: provides bidders with instructions on how to prepare their bid;
- Part 4 Evaluation Procedures and Basis of Selection: indicates how the evaluation will be conducted, the evaluation criteria that must be addressed in the bid, and the basis of selection;
- Part 5 Certifications: includes the certifications to be provided;
- Part 6 Financial and Other Requirements: includes specific requirements that must be addressed by bidders; and
- Part 7 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting contract.

The annexes contain the Statement of Work, the Basis of Payment and other pertinent documentation.

### **1.2 Requirement**

#### **1.2.1 Background:**

The *CCGS Henry Larsen* is a type 1200 icebreaker vessel built in 1987. Although some technical improvements have been made to the vessel in recent years, many of the propulsion system's core components are original and are approaching the end of their useful life. This poses several problems in terms of spares provisioning, in addition to causing general deterioration of all systems over the years. The mandate of this program is to guarantee the reliability of these systems for an additional 15 years.

#### **1.2.2 The Requirement is:**

- 1.2.2.1 To design, manufacture and install a new propulsion system that will provide the same functionality as the old system and will meet or exceed the requirements contained in Annex A - Statement of Work (SOW),

1.2.2.2 To carry out, within the Work Period of the Contract, all unscheduled work authorized by the Contracting Authority as per Annex G, Procedure for Processing Unscheduled Work.

1.2.2.3: Work location: St-Johns, Nfld, Canada.

1.2.3 The requirement is exempt from the provisions of the World Trade Organization Agreement on Government Procurement (WTO-AGP), Annex 4 and the North American Free Trade Agreement (NAFTA), Chapter Ten Annex 1001.2b Paragraph 1(a). However, it is subject to the Agreement on Internal Trade (AIT).

### **1.3 Communications Notifications**

The bidder must notify the Contracting Authority at least 7 calendar days in advance of its intention to make public an announcement related to the award of a contract.

### **1.4 Security Requirement**

There is no security requirement associated with this bid solicitation.

### **1.5 Debriefings**

Bidders may request a debriefing on the results of the bid solicitation process. Bidders should make the request to the Contracting Authority **within 15 working days** of receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

## **PART 2 - BIDDER INSTRUCTIONS**

### **2.1 Standard Instructions, Clauses and Conditions**

All instructions, clauses and conditions identified in the bid solicitation by number, date and title are set out in the Standard Acquisition Clauses and Conditions Manual (SACC) issued by Public Works and Government Services Canada:

**(<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>)**

Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The **2003** (2015-07-03) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

### **2.2 SACC Manual Clause**

B1000T - Condition of Material, 2007-11-30

### **2.3 Submission of Bids**

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit by the date, time and place indicated on page 1 of the bid solicitation.

**Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.**

### **2.4 Enquiries - Bid Solicitation**

All enquiries must be submitted in writing to the Contracting Authority no later than **seven (7) working days** before the bid closing date. Enquiries received after that time may not be answered.

Bidders should reference as accurately as possible the numbered item of the bid solicitation to which the enquiry relates. Care should be taken by bidders to explain each question in sufficient detail in order to enable Canada to provide an accurate answer. Technical enquiries that are of a "proprietary" nature must be clearly marked "proprietary" at each relevant item. Items identified as proprietary will be treated as such except where Canada determines that the enquiry is not of a proprietary nature. Canada may edit the questions or may request that the Bidder do so, so that the proprietary nature of the question is eliminated, and the enquiry can be answered with copies to all bidders. Enquiries not submitted in a form that can be distributed to all bidders may not be answered by Canada.

Any clarifications or changes to the bid solicitation resulting from the questions and answers will be published as an amendment to the bid solicitation.

## 2.5 Applicable Laws

Any resulting contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in the **Province of Newfoundland**.

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the bidders.

## 2.6 Mandatory Bidder's Conference

A mandatory bidders' conference will be held in St-Johns, Newfoundland at the CCG's facility located at 280 Southside Road, on **December 8, 2016, 09:00 hre local time**. It is mandatory that the Bidder or a representative of the Bidder attend this conference. The scope of the requirement outlined in the bid solicitation will be reviewed and questions will be answered.

Bidders should communicate with the Contracting Authority before the conference to confirm attendance. Bidders should provide, in writing, to the Contracting Authority, the names of the person(s) who will be attending and a list of issues they wish to table at least **five (5) working days** before the scheduled conference. Bidders will be required to sign an attendance form.

Any clarifications or changes to the bid solicitation resulting from the bidders' conference will be included as an amendment to the bid solicitation.

**Bidders who do not attend or send a representative will not be given an alternative appointment and their bids will be rejected as non-compliant.**

## 2.7 Mandatory Site Visit - Vessel

A mandatory visit of the Henry Larsen ice breaker vessel will be held in St-Johns, Newfoundland at the CCG's facility located at 280 Southside Road on **December 7, 2016, 09:00 hre local time**. It is mandatory that the Bidder or a representative of the Bidder visit the vessel. The scope of the requirement outlined in the bid solicitation will be reviewed and questions will be answered.

Bidders should communicate with the Contracting Authority before the visit to confirm attendance. Bidders should provide, in writing, to the Contracting Authority, the names of the person(s) who will be attending and a list of issues they wish to table at least **five (5) working days** before the scheduled visit. Bidders will be required to sign an attendance form.

**Bidders who do not attend or send a representative will not be given an alternative appointment and their bids will be rejected as non-compliant.**

## 2.8 Term of the Contract

The Work must commence and be completed as follows:

Commence: It is intended to award a contract in February 2017.

Completed by: No later than February 15, 2019.

By submitting a bid, the Bidder certifies that they have sufficient material and human resources allocated or available to deliver the Requirement and that the above Work Period is adequate to perform the work required to deliver the Requirement.

### 2.8.1 Option to extend

The Contractor grants to Canada the irrevocable option to extend the term of the Contract by up to five (5) additional one (1) year period(s) under the same conditions. The Contractor agrees that, during the extended period of the Contract, it will be paid in accordance with the applicable provisions as set out in the Basis of Payment.

Canada may exercise these options at any time by sending a written notice to the Contractor at least 30 calendar days before the expiry date of the Contract. The options may only be exercised by the Contracting Authority, and will be evidenced for administrative purposes only, through a contract amendment.

## PART 3 - BID PREPARATION INSTRUCTIONS

### 3.1 Bid Preparation Instructions

**Annex "M", MANDATORY PROPOSAL DELIVERABLES CHECKLIST, must be completed accordingly.**

Canada requests that Bidders provide their bid in separately bound sections as follows:

Section I - Technical Bid (three (3) hard copies and one (1) soft copy);

Section II - Financial Bid (one (1) hard copy);

Section III - Certifications (one (1) hard copy and one (1) soft copy)

**Two (2) packages must be provided with the bid.** The first package should include the copies of the Technical Bid (Section I), as well as the copies of the Certifications (Section III). The other package should include the copies of the Financial bid (Section II), as requested above.

If there is a discrepancy between the wording of the soft copy and the hard copy, the wording of the hard copy will have priority over the wording of the soft copy.

**Prices must appear in the financial bid only. No prices must be indicated in any other section of the bid.**

Canada requests that bidders follow the format instructions described below in the preparation of their bid:

- (a) use 8.5 x 11 inch (216 mm x 279 mm) paper;
- (b) use a numbering system that corresponds to the bid solicitation.

In April 2006, Canada issued a policy directing federal departments and agencies to take the necessary steps to incorporate environmental considerations into the procurement process. See the Policy on Green Procurement at <http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html>

### **3.2 Section I: Technical Proposal**

Bidders must submit a Technical Proposal Package for Canada's evaluation. The package must answer to all requests of the SOW. In their technical proposal, bidders must demonstrate their understanding of the requirements contained in the bid solicitation and explain how they will meet these requirements. Bidders must demonstrate their capability in a thorough, concise and clear manner for carrying out the work.

The Technical Proposal must address clearly and in sufficient depth the points that are subject to the Evaluation Procedures and Basis of Selection as per the Part 4 of the RFP. Simply repeating the statement contained in the RFP is not sufficient. In order to facilitate the evaluation of the proposal, Canada requests that bidders address and present topics in the order of the evaluation criteria under the same headings. To avoid duplication, bidders may refer to different sections of their proposals by identifying the specific paragraph and page number where the subject topic has already been addressed.

### **3.3 Section II: Financial Bid**

Bidders must submit their financial bid in accordance with the Annex D - Financial Bid Presentation Sheet. The total amount of the applicable taxes must be excluded or shown separately.

#### **3.3.1 Cost Breakdown**

Bidders must include with their financial bid a complete cost breakdown of its bid price for the Work in accordance with Annex D – Financial Bid Presentation Sheet. Once in contract the Financial Bid Presentation Sheet will be part of the Basis of Payment, Annex C.

#### **3.3.3 Financial bid evaluation.**

- 1. The Evaluation Price provided in Annex D, Para D1, Financial Bid Presentation Form, will be used for evaluating the bid.**
2. The information submitted as a mandatory item will be held as confidential business information. The details of this information may be used for contractual evaluation purposes and/or contract administration purposes.

### **3.3.4 Exchange Rate Fluctuation**

C3011T, 2013-11-06, Exchange Rate Fluctuation

### **3.3.5 Evaluation of Price**

SACC Manual Clause A0222T (2013-04-25), Evaluation of Price.

## **3.4 Section III: Certifications**

Bidders must submit the certifications required under **Part 5**.

## **PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION**

Proposals will be assessed in accordance with the entire requirement of the Request for Proposal including the technical evaluation criteria and the financial requirement. An evaluation team composed of representatives of Canada will evaluate the bids.

### **4.1 Basis of Selection - Highest Combined Rating of Technical Merit and Price**

**4.1.1** To be declared responsive, a bid must:

- a) comply with all the requirements of the RFP; and
- b) meet all mandatory criteria (deliverables); and
- c) obtain the required minimum of 35 points overall for the technical evaluation criteria which are subject to point rating. The rating is performed on a scale of 75 points.

**Bids not meeting a, b, and c will be declared non-responsive.**

**4.1.2** The selection will be based on the highest responsive combined rating of technical merit and price. The ratio will be 50 % for the technical merit and 50 % for the price.

**4.1.3** To establish the technical merit score, the overall technical score for each responsive bid will be determined as follows: total number of points obtained / maximum number of points available multiplied by the ratio of 50 %.

**4.1.4** To establish the pricing score, each responsive bid will be prorated against the lowest evaluated price and the ratio of 50%.

**4.1.5** For each responsive bid, the technical merit score and the pricing score will be added to determine its combined rating.

**4.1.6** Neither the responsive bid obtaining the highest technical score nor the one with the lowest evaluated price will necessarily be accepted. The responsive bid with the highest combined rating of technical merit and price will be recommended for award of a contract.

**4.1.7** The table below illustrates an example where all three bids are responsive and the selection of the contractor is determined by a 30/70 ratio of technical merit and price, respectively. The total available point equal 135 and the lowest evaluated price is \$45,000 (45).

Basis of Selection - Highest Combined Rating Technical Merit (30%) and Price (70%)

	<b>Bidder 1</b>	<b>Bidder 2</b>	<b>Bidder 3</b>
<b>Overall Technical Score</b>	115/135	89/135	92/135
<b>Bid Evaluated Price</b>	\$55,000.00	\$50,000.00	\$45,000.00
<b>Technical Merit Score Calculation</b>	$115/135 \times 30 = 25.56$	$89/135 \times 30 = 19.78$	$92/135 \times 30 = 20.44$
<b>Pricing Score Calculation</b>	$45\,000/55\,000 \times 70 = 57.27$	$45\,000/50\,000 \times 70 = 63.00$	$45\,000/45\,000 \times 70 = 70.00$
<b>Combine Rating</b>	82.83	82.78	90.44
<b>Overall rating</b>	<b>2nd</b>	<b>3rd</b>	<b>1st</b>

## 4.2 Mandatory Technical Criteria

A mandatory requirement is described using the words “shall”, “must”, “will”, “is required” or “is mandatory”.

### 4.2.1 Completeness and quality of the written proposal

In their technical bid, bidders must demonstrate their understanding of the requirements contained in the bid solicitation and explain how they will meet these requirements. Bidders must demonstrate their capability in a thorough, concise and clear manner for carrying out the work.

The technical bid must address clearly and in sufficient depth the points that are subject to the evaluation criteria against which the bid will be evaluated. Simply repeating the statement contained in the bid solicitation is not sufficient. In order to facilitate the evaluation of the bid, Canada requests that bidders address and present topics in the order of the evaluation criteria under the same headings. To avoid duplication, bidders may refer to different sections of their bids by identifying the specific paragraph and page number where the subject topic has already been addressed.

#### 4.2.2 Classification Society

Bidders must provide the name of the classification society that will evaluate and approve the design of the proposed propulsion system according to the laws and regulations applicable to this specific class of ship and the various requirements specified in the Statement of work (SOW), Annex A. The selected classification society must be approved by Transport Canada Marine Safety (TCMS) under the Delegated Statutory Inspection Program (DSIP), available at this web address:

<https://www.tc.gc.ca/eng/marinesafety/dvro-fsc-dspi-1781.htm>

Bidders must complete Annex J, Certification for the classification society, indicating that they have reached an agreement with a firm to verify and approve the work.

**Bidders must include the costs associated with the approval of the proposed system by the classification society listed above in their financial bid.**

#### 4.2.3 Bidders' experience

Note: To be valid, bidders must provide information on the date and place of the projects, an overview of the work as well as the name and registration numbers of the vessels.

The bidders must have design, deliver and install, as a prime contractor, cycloconverter propulsion systems that meet Classification Society Standards. Bidders must demonstrate that they have installed their own Class approved cycloconverter propulsion systems on at least 3 vessels.

The bidders must demonstrate that the proposed system is not a prototype and can obtain a class approval certificate as required in annex A, SOW.

#### 4.2.4 System Check

Bidders must demonstrate that the new system will reproduce at least the same functionality and performance of the current system. Bidders must also check and summarize, in tabular form, the current functions and corresponding functions proposed for the equipment listed below:

- a) The new cycloconverter system dimensions shall fit within the dimensions provided in section 10.2, Figure 2, Annex A
- b) Provide details on the proposed route for removal and installation of equipment
- c) Meets the propulsion minimum functional requirements as per section 11, Annex A
- d) Meets Telegraph system requirements as per section 12, Annex A
- e) Provide propulsion motor encoder and speed feedback details as per section 12.2, Annex A
- f) Voltage regulation system as per section 13, Annex A

- g) Protection system requirements as per section 14, Annex A
- h) Drive system Protection as per section 15, Annex A
- i) Environmental requirements are met for all proposed equipment as per section 19, Annex A
- j) New drive cooling system is detailed
- k) New Drive system meets requirements of Section 20 of Annex A

#### 4.2.5 Support Capacity

##### a) Field Service Representatives (FSR)

Bidders must demonstrate and certify that they have or will have an FSR based in Canada and that qualified technicians will be available to provide on-site support within 48 hours of a request by the CCG, directly at the Coast Guard base in St-Johns, for the duration of the contract and warranty period.

##### b) Remote access

Bidders must demonstrate and certify that the proposed system will have the ability to be remotely accessed to assist the crew if a technical problem occurs when the ship is in a remote area.

Note: If required, the Coast Guard will provide an IP-based intranet communication link for transferring data between the ship and the Coast Guard's Office in St-Johns.

##### c) Equipment Life Cycle

Bidders must demonstrate and certify that the equipment proposed for this contract will have a minimum of fifteen (15) years remaining in its production life and twenty (20) years remaining in its complete life cycle services.

<b>Definitions :</b>	
« Production life »	Equipment still being manufactured and sold. Full technical services is available
« Complete life cycle services »	Serial production ceased. All spare parts and full services remain available.

##### d) Spare parts availability

Bidders must demonstrate and certify that spare parts for new equipment are quickly and easily available in North America, directly from the original manufacturers or through authorized suppliers.

#### **4.2.6 Document Management Plan**

Bidders must provide with their proposal a Document Management Plan for drawings and specifications, including the details for Regulatory approvals and Client Feedback.

#### **4.2.7 Sample of System Manuals**

Bidders must provide with their proposals a sample of installation, operation and troubleshooting manuals from a previous propulsion system installation.

#### **4.2.8 Preliminary Planning and Scheduling**

Bidders must provide with their proposals a planning and scheduling GANTT chart that will allow a preliminary evaluation of the different periods of time required for completion of the work. This chart must include at least the following:

- Contract award (Day 1);
- Complete evaluation of the current system capabilities. Sea trials and production of a report on the ship's performance;
- Production and submission of the Preliminary Design Package (PDP);
- Review by Canada of the PDP;
- Production and submission of all drawings and other design documents (Design Review Package);
- Review by Canada of the Design Review Package;
- Period of approval by Classification Society and TCMS;
- Purchase of the components. Pre-assembly of the equipment at factory;
- Factory Acceptance Tests (FAT);
- Current system removal. New equipment installation and wiring;
- Ship commissioning. Dock and sea trials. Final approval of the new system;
- Training of the CCG personnel.

#### **4.2.9 Quality Management System**

Bidders must provide with their proposals objective evidence that they have in place a Quality Management System registered to ISO 9001:2008 or a Quality Management System modeled on ISO 9001:2008 which will include:

- a) if registered, its valid ISO 9001:2008 certification, and;
- b) an example of its Quality Control Plan (QCP) as applied on previous projects of the same nature and complexity of this RFP, and;
  - a sample of an Inspection and Test Plan (ITP) developed in accordance with the QCP in (b) above.

### 4.3 Point Rated Technical Criteria

#### 4.3.1 Corporate history on AC/AC propulsion systems.

Note: To be valid, bidders must provide information on the date and place of the installation, an overview of the work as well as the name and registration numbers of the vessels.

	<b>Bidders' proven experience, as a prime contractor, in the design, delivery and installation of AC/AC electric propulsion systems for vessels of at least the same tonnage or greater than the Henry Larsen.</b>	<b>Max 20</b>
<b>A</b>	3 to 5 years experience	<b>5 pts</b>
<b>B</b>	6 to 10 years experience	<b>10 pts</b>
<b>C</b>	11 to 15 years experience	<b>15 pts</b>
<b>D</b>	16 years and more experience	<b>20pts</b>

#### 4.3.2 Experience in similar projects, as a prime contractor, on icebreaker vessels over the past 20 years.

Note: To be valid, each of the systems provided as reference must drive an AC/AC propulsion synchronous electric motor with a minimum of 5000HP. Bidders must provide information on the date and place of the installation, an overview of the work as well as the name and registration numbers of the vessels.

Definition of "similar project": Design, delivery and installation of a propulsion system of at least the same function than the one currently installed on the Henry Larsen icebreaker vessel.

	<b>Number of similar projects carried out by the bidder, as a prime contractor over the past 20 years:</b>	<b>Max 20</b>
<b>A</b>	Design, delivery and installation of 3 or 4 AC/AC systems	<b>10 pts</b>
<b>B</b>	Design, delivery and installation of 5 to 6 AC/AC systems	<b>15 pts</b>
<b>C</b>	Design, delivery and installation of 7 or more AC/AC systems	<b>20 pts</b>

#### 4.3.3 Corporate history on icebreaker vessels.

Note: To be valid, bidders must provide information on the date and place of the installation, an overview of the work as well as the name and registration numbers of the vessels.

	<b>Bidders' proven experience, as a prime contractor, in the design, delivery and installation of AC/AC electric propulsion systems for icebreaker vessels of at least the same tonnage or greater than the Henry Larsen.</b>	<b>Max 20</b>
<b>A</b>	3 to 5 years experience	<b>5 pts</b>
<b>B</b>	6 to 10 years experience	<b>10 pts</b>
<b>C</b>	11 to 15 years experience	<b>15 pts</b>
<b>D</b>	16 years and more experience	<b>20pts</b>

#### 4.3.4 Personnel in charge of the installation of icebreaker propulsion systems.

Note: Bidders must provide the resume of the person in charge of the installation of AC type electric propulsion systems for icebreaker vessels of at least the same tonnage, or greater, than the Henry Larsen. Also, Bidders must provide information on the date and place of installation of these systems, an overview of the work accomplished as well as the name and registration number of the vessels. This specific individual shall be employed by the bidder for, as a minimum, the duration of the contract period and shall coordinate the installation of the proposed system.

	<b>Experience of the person in charge of the installation work:</b>	<b>Max 15</b>
<b>A</b>	Professional with a minimum experience of 5 years in the installation of electric propulsion systems.	<b>5 pts</b>
<b>B</b>	Professional with a minimum experience of 10 years in the installation of electric propulsion systems.	<b>10 pts</b>
<b>C</b>	Professional with a minimum experience of 15 years in the installation of electric propulsion systems.	<b>15 pts</b>

**TOTAL POINTS : 75**

**MINIMUM REQUIRED : 35**

## **PART 5 - CERTIFICATIONS**

Bidders must provide the required certifications and documentation to be awarded a contract.

The certifications provided by bidders to Canada are subject to verification by Canada at all times. Canada will declare a bid non-responsive, or will declare a contractor in default, if any certification made by the Bidder is found to be untrue whether during the bid evaluation period or during the contract period.

The Contracting Authority will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply with this request will also render the bid non-responsive or will constitute a default under the Contract.

### **5.1 Mandatory Certifications Required with the Proposal**

The Bidder must submit the following duly completed mandatory certifications as part of its bid.

#### **5.1.1 Code of Conduct and Certifications - Related documentation**

By submitting a bid, the Bidder certifies that the Bidder and its affiliates are in compliance with the provisions as stated in Section 01 Code of Conduct and Certifications - Bid of Standard Instructions 2003. The related documentation therein required will assist Canada in confirming that the certifications are true.

Pursuant to section 01 of Standard Instructions 2003, Bidders who are incorporated, including those bidding as a joint venture, must provide a complete list of names of all individuals who are currently directors of the Bidder. Bidders bidding as sole proprietorship, including those bidding as a joint venture, must provide the name of the owner.

#### **5.1.2 Federal Contractors Program for Employment Equity - Bid Certification**

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "FCP Limited Eligibility to Bid" list available from Human Resources and Skills Development Canada (HRSDC) - Labour's website :  
[http://www.labour.gc.ca/eng/standards\\_equality/eq/emp/fcp/list/inelig.shtml](http://www.labour.gc.ca/eng/standards_equality/eq/emp/fcp/list/inelig.shtml)

Canada will have the right to declare a bid non-responsive if the Bidder, or any member of the Bidder if the Bidder is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list at the time of contract award.

Canada will also have the right to terminate the Contract for default if a Contractor, or any member of the Contractor if the Contractor is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list during the period of the Contract.

#### **5.1.3 Education and Experience**

By submission of a bid, the Bidder certifies that all the information provided in the résumés and

supporting material submitted with its bid, particularly the information pertaining to education, achievements, experience and work history, has been verified by the Bidder to be true and accurate. Furthermore, the Bidder warrants that every individual proposed by the Bidder for the requirement is capable of performing the Work described in the resulting contract.

#### **5.1.4 Status and Availability of Resources**

By submission of a bid, the Bidder certifies that, should it be awarded a contract as a result of the bid solicitation, every individual proposed in its bid will be available to perform the Work as required by Canada's representatives and at the time specified in the bid solicitation or agreed to with Canada's representatives. If for reasons beyond its control, the Bidder is unable to provide the services of an individual named in its bid, the Bidder may propose a substitute with similar qualifications and experience. The Bidder must advise the Contracting Authority of the reason for the substitution and provide the name, qualifications and experience of the proposed replacement. For the purposes of this clause, only the following reasons will be considered as beyond the control of the Bidder: death, sickness, maternity and parental leave, retirement, resignation, dismissal for cause or termination of an agreement for default.

If the Bidder has proposed any individual who is not an employee of the Bidder, the Bidder certifies that it has the permission from that individual to propose his/her services in relation to the Work to be performed and to submit his/her résumé to Canada. The Bidder must, upon request from the Contracting Authority, provide a written confirmation, signed by the individual, of the permission given to the Bidder and of his/her availability.

#### **5.1.5 Former Public Servant**

Contracts awarded to former public servants (FPS) in receipt of a pension or of a lump sum payment must bear the closest public scrutiny, and reflect fairness in the spending of public funds. In order to comply with Treasury Board policies and directives on contracts awarded to FPS, bidders must provide the information required below with its proposal. Failure to provide the required information will render the proposal non-responsive.

##### **5.1.5.1 Definitions**

For the purposes of this clause, "*former public servant*" is any former member of a department as defined in the *Financial Administration Act*, R.S., 1985, c. F-11, a former member of the Canadian Armed Forces or a former member of the Royal Canadian Mounted Police. A former public servant may be:

- (a) an individual;
- (b) an individual who has incorporated;
- (c) a partnership made of former public servants; or
- (d) a sole proprietorship or entity where the affected individual has a controlling or major interest in the entity.

*"lump sum payment period"* means the period measured in weeks of salary, for which payment has been made to facilitate the transition to retirement or to other employment as a result of the

*implementation of various programs to reduce the size of the Public Service. The lump sum payment period does not include the period of severance pay, which is measured in a like manner.*

*"pension" means a pension or annual allowance paid under the Public Service Superannuation Act (PSSA), R.S., 1985, c.P-36, and any increases paid pursuant to the Supplementary Retirement Benefits Act, R.S., 1985, c.S-24 as it affects the PSSA. It does not include pensions payable pursuant to the Canadian Forces Superannuation Act, R.S., 1985, c.C-17, the Defence Services Pension Continuation Act, 1970, c.D-3, the Royal Canadian Mounted Police Pension Continuation Act, 1970, c.R-10, and the Royal Canadian Mounted Police Superannuation Act, R.S., 1985, c.R-11, the Members of Parliament Retiring Allowances Act, R.S., 1985, c.M-5, and that portion of pension payable to the Canada Pension Plan Act, R.S., 1985, c.C-8.*

### **5.1.5.2 Former Public Servant in Receipt of a Pension**

As per the above definitions, is the Bidder a FPS in receipt of a pension? **Yes ( ) No ( )**

If so, the Bidder must provide the following information, for all FPS in receipt of a pension, as applicable:

- (a) name of former public servant;
- (b) date of termination of employment or retirement from the Public Service.

By providing this information, Bidders agree that the successful Bidder's status, with respect to being a former public servant in receipt of a pension, will be reported on departmental websites as part of the published proactive disclosure reports in accordance with **Contracting Policy Notice: 2012-2** and the Guidelines on the Proactive Disclosure of Contracts.

### **5.1.5.3 Work Force Adjustment Directive**

Is the Bidder a FPS who received a lump sum payment pursuant to the terms of the Work Force Adjustment Directive? **Yes ( ) No ( )**

If so, the Bidder must provide the following information:

- (a) name of former public servant;
- (b) conditions of the lump sum payment incentive;
- (c) date of termination of employment;
- (d) amount of lump sum payment;
- (e) rate of pay on which lump sum payment is based;
- (f) period of lump sum payment including start date, end date and number of weeks;
- (g) number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is \$5,000, including Applicable Taxes.

## **PART 6 - FINANCIAL AND OTHER REQUIREMENTS**

### **6.1 Financial Capability**

A9033T, 2012-07-16, Financial Capability

### **6.2 Contract Financial Security**

E5000C, 2010-01-11, Performance bonds

- 6.2.1** If this bid is accepted, the Bidder shall be required to provide the performance bond form [PWGSC-TPSGC 505](#) in accordance with 7.13 **before contract award.**
- 6.2.2.** If, for any reason, Canada does not receive, within the specified period, the required Contract Financial Security, Canada may accept another offer, seek new bids, negotiate a contract or not accept any bids, as Canada may deem advisable.

### **6.3 Insurance Requirements**

The Bidder must provide with its proposal a letter from an insurance broker or an insurance company licensed to operate in Canada stating that the Bidder, if awarded a contract as a result of the bid solicitation, can be insured in accordance with the Insurance Requirements specified in Annex E.

## PART 7 - RESULTING CONTRACT CLAUSES

The following clauses and conditions apply to and form part of any contract resulting from the bid solicitation.

### 7.1 Requirement

- 7.1.1 To design, manufacture and install a new propulsion system that will provide the same functionality as the old system and will meet or exceed the requirements contained in Annex A - Statement of Work (SOW),
- 7.1.2 To carry out, within the Work Period of the Contract, all unscheduled work authorized by the Contracting Authority as per Annex G, Procedure For Processing Unscheduled Work.
- 7.1.3 Work location: St-Johns, Newfoundland, Canada.

### 7.2 Standard Clauses and Conditions

All clauses and conditions identified in the Contract by number, date and title are set out in the *Standard Acquisition Clauses and Conditions Manual* issued by Public Works and Government Services Canada: <https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>

#### 7.2.1 General Conditions

2040 (2015-09-03), General Conditions – Research and Development, apply to and form part of the Contract.

2040 (2015-09-03), General Conditions - Research and Development, are hereby amended as follows;

#### **Section 22 Warranty:**

**DELETE:** Despite inspection and acceptance of the Work by or on behalf of Canada and without restricting any other provision of the Contract or any condition, warranty or provision imposed by law, the Contractor warrants that, for twelve (12) months, the Work will be free from all defects in design, material or workmanship, and will conform to the requirements of the Contract. The warranty period begins on the date of acceptance of the Work by the Technical Authority. With respect to Government Property not supplied by the Contractor, the Contractor's warranty will extend only to its proper incorporation into the Work.

**ADD:** Despite inspection and acceptance of the Work by or on behalf of Canada and without restricting any other provision of the Contract or any condition, warranty or provision imposed by law, the Contractor warrants that, for fifteen (15) months, the Work will be free from all defects in design, material or workmanship, and will conform to the requirements of the Contract. The warranty period begins on the date of acceptance of the

Work by the Technical Authority. With respect to Government Property not supplied by the Contractor, the Contractor's warranty will extend only to its proper incorporation into the Work.

**ADD: Performance Period (Warranty)**

Following vessel's commissioning and final acceptance of the new propulsion control system, the contractor shall enter into a fifteen (15) months performance period\*. During this period, the contractor shall be responsible for the continued functionality, performance, and additional tuning of the new propulsion system upgrades such that the systems meet the functional requirements stated within this statement of work. During this period, the contractor shall also be responsible to replace all defective parts, in addition to perform all work and additional equipment purchases that may be required to correct the anomalies in the original design of the control system.

In addition to providing remote assistance, the contractor shall be available to travel to the vessel within 48 hours' notice during this period. One (1) visit to the vessel during ice breaking season shall be included during the performance period to tune the systems to the peak demands experienced during ice breaking. The contractor shall be responsible for travel to the vessel's home port (St-Johns), and the Coast Guard will cover any follow-on travel costs to reach the vessel. For the ice breaking visit, the contractor must be willing to be flown onto the vessel via helicopter and commence testing while the vessel is underway. Because the vessel will operate in the Atlantic region during this period, this icebreaking visit might be exceptionally long, up to seven (7) days. During this time only, lodging and meals will be provided to the contractor's technician(s) directly onboard the vessel, at the CCG expenses.

**Section 30 Licenses to Intellectual Property Rights in Foreground and Background Information:**

Delete: Para 3a), 3b) 3c) and 4.

the right to disclose the Foreground and Background Information to third parties bidding on or negotiating contracts with Canada and to sublicense or otherwise authorize the use of that information by any contractor engaged by Canada solely for the purpose of carrying out such contracts. Canada will require these third parties and contractors not to use or disclose that information except as may be necessary to bid on, negotiate or carry out those contracts;

the right to disclose the Foreground and Background Information to other governments for information purposes;

the right to reproduce, modify, improve, develop or translate the Foreground and Background Information or have it done by a person hired by Canada. Canada, or a person designated by Canada, will own the Intellectual Property Rights associated with the reproduction, modification, improvement, development or translation.

The Contractor agrees to make the Background Information, including in the case of Software, the source code promptly available to Canada for any purpose mentioned above. The license does not apply to any Software that is subject to detailed license conditions that are set out elsewhere in the Contract. Furthermore, in

the case of commercial off-the-shelf software, the Contractor's obligation to make the source code promptly available to Canada applies only to source code that is within the control of or can be obtained by the Contractor or any subcontractor.

### **7.2.2 Supplemental General Conditions**

1029 (2010-08-16), Ship Repairs, apply to and form part of the Contract

### **7.3 Security Requirement**

There is no security requirement applicable to this Contract.

### **7.4 Term of Contract**

#### **7.4.1 Work Period**

1. Work must commence and be completed as follows:

Commence: Date of contract award.

Complete: On or before February 15, 2019.

2. The Contractor certifies that he has sufficient materiel and human resources allocated or available to deliver the Requirement and that the above work period provides an adequate period to perform the work required to deliver the Requirement.

#### **7.4.2 Option to extend**

The Contractor grants to Canada the irrevocable option to extend the term of the Contract by up to five (5) additional one (1) year period(s) under the same conditions. The Contractor agrees that, during the extended period of the Contract, it will be paid in accordance with the applicable provisions as set out in the Basis of Payment.

Canada may exercise these options at any time by sending a written notice to the Contractor at least 30 calendar days before the expiry date of the Contract. The options may only be exercised by the Contracting Authority, and will be evidenced for administrative purposes only, through a contract amendment.

### **7.5 Deliverables**

All deliverables must be delivered as requested in the SOW and the Contract.

### **7.6 Authorities**

#### **7.6.1 Contracting Authority**

The Contracting Authority for the contract is:

Rejean Giguere

Department of Public Works and Government Services Canada (PWGSC) acquisition Sector,

800, rue de La Gauchetière Ouest, bureau 7300  
Montreal, Quebec, H5A 1L6  
Email: [rejean.giguere@tpsqc-pwgsc.gc.ca](mailto:rejean.giguere@tpsqc-pwgsc.gc.ca)

The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

### **7.6.2 Technical Authority**

The Technical Authority for the Contract is: *(information will be provided at contract award)*.

The Technical Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Technical Authority; however the Technical Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

### **7.6.3 Inspection Authority – Same as Technical Authority**

The Inspection Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for the inspection of the Work and acceptance of the finished work. The Inspection Authority may be represented on-site by a designated inspector and any other Government of Canada Inspector who may from time to time be assigned in support of the designated inspector.

### **7.6.4 Contractor's Representative *(information will be provided at contract award)***

Name:

Title:

Company:

Address:

Telephone:

E-mail:

## **7.7 Payment**

### **7.7.1 Basis of Payment - Firm Price**

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid a firm price in accordance with the Basis of Payment in Annex C.

### **7.7.2 Limitation of Price**

Canada will not pay the Contractor for any design changes, modifications or interpretations of the

Work unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

### **7.7.3 Method of Payment - Milestone Payment**

Canada will make milestone payments not more frequently than once a month in accordance with the Schedule of Milestones for Payment, Appendix 1 to Annex C, if:

- (a) an accurate and complete claim for payment using PWGSC-TPSGC 1111, Claim for Progress Payment, and any other document required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
- (b) all the certificates appearing on form PWGSC-TPSGC 1111 have been signed by the respective authorized representatives;
- (c) all work associated with the milestone and as applicable any deliverable required has been completed and accepted by Canada.

### **7.7.4 SACC Manual Clauses**

H4500C - Lien - Section 427 of the Bank Act, 2010-01-11  
C2000C - Taxes - Foreign-based Contractor, 2007-11-30  
C0711C - Time Verification, 2008-05-12  
A9055C - Scrap and Waste Material, 2010-08-16  
A9047C - Title to Property - Vessel, 2008-05-12  
A9066C - Vessel - Access by Canada, 2008-05-12

## **7.8 Invoicing Instructions**

1. The Contractor must submit a claim for payment using form PWGSC-TPSGC 1111, Claim for Progress Payment. Each claim must show:
  - (a) all information required on form PWGSC-TPSGC 1111;
  - (b) all applicable information detailed under the section entitled "Invoice Submission" of the general conditions;
  - (c) the description and value of the milestone claimed as detailed in the Contract;
  - (d) quality assurance documentation when applicable and/or as requested by the Contracting Authority.
2. The Goods and Services Tax or Harmonized Sales Tax (GST/HST), as applicable, must be calculated on the total amount of the claim.
3. The Contractor must prepare and certify one original and one (1) copy of the claim on form PWGSC-TPSGC 1111, and forward it to the Contracting and Technical Authority identified under the section entitled "Authorities" of the Contract for appropriate certification after inspection and acceptance of the Work takes place.
4. The Contracting Authority will then forward the original of the claim to the Technical Authority for

certification and onward submission to the Payment Office for the remaining certification and payment action.

5. The Contractor must not submit claims until all work identified in the claim is completed.

## **7.9 Certifications**

### **7.9.1 Compliance**

Compliance with the certifications and related documentation provided by the Contractor in its bid is a condition of the Contract and subject to verification by Canada during the term of the Contract. If the Contractor does not comply with any certification, provide the related documentation or if it is determined that any certification made by the Contractor in its bid is untrue, whether made knowingly or unknowingly, Canada has the right, pursuant to the default provision of the Contract, to terminate the Contract for default.

### **7.10 Applicable Laws**

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in the Province of Newfoundland.

### **7.11 Priority of Documents**

If there is a discrepancy between the wordings of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list:

- (a) The Articles of Agreement;
- (b) The General Conditions 2040, (2015-09-03), Research and Development;
- (c) The Supplemental General Conditions 1029, (2010-08-16), Ship Repairs;
- (d) Annex A, Statement of Work (SOW);
- (e) Annex C, Basis of payment;
- (f) Appendix 1 to Annex C, Schedule of Milestones for Payment;
- (g) Other Annexes;
- (h) The contractor's proposal dated:

### **7.12 Insurance Requirements**

The Contractor must comply with the insurance requirements specified in Annex E. The Contractor must maintain the required insurance coverage for the duration of the Contract. Compliance with the insurance requirements does not release the Contractor from or reduce its liability under the Contract.

The Contractor is responsible for deciding if additional insurance coverage is necessary to fulfill its obligation under the Contract and to ensure compliance with any applicable law. Any additional insurance coverage is at the Contractor's expense, and for its own benefit and protection.

The Contractor must forward to the Contracting Authority, **before Contract award**, a Certificate of

Insurance evidencing the insurance coverage and confirming that the insurance policy complying with the requirements is in force. Coverage must be placed with an Insurer licensed to carry out business in Canada. The Contractor must, if requested by the Contracting Authority, forward to Canada a certified true copy of all applicable insurance policies.

## **7.13 Financial Security**

### **7.13.1 Term of Financial Security**

Any bond, bill of exchange, letter of credit or other security provided by the Contractor to Canada in accordance with the terms of the Contract must not expire before 90 days after the end of the Warranty Period indicated in the Contract.

The Contracting Authority may, at its sole discretion, require an extension to the period of the security, for which the Contractor may apply for financial compensation.

The Contracting Authority may, at its sole discretion, return the security to the Contractor before the expiration, provided however that no risk will accrue to Canada as a result of this.

### **7.13.2 Contract Financial Security**

- 7.13.2.1 The Contractor must provide the Contracting Authority with financial security before contract award. The financial security must be in the form of a security deposit as defined in clause 6.2, in the amount of **ten (10) percent of the Contract price, applicable taxes not included.**
- 7.13.2.2 If, for any reason, Canada does not receive the security deposit in the amount set out above within the specified period, the Contractor will be in default. Canada may, at its discretion, terminate the Contract for default pursuant to the Contract default provision.
- 7.13.2.3 If the security deposit is in the form of government guaranteed bonds with coupons, all coupons that are unmatured at the time the security deposit is provided must be attached to the bonds. The Contractor must provide written instructions concerning the action to be taken with respect to coupons that will mature while the bonds are pledged as security, when such coupons are in excess of the security deposit requirement.
- 7.13.2.4 If the security deposit is in the form of a bill of exchange, Canada will deposit the bill of exchange in an open account in the Consolidated Revenue Fund. Bills of exchange that are deposited to the credit of the Consolidated Revenue Fund will bear simple interest, calculated on the basis of the rates which are in effect during the period the deposit is held.

These rates are published monthly by the Department of Finance and are set to be equal to the average yield on 90-day Treasury Bills, less 1/8 of 1 percent. Interest will be paid annually or, when the security deposit is returned to the Contractor, if earlier. The Contractor may, however, request Canada to hold and not cash the bill of exchange, in which case no interest will become payable.

7.13.2.5 Canada may convert the security deposit to the use of Canada if any circumstance exists which would entitle Canada to terminate the Contract for default, but any such conversion will not constitute termination of the Contract.

7.13.2.6 When Canada so converts the security deposit:

- a. the proceeds will be used by Canada to complete the Work according to the conditions of the Contract, to the nearest extent that it is feasible to do so and any balance left will be returned to the Contractor on completion of the warranty period; and
- b. if Canada enters into a contract to have the Work completed, the Contractor will:
  - i. be considered to have irrevocably abandoned the Work; and
  - ii. remain liable for the excess cost of completing the Work if the amount of the security deposit is not sufficient for such purpose. "Excess cost" means any amount over and above the amount of the Contract Price remaining unpaid together with the amount of the security deposit.

7.13.2.7 If Canada does not convert the security deposit to the use of Canada before completion of the entire contract period, including any extension and warranty period, Canada will return the security deposit to the Contractor within a reasonable time after such date.

7.13.2.8 If Canada converts the security deposit for reasons other than bankruptcy, the financial security must be re-established to the level of the amount stated above so that this amount is continued and available until completion of the entire contract period, including any extension and warranty period.

7.13.2.9 Security Deposit Definition

1. In this Article, "security deposit" means
  - a. a bill of exchange that is payable to the Receiver General for Canada and certified by an approved financial institution or drawn by an approved financial institution on itself; or
  - b. a government guaranteed bond; or
  - c. an irrevocable standby letter of credit, or
  - d. such other security as may be considered appropriate by the Contracting Authority and approved by Treasury Board;
2. "approved financial institution" means
  - a. any corporation or institution that is a member of the Canadian Payments Association;

- b. a corporation that accepts deposits that are insured by the Canada Deposit Insurance Corporation or the Régie de l'assurance-dépôts du Québec to the maximum permitted by law;
  - c. a credit union as defined in paragraph 137(6) of the Income Tax Act;
  - d. a corporation that accepts deposits from the public, if repayment of the deposits is guaranteed by a Canadian province or territory; or
  - e. the Canada Post Corporation.
3. "government guaranteed bond" means a bond of the Government of Canada or a bond unconditionally guaranteed as to principal and interest by the Government of Canada that is:
- a. payable to bearer;
  - b. accompanied by a duly executed instrument of transfer of the bond to the Receiver General for Canada in accordance with the Domestic Bonds of Canada Regulations;
  - c. registered in the name of the Receiver General for Canada.
4. "irrevocable standby letter of credit"
- a. means any arrangement, however named or described, whereby a financial institution (the "Issuer"), acting at the request and on the instructions of a customer (the "Applicant"), or on its behalf,
    - i. will make a payment to or to the order of Canada, as the beneficiary;
    - ii. will accept and pay bills of exchange drawn by Canada;
    - iii. authorizes another financial institution to effect such payment, or accept and pay such bills of exchange; or
    - iv. authorizes another financial institution to negotiate, against written demand(s) for payment, provided that the conditions of the letter of credit are complied with.
  - b. must state the face amount which may be drawn against it;
  - c. must state its expiry date;
  - d. must provide for sight payment to the Receiver General for Canada by way of the financial institution's draft against presentation of a written demand for payment signed by the authorized departmental representative identified in the letter of credit by hisher

office;

- e. must provide that more than one written demand for payment may be presented subject to the sum of those demands not exceeding the face amount of the letter of credit;
- f. must provide that it is subject to the International Chamber of Commerce (ICC) Uniform Customs and Practice (UCP) for Documentary Credits, 2007 Revision, ICC Publication No. 600. Pursuant to the ICC UCP, a credit is irrevocable even if there is no indication to that effect; and
- g. must be issued (Issuer) or confirmed (Confirmer), in either official language, by a financial institution that is a member of the Canadian Payments Association and is on the letterhead of the Issuer or Confirmer. The format is left to the discretion of the Issuer or Confirmer.

#### **7.14 Limitation of Contractor's Liability for Damages to Canada**

- 7.14.1 This section applies despite any other provision of the Contract and replaces the section of the general conditions entitled "Liability". Any reference in this section to damages caused by the Contractor also includes damages caused by its employees, as well as its subcontractors, agents, and representatives, and any of their employees.
- 7.14.2 Whether the claim is based in contract, tort (including negligence), or another cause of action, the Contractor's liability for all damages suffered by Canada caused by the Contractor's performance of or failure to perform the Contract is limited to \$10 million per incident or occurrence to an annual aggregate of \$20 million for losses or damage caused in any one year of carrying out the Contract, each year starting on the date of coming into force of the Contract or its anniversary. This limitation of the Contractor's liability does not apply to:
  - a) any infringement of intellectual property rights;
  - b) any breach of warranty obligations; or
  - c) any liability of Canada to a third party arising from any act or omission of the Contractor in performing the Contract.
- 7.14.3 Each Party agrees that it is fully liable for any damages that it causes to any third party in connection with the Contract, regardless of whether the third party makes its claim against Canada or the Contractor. If Canada is required, as a result of joint and several liability, to pay a third party in respect of damages caused by the Contractor, the Contractor must reimburse Canada for that amount.
- 7.14.4 The Parties agree that nothing herein is intended to limit any insurable interest of the Contractor nor to limit the amounts otherwise recoverable under any insurance policy. The Parties agree that to the extent that the insurance coverage required to be

maintained by the Contractor under this Contract or any additional insurance coverage maintained by the Contractor, whichever is greater, is more than the limitations of liability described in sub article (7.14.2), the limitations provided herein are increased accordingly and the Contractor shall be liable for the higher amount to the full extent of the insurance proceeds recovered.

- 7.14.5 If, at any time, the total cumulative liability of the Contractor for losses or damage suffered by Canada caused by the Contractor's performance of or failure to perform the Contract, excluding liability described under subsection 7.14.2(a), (b), and (c) exceeds \$40 million, either Party may terminate the Contract by giving notice in writing to the other Party and neither Party will make any claim against the other for damages, costs, expected profits or any other such loss arising out of the termination, but no such termination or expiry of the Contract shall reduce or terminate any of the liabilities that have accrued to the effective date of the termination.
- 7.14.6 The date of termination pursuant to this Article, shall be the date specified by Canada in its notice to terminate, or, if the Contractor exercises the right to terminate, in a notice to the Contractor from Canada in response to the Contractor's notice to terminate. The date of termination shall be in Canada's discretion to a maximum of 12 months after service of the original notice to terminate served by either Party pursuant to sub article 7.14.5, above.
- 7.14.7 In the event of a termination under this Article, the Contract will automatically remain in force subject to all of the same terms and conditions until the date of termination and the Contractor agrees that it will be paid in accordance with the applicable provisions as set out in the Basis of Payment, Annex B and that the Contractor's liability remains as specified in subarticles (7.14.1) through (7.14.4), above.
- 7.14.8 Nothing shall limit Canada's other remedies, including Canada's right to terminate the Contract for default for breach by the Contractor of any of its obligations under this Contract, notwithstanding that the Contractor may have reached any limitation of its liability hereunder.

## **7.15 Project Schedule**

The project schedule must be delivered in accordance with the SOW.

The Contractor must revised the project schedule on an as required basis and submit to Canada for review and concurrence every month. If the revision is due to authorized unscheduled work, the revision must include the unscheduled work, all related schedule impact on the work and impact to the delivery date of the requirement should it be the case.

## **7.16 Post Contract Award Meeting**

A Post Contract Award Meeting will be convened and chaired by the Contracting Authority at the Contractor's facility at a time to be determined. At the meeting the Contractor will introduce the project management personnel supported by an organization chart, and Canada will introduce the Authorities of the Contract. A review of the term and conditions of the Contract will be conducted by

the Contracting Authority.

The Contractor's costs of holding a Post Contract Award Meeting must be included in the price of the bid. Travel and living expenses for Government Personnel will be arranged and paid for by the Canada.

#### **7.17 Progress Report**

1. The Contractor must submit monthly reports on the progress of the Work in an electronic format to the Technical Authority and to the Contracting Authority.
2. The progress report must contain two (2) Parts:
  - (a) PART 1: The Contractor must answer the following three questions:
    - i. is the project schedule being impacted and if impacted why ?
    - ii. is the project delivery date being impacted and if impacted why ?
    - iii. is the project within budget ?
    - iv. is the project free of any areas of concern in which the assistance or guidance of Canada may be required ?

- (b) PART 2: A narrative report, brief, yet sufficiently detailed to enable the Technical Authority to evaluate the progress of the Work, containing as a minimum:

a description of the progress of each task and of the Work as a whole during the period of the report. Sufficient sketches, diagrams, photographs, etc., must be included, if necessary, to describe the progress accomplished.

#### **7.18 Subcontractor(s)**

The Contracting Authority shall be notified, in writing, of any subcontractors the contractor may require to perform the Work as well as any changes that may occur during the period of the contract. When the Contractor subcontracts work, a copy of the subcontract purchase order is to be passed to the Contracting Authority. In addition, the Contractor must monitor progress of subcontracted work and inform the Inspection Authority on pertinent stages of work to permit inspection when considered necessary by the Inspection Authority.

#### **7.19 Insulation Materials - Asbestos Free**

All materials used to insulate or re-insulate any surfaces on board the vessel must meet Transport Canada Marine standards, for commercial marine work, and, for all work, be free from asbestos in any form. The Contractor must ensure that all machinery and equipment located below or adjacent to surfaces to be re-insulated are adequately covered and protected before removing existing insulation.

## **7.20 SACC Manual Clauses**

B9035C - Progress Meetings, 2008-05-12

B5007C - Procedures for Design Change or Additional Work, 2010-01-11

D3015C - Dangerous Goods/Hazardous Products, 2014-09-25

A0285C - Workers Compensation, 2007-05-25

## **7.21 Trade Qualifications**

The Contractor must use qualified, certificated (if applicable) and competent tradespeople and supervision to ensure a uniform high level of workmanship. The Technical Authority may request to view and record details of the certification and/or qualifications held by the Contractor's tradespeople. This request should not be unduly exercised but only to ensure qualified tradespeople are on the job.

## **7.22 Welding Certification**

1. The Contractor must ensure that welding is performed by a welder certified by the Canadian Welding Bureau (CWB) in accordance with the requirements of the following Canadian Standards Association (CSA) standards:

CSA W47.1-09 (R2014) Certification for Companies for Fusion Welding of Steel  
(Minimum Division Level 2.1)

2. In addition, welding must be done in accordance with the requirements of the applicable drawings and specifications.
3. Before the commencement of any fabrication work, and upon request from the Technical Authority, the Contractor must provide approved welding procedures and/or a list of welding personnel intended to be used in the completion of the work. The list must identify the CWB welding procedure qualifications attained by each of the personnel listed and must be accompanied by a copy of each person's current CWB welding certification.

## **7.23 Permits, Licenses and Certificates**

The Contractor must obtain and maintain all permits, licenses and certificates of approval required for the work to be performed under any applicable federal, provincial or municipal legislation. The Contractor is responsible for any charges imposed by such legislation or regulations. Upon request, the Contractor must provide a copy of any such permit, license or certificate to Canada.

## **7.24 ISO 9001:2008 - Quality Management Systems**

In the performance of the Work described in the Contract, the Contractor must comply with the requirements of:

ISO 9001:2008 - Quality management systems - Requirements, published by the International Organization for Standardization (ISO), current edition at date of submission of Contractor's bid. The

Contractor's quality management system must address each requirement contained in the standard; however, the Contractor is not required to be registered to the applicable standard.

### **7.25 Dispute Resolution**

The parties agree to follow the procedures below for the settlement of any disputes which may arise throughout the life of this Contract prior to seeking redress through court procedures:

- (a) Disputes arising from this Contract will in the first instance be resolved by the Contracting Authority and the Contractor's Contract Administrator within 15 working days or such additional time as may be agreed to by both parties.
- (b) Failing resolution under (a) above, the Manager of the Montreal Procurement Division at PWGSC and the Contractor's Representative Supervisor will attempt to resolve the dispute within an additional fifteen (15) working days.
- (c) Failing resolution under (a) or (b) above, the Director of the Montreal Procurement Division at PWGSC, and the Contractor's Senior Management will attempt to resolve the dispute within an additional thirty (30) working days.
- (d) Notwithstanding the above procedure, either party may seek a decision through the courts at any time during the dispute.

### **7.26 Discretionary Audit**

The Contractor's certification that the price or rate is not in excess of the lowest price or rate charged anyone else, including the Contractor's most favored customer, for the like quality and quantity of the goods, services or both, is subject to verification by government audit, at the discretion of Canada, before or after payment is made to the Contractor.

If the audit demonstrates that the certification is in error after payment is made to the Contractor, the Contractor must, at the discretion of Canada, make repayment to Canada in the amount found to be in excess of the lowest price or rate or authorize the retention by Canada of that amount by way of deduction from any sum of money that may be due or payable to the Contractor pursuant to the Contract.

If the audit demonstrates that the certification is in error before payment is made, the Contractor agrees that any pending invoice will be adjusted by Canada in accordance with the results of the audit. It is further agreed that if the Contract is still in effect at the time of the verification, the price or rate will be lowered in accordance with the results of the audit.

### **7.27 Failure to Deliver**

Time is of the essence of the Contract. Changes in the Completion date not caused by Canada are Contractor defaults, will prejudice Canada and are at the Contractor's expense. The Completion date will not be extended without consideration being provided by the Contractor acceptable to Canada in the form of adjustment to the price, warranty or services to be provided.

## **ANNEX A – STATEMENT OF WORK**

AS PER ATTACHED PDF DOCUMENT.

**ANNEX C - BASIS OF PAYMENT - FIRM PRICE**

Annex C will form the Basis of Payment for the resulting Contract and must not be filled in at the bid submission stage. Prices given in Annex D will be transferred to Annex C and will be part of the resulting contract.

**C1 Contract Firm Price, in Canadian dollars, applicable taxes not included:**

For the execution of work set out in Annex A (SOW):

Contract firm price for the CCGS Henry Larsen	Amount
<b>TOTAL :</b>	<b>\$</b>

**C2 Rates for unscheduled work, in Canadian dollars, applicable taxes not included:**

The Contractor will be paid for unscheduled work on an as and when required basis, as authorized by Canada and as per Annex G, Procedure for Processing Unscheduled Work:

a)	For Engineering work, firm hourly rate:	\$
b)	For Other Related work, firm hourly rate:	\$
c)	For welding work, firm hourly rate:	\$

**Prorated Prices for unscheduled work:**

Hours and prices for unscheduled work shall be based on comparable historical data applicable to similar work at the same facility, or shall be determined by prorating the quoted Work costs in the Contract when in similar areas of the vessel.

**Overtime**

There will be no overtime payment for Known Work. Any request for payment must be accompanied by a copy of the overtime authorization and a report containing the overtime performed pursuant to the written authorization.

**APPENDIX 1 TO ANNEX C – SCHEDULE OF MILESTONES FOR PAYMENT**

#	DELIVERABLES:	% paid of the total contract amount, applicable taxes not included
P1	<b>Preliminary design survey completed :</b> <ul style="list-style-type: none"> <li>• Assessment of the current propulsion system. Sea trials and production of a report on ship's characteristics and performance;</li> <li>• Presentation of the Preliminary Design Package (PDP);</li> <li>• Review of the PDP by Canada.</li> </ul>	5 %
P2	<b>100 % of design work completed :</b> <ul style="list-style-type: none"> <li>• Delivery of all drawings and other design or installation documents;</li> <li>• Programming data details (PLC);</li> <li>• Review and approval by Canada;</li> <li>• Review by the Classification Society.</li> </ul>	10 %
P3	<b>Purchase / preparation of equipments completed :</b> <ul style="list-style-type: none"> <li>• Purchase of all required equipments and components;</li> <li>• Pre-assembly of the equipment at factory;</li> <li>• Proposal of a spare parts list.</li> </ul>	15 %
P4	<b>Factory Acceptance Tests (FAT) completed :</b> <ul style="list-style-type: none"> <li>• Functionnal proof of the entire system;</li> <li>• Approval by Canada;</li> <li>• Approval by the Classification Society.</li> </ul>	15 %
P5	<b>Installation work completed :</b> <ul style="list-style-type: none"> <li>• Removal of equipment and cabling that is no longer useful;</li> <li>• Test report on conserved cables;</li> <li>• Passage of the new cables;</li> <li>• Installation and connection of all equipments;</li> <li>• Adjustment, programming and calibration of all equipments;</li> <li>• Operation of the equipments and individual protections checked;</li> <li>• Delivery of spare parts</li> <li>• Approval by Canada.</li> </ul>	20 %
P6	<b>Ship's commissioning completed :</b> <ul style="list-style-type: none"> <li>• Dock/sea trials;</li> <li>• Fine tuning of the entire system and bugs fix;</li> <li>• Production of a report on the ship's performance;</li> <li>• Final approval by Canada;</li> <li>• Approval by the Classification Society and Transport Canada.</li> </ul>	20 %
P7	<b>Training and Final Documentation completed :</b> <ul style="list-style-type: none"> <li>• Delivery of the final version of the drawings;</li> <li>• Delivery of all technical manuals;</li> <li>• Training of the CCG personnel.</li> </ul>	10 %
P8	<b>Final payment at the end of the warranty period</b>	5%

**ANNEX D - FINANCIAL BID PRESENTATION**

**D1 Contract Firm Price, in Canadian dollars, applicable taxes not included, for evaluation purpose:**

For the work specified in Annex A (SOW):

Contract firm price for the CCGS Henry Larsen	Amount
<b>TOTAL :</b>	<b>\$</b>

**2 Rates for unscheduled work, in Canadian Dollars, applicable taxes not included:**

The Contractor will be paid for unscheduled work on an as and when required basis, as authorized by Canada and as per Annex G, Procedure for Processing Unscheduled Work:

a)	For Engineering work, firm hourly rate:	\$
b)	For Other Related work, firm hourly rate:	\$
c)	For welding work, firm hourly rate:	\$

**Prorated Prices Unscheduled Work**

Hours and prices for unscheduled work shall be based on comparable historical data applicable to similar work at the same facility, or shall be determined by prorating the quoted Work costs in the Contract when in similar areas of the vessel.

**Overtime**

There will be no overtime payment for Known Work. Any request for payment must be accompanied by a copy of the overtime authorization and a report containing the overtime performed pursuant to the written authorization.

## ANNEX E - INSURANCE REQUIREMENTS

### E1 Ship Repairers' Liability Insurance

1. The Contractor must obtain Ship Repairer's Liability Insurance and maintain it in force throughout the duration of the Contract, in an amount usual for a contract of this nature, but for not less than \$10,000,000 per accident or occurrence and not less than \$20,000,000 in the annual aggregate.
2. The Ship Repairer's Liability insurance must include the following:
  - a. Additional Insureds: Canada is added as an additional insured, but only with respect to liability arising out of the Contractor's performance of the Contract. The interest of Canada as additional insured should read as follows: Canada, represented by Public Works and Government Services Canada.
  - b. Waiver of Subrogation Rights: Contractor's Insurer to waive all rights of subrogation against Canada as represented by Environment Canada and Public Works and Government Services Canada for any and all loss of or damage to the vessel, however caused.
  - c. Notice of Cancellation: The Insurer will endeavor to provide the Contracting Authority thirty (30) days written notice of cancellation.
  - d. Contractual Liability: The policy must, on a blanket basis or by specific reference to the Contract, extend to assumed liabilities with respect to contractual provisions.
  - e. Cross Liability/Separation of Insured: Without increasing the limit of liability, the policy must protect all insured parties to the full extent of coverage provided. Further, the policy must apply to each Insured in the same manner and to the same extent as if a separate policy had been issued to each.

### E2 Commercial General Liability Insurance

1. The Contractor must obtain Commercial General Liability Insurance, and maintain it in force throughout the duration of the Contract, in an amount usual for a contract of this nature, but for not less than \$10,000,000 per accident or occurrence and not less than \$20,000,000 in the annual aggregate.
2. The Commercial General Liability Insurance policy must include the following:
  - (a) Additional Insureds: Canada is added as an additional insured, but only with respect to liability arising out of the Contractor's performance of the Contract. The interest of Canada should read as follows: Canada, as represented by Public Works and Government Services Canada.
  - (b) Bodily Injury and Property Damage to third parties arising out of the operations of the Contractor.

- (c) Products and Completed Operations: Coverage for bodily injury or property damage arising out of goods or products manufactured, sold, handled, or distributed by the Contractor and/or arising out of operations that have been completed by the Contractor.
- (d) Personal Injury: While not limited to, the coverage must include Violation of Privacy, Libel and Slander, False Arrest, Detention or Imprisonment and Defamation of Character.
- (e) Cross Liability/Separation of Insureds: Without increasing the limit of liability, the policy must protect all insured parties to the full extent of coverage provided. Further, the policy must apply to each Insured in the same manner and to the same extent as if a separate policy had been issued to each.
- (f) Blanket Contractual Liability: The policy must, on a blanket basis or by specific reference to the Contract, extend to assumed liabilities with respect to contractual provisions.
- (g) Employees and, if applicable, Volunteers must be included as Additional Insured.
- (h) Employers' Liability (or confirmation that all employees are covered by Worker's compensation (WSIB) or similar program)
- (i) Broad Form Property Damage including Completed Operations: Expands the Property Damage coverage to include certain losses that would otherwise be excluded by the standard care, custody or control exclusion found in a standard policy.
- (j) Notice of Cancellation: The Insurer will endeavour to provide the Contracting Authority thirty (30) days written notice of policy cancellation.
- (k) If the policy is written on a claims-made basis, coverage must be in place for a period of at least 12 months after the completion or termination of the Contract.
- (l) Owners' or Contractors' Protective Liability: Covers the damages that the Contractor becomes legally obligated to pay arising out of the operations of a subcontractor.
- (m) Non-Owned Automobile Liability - Coverage for suits against the Contractor resulting from the use of hired or non-owned vehicles.
- (n) Advertising Injury: While not limited to, the endorsement must include coverage piracy or misappropriation of ideas, or infringement of copyright, trademark, title or slogan.
- (o) All Risks Tenants Legal Liability - to protect the Contractor for liabilities arising out of its occupancy of leased premises.
- (p) Amendment to the Watercraft Exclusion to extend to incidental repair operations on board watercraft.
- (q) Sudden and Accidental Pollution Liability (minimum 120 hours): To protect the

Contractor for liabilities arising from damages caused by accidental pollution incidents.

- (r) **Litigation Rights:** Pursuant to subsection 5(d) of the Department of Justice Act, S.C. 1993, c. J-2, s.1, if a suit is instituted for or against Canada which the Insurer would, but for this clause, have the right to pursue or defend on behalf of Canada as an Additional Named Insured under the insurance policy, the Insurer must promptly contact the Attorney General of Canada to agree on the legal strategies by sending a letter, by registered mail or by courier, with an acknowledgement of receipt.

For the province of Quebec, send to:

Director Business Law Directorate,  
Quebec Regional Office (Ottawa),  
Department of Justice,  
284 Wellington Street, Room SAT-6042,  
Ottawa, Ontario, K1A 0H8

For other provinces and territories, send to:

Senior General Counsel,  
Civil Litigation Section, Department of Justice  
234 Wellington Street, East Tower  
Ottawa, Ontario K1A 0H8

A copy of the letter must be sent to the Contracting Authority. Canada reserves the right to co-defend any action brought against Canada. All expenses incurred by Canada to co-defend such actions will be at Canada's expense. If Canada decides to co-defend any action brought against it, and Canada does not agree to a proposed settlement agreed to by the Contractor's insurer and the plaintiff(s) that would result in the settlement or dismissal of the action against Canada, then

Canada will be responsible to the Contractor's insurer for any difference between the proposed settlement amount and the amount finally awarded or paid to the plaintiffs (inclusive of costs and interest) on behalf of Canada.

### **E3 Errors and Omissions Liability Insurance**

The Contractor must obtain Errors and Omissions Liability (a.k.a. Professional Liability) insurance, and maintain it in force throughout the duration of the Contract, in an amount usual for a contract of this nature but for not less than \$1,000,000 per loss and in the annual aggregate, inclusive of defence costs.

If the policy is written on a claims-made basis, coverage must be in place for a period of at least 12 months after the completion or termination of the Contract.

The following endorsement must be included:

**Notice of Cancellation:** The Insurer will endeavour to provide the Contracting Authority thirty (30) days written notice of cancellation.

## ANNEX G - PROCEDURE FOR PROCESSING UNSCHEDULED WORK

### 1. Purpose

The Unscheduled Work Procedure has been instituted for the following purposes:

- a. To establish a uniform method of dealing with requests for Unscheduled Work;
- b. To obtain the necessary Technical Authority approval and Contracting Authority authorization before Unscheduled Work commences;
- c. To provide a means of maintaining a record of Unscheduled Work requirements including Serial Numbers, dates, and accumulated cost the Contractor shall have a cost accounting system that is capable of assigning job numbers for each Unscheduled Work requirement so that each requirement can be audited individually.

### 2. Definitions and Particulars

- a. An Unscheduled Work Procedure is a contractual procedure whereby changes to the scope of Work under the Contract may be defined, priced and contractually agreed to. Such changes may arise from;
  - i. "Work Arising" from opening up of machinery and/or surveys of equipment and material, or
  - ii. "New Work" not initially specified but required on the Vessel.
- b. The procedure does not allow for the correction of deficiencies in the Contractor's Proposal.
- c. No unscheduled work may be undertaken by the Contractor without written authorization of the Contracting Authority except under emergency circumstances described in Sub. Paragraph 3(b). Unscheduled Work.
- d. Work undertaken without written Contracting Authority authorization will be considered the Contractor's responsibility and cost.
- e. The appropriate PWGSC form is the final summary of the definition of the Unscheduled Work requirement, and the costs negotiated and agreed to.

### 3. Procedures

- a. The procedure involves the electronic form PWGSC-TPSGC 1379 (10/2011) for refit and repair and will be the only form for authorizing all Unscheduled Work.
- b. Emergency measures required to prevent loss or damage to the Vessel which would occur if this procedure were followed, shall be taken by the Contractor on its own authority. The responsibility for the cost of such measures shall be determined in accordance with the terms

and conditions of the Contract.

- c. The Technical Authority will initiate a work estimate request by defining the Unscheduled Work requirement. It will attach drawings, sketches, additional specifications, other clarifying details as appropriate, and allocate their Serial Number for the request.
- d. Notwithstanding the foregoing, the Contractor may propose to the Technical Authority in writing, either by letter or some type of Defect Advice Form (this is the Contractor's own form) that certain Unscheduled Work should be carried out.
- e. The Technical Authority will either reject or accept such Proposal, and advise the Contractor and Contracting Authority. Acceptance of the Proposal is not to be construed as authorization for the work to proceed. If required, the Technical Authority will then define the Unscheduled Work requirement in accordance with Sub. Paragraph 3.(c).
- f. The Contractor will electronically submit its Proposal to the Contracting Authority together with all price support, any qualifications, remarks or other information requested.

The price support shall demonstrate the relationship between the scope of work, the Contractor's estimated costs and its selling price. It is a breakdown of the Contractor's unit rates, estimates of person hours by trade, estimate of material cost per item, for both the contractor and all of its subcontractors, estimates of any related impact and an evaluation of the contractor's time required to perform the Unscheduled Work.

- g. The Contractor shall provide copies of purchase orders and paid invoices for Subcontracts and/or materials, including stocked items, in either case. The Contractor shall provide a minimum of two quotations for Subcontracts or materials. If other than the lowest, or sole source is being recommended for quality and/or delivery considerations, this shall be noted. On request to the Contractor, the Contracting Authority shall be permitted, to meet with any proposed Subcontractor or material supplier for discussion of the price and always with the Contractor's representative present.
- h. After discussion between the Contracting Authority and the Contractor and if no negotiation is required, the Contracting Authority will seek Technical Authority confirmation to proceed by signing the form. The Contracting Authority will then sign and authorize the Unscheduled Work to proceed.
- i. In the event the Technical Authority does not wish to proceed with the work, it will cancel the proposed Unscheduled Work through the Contracting Authority in writing.
- j. In the event the negotiation involves a Credit, the appropriate PWGSC form will be noted as "credit" accordingly.
- k. In the event that the Technical Authority requires Unscheduled Work of an urgent nature or an impasse has occurred in negotiations, the commencement of the Unscheduled Work should not be unduly delayed and should be processed as follows, in either case. The Contractor will complete the appropriate PWGSC 1379 form indicating the offered cost and pass it to the Contracting Authority. If the Technical Authority wishes to proceed, the Technical Authority and the Contracting Authority will sign the completed PWGSC form with

the notation, "CEILING PRICE SUBJECT TO DOWNWARD ADJUSTMENT", and allocate a Serial Number having the suffix "A". The work will proceed with the understanding that following an audit of the Contractor's actual costs for completing the described work, the cost will be finalized at the ceiling price or lower, if justified by the audit. A new PWGSC form will then be completed with the finalized costs, signed and issued with the same Serial Number without the suffix "A", and bearing a notation that this form is replacing and cancelling the form having the same Serial Number with the suffix "A".

NOTE: PWGSC forms bearing Serial Numbers with a suffix "A" shall not to be included in any contract amendments, and therefore no payment shall be made until final resolution of the price and incorporation into the contract.

4. Amendment to Contract or Formal Agreement.

The Contract will be amended from time to time in accordance with the Contract terms to incorporate the costs authorized on the appropriate PWGSC forms.

**ANNEX J – CLASSIFICATION SOCIETY CERTIFICATION FORM**

This confirms that the bidder has entered into an agreement with the classification society identified below to complete the work as required in Annex A, SOW:

Name of classification society \_\_\_\_\_

Signature of authorized signatory of classification society \_\_\_\_\_

Name of authorized signatory of classification society \_\_\_\_\_

Title of authorized signatory of classification society \_\_\_\_\_

Address for authorized signatory of classification society \_\_\_\_\_

Telephone no. for authorized signatory of classification society \_\_\_\_\_

Name of Bidder \_\_\_\_\_

Date signed \_\_\_\_\_

## ANNEX K - FEDERAL CONTRACTORS PROGRAM FOR EMPLOYMENT EQUITY – BID CERTIFICATION

I, the Bidder, by submitting the present information to the Contracting Authority, certify that the information provided is true as of the date indicated below. The certifications provided to Canada are subject to verification at all times. I understand that Canada will declare a bid non-responsive, or will declare a contractor in default, if a certification is found to be untrue, whether during the bid evaluation period or during the contract period. Canada will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply with such request by Canada will also render the bid non-responsive or will constitute a default under the Contract.

For further information on the Federal Contractors Program for Employment Equity, visit HRSDC-Labour's website.

Date: \_\_\_\_\_

(YYYY/MM/DD)

If left blank, the date will be deemed to be the bid solicitation closing date

Complete both A and B.

A. Check only one of the following:

- ( ) A1. The Bidder certifies having no work force in Canada.
  - ( ) A2. The Bidder certifies being a public sector employer.
  - ( ) A3. The Bidder certifies being a federally regulated employer being subject to the Employment Equity Act.
  - ( ) A4. The Bidder certifies having a combined work force in Canada of less than 100 employees (combined work force includes: permanent full-time, permanent part-time and temporary employees [temporary employees only includes those who have worked 12 weeks or more during a calendar year and who are not full-time students]).
  - A5. The Bidder has a combined workforce in Canada of 100 or more employees; and
    - ( ) A5.1. The Bidder certifies already having a valid and current Agreement to Implement Employment Equity (AIEE) in place with HRSDC-Labour.
- OR**
- ( ) A5.2. The Bidder certifies having submitted the Agreement to Implement Employment Equity (LAB1168) to HRSDC-Labour. As this is a condition to contract award, proceed to completing the form Agreement to Implement Employment Equity (LAB1168), duly signing it, and transmit it to HRSDC-Labour.

B. Check only one of the following:

B1. The Bidder is not a Joint Venture.

**OR**

B2. The Bidder is a Joint venture and each member of the Joint Venture must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification. (Refer to the Joint Venture section of the Standard Instructions)

**ANNEX L - DIRECTORS/OWNERS OF THE BIDDER (Code of Conduct)**

<b>NAME</b>	<b>TITLE</b>

## ANNEX M – MANDATORY PROPOSAL DELIVERABLES CHECKLIST

Notwithstanding deliverable requirements specified within the bid solicitation and its associated Technical Specification (Annex A), mandatory deliverables that must be submitted with the Bidder's proposal to be deemed responsive are summarized below.

The Bidder must submit a completed Annex "M" Deliverables/ Certifications.

The following are mandatory and the Bidder's submission will be evaluated against the requirements as defined herein. The Bidder must be determined to be compliant on each item to be considered responsive.

Item	Description	Completed	Location in the bid
1	Request for Proposal document, page 1, completed and signed		
2	Annex J, Proposed Classification Society		
3	Annex D, Financial Bid Presentation Form		
4	Points Rated Technical Criteria, article 4.3		
5	Mandatory Technical Criteria, article 4.2		
6	Annex L, Directors/Owners of the Bidders (code of conduct), article 5.1.1		
7	Annex K, Federal Contractors Program for Employment Equity – article 5.1.2		
8	Annex N - Former Public Servant in Receipt of a Pension, article 5.1.5.2		
9	Annex O, Work Force Adjustment Directive, article 5.1.5.3		
10	Letter stating that the Bidder can be insured, article 6.3		
11	Statement for ISO 9001-2008, Article 4.2.10		

## ANNEX N – FORMER PUBLIC SERVANT (FPS) IN RECEIPT OF A PENSION

### 5.1.5.2 Former Public Servant in Receipt of a Pension

As per the above definitions, is the Bidder a FPS in receipt of a pension? **Yes ( ) No ( )**

If so, the Bidder must provide the following information, for all FPS in receipt of a pension, as applicable:

- (a) name of former public servant;
- (b) date of termination of employment or retirement from the Public Service.

By providing this information, Bidders agree that the successful Bidder's status, with respect to being a former public servant in receipt of a pension, will be reported on departmental websites as part of the published proactive disclosure reports in accordance with **Contracting Policy Notice:**

2012-2 and the Guidelines on the Proactive Disclosure of Contracts.

<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/A/A3025C/2>

## ANNEX O – WORK FORCE ADJUSTMENT DIRECTIVE

### 5.1.5.3 Work Force Adjustment Directive

Is the Bidder a FPS who received a lump sum payment pursuant to the terms of the Work Force Adjustment Directive? **Yes** ( ) **No** ( )

If so, the Bidder must provide the following information:

- (a) name of former public servant;
- (b) conditions of the lump sum payment incentive;
- (c) date of termination of Employment;
- (d) amount of lump sum payment;
- (e) rate of pay on which lump sum payment is based;
- (f) period of lump sum payment including start date, end date and number of weeks;
- (g) number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is \$5,000, including Applicable Taxes.

# **CCGS Henry Larsen Statement of Work**

## **Propulsion Upgrade**

Date: November 3rd, 2016

Prepared by Marine Engineering

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## 1 PROPULSION SYSTEM REPLACEMENT

### 1.1 Introduction

1.1.1 The intent of this document is to establish the requirements for the replacement of the 12 pulse reversing Cycloconverter, Telegraph system, Voltage regulation system and associated controls and wiring on board the CCGS Henry Larsen. The vessel is based out of St John's , Newfoundland and belongs to the Canadian Coast Guard (CCG) , a division of the Department of Fisheries and Oceans

1.1.2 The existing propulsion system on board the CCGS Henry Larsen was installed in 1987 and consists of the following main equipment as supplied by the OEM Canadian General Electric.(CGE) See [Figure 1](#) for basic block diagram

- 2 CGE Horizontal Synchronous Motors, Port and Stbd rated 8046HP, 1900Volt
- 3 CGE Horizontal Generators, Port Center, Stbd 5MW, 4160Volt, 60HZ
- 2 CGE Cycloconverters Port and Stbd C/W Air Cooling common to both CCV's
- 1 CGE Cycloconverter test panel
- 2 CGE Exciter Cubicles, Port and Stbd
- 2 PLC Propulsion Control Cubicles, Port and Stbd
- 1 CGE Spare Exciter Cubicle
- 4 CGE/Federal Pioneer Propulsion Transformers, T1, T2, T3 and T4 4160/1200Volt, 4270KVA
- Chadburn Blocktube electric telegraph system
- 3 Basler voltage regulation systems

1.1.3 The Port and Stbd Cycloconverters (CCV) main controls for this system consist of a MEM (medium size electronic module), 12 pulse power thyristors, exciters, telegraphs, voltage regulators, and outdated series 6 PLC controllers. The MEM is a one off system of which the Larsen's is the only unit in existence. The ship has one set of spares available to replace any upcoming problems but when these spares are utilized, the ship will be in the position of trying to source replacements.

1.1.4 See figure 1 for a basic block diagram of the connected system. The intent of this SOW is to identify the equipment to be replaced. The contractor will retain the existing propulsion generators, motors and transformers configured as is. All other equipment (see Section 3 - Equipment list to be removed) will be replaced to commercial off the shelf marine class certified equipment. This will include a new type approved 12 pulse reversing cyclo-converter with associated controls.

1.1.5 The anticipated install period should start on or about **October 15, 2018** and should not exceed 16 weeks duration. The install will take place alongside at the Canadian Coast Guard base at 280 Southside Road in St John's,

Newfoundland. The contractor must indicate in their bid package the maximum amount of time required to perform the upgrades.

**1.1.6 Classification Society and Transport Canada Requirements**

The original systems included in this contract were built to Lloyds Register standards. The function of classification society approvals within this contract is twofold;

- a) the class approvals and oversight will be used as the foundation to obtain the necessary Transport Canada plan approval for the modifications to the vessel
- b) the class approval of the systems allows for future delegated inspections to be completed by class societies. The following is a basic overview of the contractor's responsibilities for this contract:
- c) All equipment provided shall be type approved by the contractors designated class society . The contractor shall provide certificates to verify.
- d) The contractor shall be responsible for the TCMS plan approval for the telegraphs, Cycloconverter, and Generator Excitation control to achieve "plan approval", the contractor shall submit a design package to the Classification Society as defined in the mandatory requirement of the RFP, section 4.2.2, and request the design to be stamped approved by the chosen classification society.
- e) The contractor shall be responsible for submitting the classification reviewed design packages to Transport Canada for plan approval.
- f) CCG will pay for direct costs to TCMS for plan approval only once class approval is obtained. Preparation of plans by contractor or engineering firms will be the sole responsibility and cost of the contractor.

**1.2 Work schedule**

- 1.2.1 The contractor must include in their bid package the anticipated time frames required for each phase as defined in the RFP, section 4.2.8

## 2 VESSEL PARTICULARS

Name: Henry Larsen  
Type: Medium Duty Ice Breaker  
Ice Class: Arctic Class 4, Lloyd register X100A1 Ice Class 1A, Super X LMC  
Year Built: 1987  
Voyage Class: Unlimited, beyond 200NM  
Builder: Burrard Yarrows Corp, Vancouver, BC

### Principal Dimensions:

Length: 99.8 meters  
Breadth, molded: 19.51 meters  
Loaded Draft: 7.2 meters  
Tonnage, displ: 6,166.5 Tons

Propulsion: Diesel Electric AC/AC  
MV Bus: 4160Volt  
S/S Bus: 600Volt

### **3 EQUIPMENT LISTING TO BE REMOVED BY THE CONTRACTOR**

#### **3.1 Propulsion Motors**

- 3.1.1 Encoders, port and Stbd, BEI M25G-X-HSS-6144G-XD1-X-S-C14-S-5
- 3.1.2 High Voltage isolators , 3 per Propulsion motor, CGE 0517L0252G001
- 3.1.3 Propulsion Motor accessory Gear box Port and Stbd, CGE ENI 39261 G001
- 3.1.4 Propulsion motor tach feedback Port and Stbd, CGE 5BC46AB2082A tachogenerator, 200Vdc/1000Rpm
- 3.1.5 Rev counter , Port and Stbd, Henschel 14-100 Transmitter and counter
- 3.1.6 Type I Henschel 14-112 speed indicator and counter 200-0-200RPM, Port and Stbd
- 3.1.7 Associated wiring as defined in section 22

#### **3.2 Cycloconverter**

- 3.2.1 Port and Stbd Cycloconverters which includes cabinets
- 3.2.2 Port and Stbd Propulsion motor Exciter supply which includes cabinets
- 3.2.3 Propulsion motor spare Exciter which includes cabinet
- 3.2.4 Propulsion PLC controls, Port and Stbd , Series 6 PLC, which includes cabinets
- 3.2.5 All Power supplies for Cycloconverter
- 3.2.6 Propulsion Test Panel, for testing PLC and drive cards which includes cabinet
- 3.2.7 Engine control room RPM/rev counter, Port and Stbd 10-0-10v gauges with Rev counter, Chadburn B404
- 3.2.8 Bridge RPM Gauges illuminated , Port , Center, Stbd, 2 per station 10-0-10V gauges, Chadburn B403
- 3.2.9 Associated Gauges ( switchboard and MCR console, bridge console, Kw and current)
- 3.2.10 Associated wiring as defined in section 22

### **3.3 Telegraph System**

- 3.3.1 Engine control room Telegraph, Port and Stbd, Chadburn 016.007749.05 Issue D
- 3.3.2 Bridge Telegraph , Port , Center, Stbd, 2 per station, Chadburn 016.007749.05 Issue D
- 3.3.3 Controls stations at each telegraph, 4x including switches
- 3.3.4 Control transfer panel in ECR console
- 3.3.5 Telegraph Mechanical shafting located in void space
- 3.3.6 Associated wiring as defined in section 22

### **3.4 Main Engines/Generators**

- 3.4.1 Basler Voltage regulation 3x
- 3.4.2 Basler SR125H3 voltage regulator
- 3.4.3 Basler EL201 Excitation Limiter
- 3.4.4 Basler UFOV-260A Under Frequency/Over Voltage Module
- 3.4.5 Basler SBO-181 Excitation support module
- 3.4.6 Matching 4160 CT's , custom units matched to current boost module, Federal Pioneer Type MITB/4, Ratio 1200/5
- 3.4.7 Associated Guages/metering , voltage , current, KW and power factor.
- 3.4.8 Associated wiring as defined in section 22

### **3.5 EXISTING WIRING CONNECTIONS TO BE REMOVED**

- 3.5.1 All wiring as identified in section 22

#### 4 REFERENCES (BACKGROUND INFO OF EXISTING EQUIPMENT)

##### 4.1 Equipment Data

- 4.1.1 CGE Horizontal Synchronous Motor Part Number EN 139568, Serial # 1045148 and 1045149
- a) 8046 HP
  - b) 6170KVA
  - c) V/P/HZ (maximum) 1900/3/18 The speed varies directly with frequency as the motor accelerates from zero speed. The AC volts vary almost directly with the frequency up to 14.5 hertz or 145RPM, then remain constant to 18HZ, 145RPM. At 14.5 Hz, 145RMP, the cycloconverter AC volts is 1900.
  - d) Full Load amps 1875
  - e) Power factor 1.0
  - f) Speed 0-180 RPM in ahead and astern directions
  - g) Service factor 1.1 for 2 hours
  - h) Temp Rise Stator - 85 Degress celcius by RTD
  - i) Temp Rise Rotor – 85 Degrees celcius by resistance
  - j) Brushless Exciters EN-209015 Serial No 1045150 and 1045151 , 325Volts, 3 phase , 60. Exciter amps 146amps

- 4.1.2 CGE Horizontal Generator Part Number EN 139584, Serial # 1045142 to 1045144, Brushless Exciters EN-209017 Serial No 1045145 to 1045147 ,
- a) 5000KW
  - b) 5250KVA
  - c) 720RPM
  - d) 4160Volt, 3 phase, 60 Hz
  - e) 0.8 P.F
  - f) 867 amps rated, 954 for 10% overload
  - g) Special data reactance and time constants
    - o  $X_d$  1.67,  $X'_d$  0.267,  $X_d(\text{sat})$  0.240,  $X''_d$  0.125,  $x''_d(\text{sat})$  0.119
    - o  $X_q$  0.917,  $x''_q$  0.148,  $X'_q(\text{sat})$  0.141,  $X_o$  0.061,  $X_2$  0.136, SCR 0.75
    - o  $T'_{do}$  6.63 sec,  $T'_d$  1.06 sec,  $T''_d$  0.014 sec,  $Tao$  0.08 sec
  - h) 90 Degree C temperature rise by resistance after 10% overload for 2 hours
    - o Exciter data
      - 5.3 amps at rated voltage with 9.4 Ohms at 25Degrees celcius
      - 68 Rated Excitation Volts, with 180 ceiling voltage
      - 1.6 Amp minimum field amps
      - 15Volt minimum field volts cold
      - 5.7 amps Overload field amps
      - 73 Volt overload field volts Hot

FPE instruction manual C-7-360-1 Dry type transformers 4270KVA at 4160 Primary, LV 3 x 1675KVA at 1200V . Serial/Instruction Manual T911294-1, T911294-2 Y connected, T911295-1 and T911195-2 Delta connected

Chadburn Telegraph Instruction manual PGEE-11639

## 4.2 Drawings

4.2.1 All drawings shall be provided in pdf format

<b>Drawing Number</b>	<b>Description (format)</b>
M1307D0412	Transformer Dimensions
M1339D1435	Transformer Connection Diagram
M2112D0930-T91294	Transformer Nameplate Data
016 00749 05	Circuit Diagram of Telegraph System
no drawing #	Inverter Propulsion Isolation
23-0600 sheet 2,3,6	Machinery arrangements
23-0628 sheet 1-4	Arrangement of lifting gear
33-0800 sheet 13-14	Power Deck Plan tank top
33-0882 sheet 1-14	Wireway Deck plan
34-0800-02	MV SB Connection Diagrams
34-0800-03	SS SB Connection Diagrams
32-0800-30	One line Diagram
34-0832-00	Monitoring System Book of diagrams
34-8042-02	WH Wing Console drawings
34-0826-01 1-17	Propulsion System Book of Drawings
34-0831-01	Automation System book of Diagrams
34-0832-01	A&M wiring Diagram
34-0841-01	ECR Console drawings
35-0800-03	General arrangement ECR
35-0800-04	General arrangement Wheelhouse
35-0831-01 Sheets 2-6	Automation system transducer fitting schedule
35-0882-03	CCV & Propulsion Transformer Penetrations
35-0882-04	Wheelhouse Deck Penetrations
W5330D002	MV SB General Layout
W5339D1278	Single Line MV Switchboard
W5339D1288 1-14	Power Schematic Drawings Switchboard
W5339D2141 1-9	MV SB Breaker Schematics
W5339D2413 1-15	MV SB Cell Wiring
W5339D2418	Relay Cabinet Wiring , Transformer Differential
W5340C0070	Relay Cabinet outline , Transformer Differential
32-0800-05	Port Vital MCC One Line Diagram
32-0800-06	Stbd Vital MCC One Line Diagram
32-0800-09	MCC #3 One Line Diagram
LSU#1 AAW-4207	LSU #1
TER AAW-4207	Telegraph event recorder

4.2.2 All drawings that are modified as a result of the propulsion upgrade by the contractor shall be updated by the contractor.

#### 4.2.3 Regulations

All work performed must be compliant with the latest Canada Shipping Act Regulations and in particular to the Marine Machinery Regulations. All work shall meet Transport Canada approved Class Regulations as recognized under the DISP program.

#### 4.2.4 Standards

The Contractor is to perform all of the following work and is to provide fully certified personnel acceptable to TCMS in accordance to latest revision of the Ship Safety Electrical Standards TP127E and IEEE Standard 45 Recommended Practice for Electrical Installation on Shipboard.

All work shall be completed in accordance with Canadian Coast Guard's Ship's ISM Fleet Safety and Security Manual concerning Hot Work, and Lock-Out and Tag Out Procedures.

**5 GENERAL NOTES**

**5.1 Identification**

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

**5.2 References**

Applicable regulations and documentation to be followed as per posted date of RFP

<b>FSSM Procedures</b>	<b>Title</b>
1.0	Safety Management System
7.A.10	Vessel Specific - Asbestos Management Plan
7.B.2.	Fall Protection
7.B.3	Entry into Confined spaces
7.B.4	Hotwork
7.B.5	Lockout and Tagout
7.B.6	Electrical Safety – energized Circuits
7.E.1	Handling petroleum Products
7.E.5	Handling, Storage & Disposal of Hazardous Material
7.E.6	Handling and Discharge – Solid Waste
7.E.8	Use of Hydrocarbons
10.A.6	Paint and Other Coatings
10.A.7	Contractor Safety and Security
Ship Specific	Vessel Specific - Asbestos Management Plan
<b>Publications</b>	
TP3177E	Standard for the Control of Gas Hazards in Vessels to be Repaired or Altered
T127E	Transport Canada Marine Safety Electrical Standard
IEEE 45	Recommended Practice for Electrical Installation on Ships
CSA W47.1	Certification of Companies for Fusion Welding of Steel Structures Division 2 Certification
CSA W47.2	Certification of Companies for Fusion Welding of Aluminum
CSA W59	Welded Steel Construction – Metal Arc Welding
CSA W59.2	Welded Aluminum Construction
<b>Acts</b>	
CSA	Canada Shipping Act
CLC	Canada Labour Code
<b>Regulations</b>	
MOHS	Maritime Occupational Health and Safety

### **5.3 Occupational Health and Safety**

- 5.3.1 The Contractor and all sub-contractors shall follow Occupational Health and Safety (OHS) procedures in accordance with applicable federal and provincial OHS regulations ensuring that Contractor activities are carried out in a safe manner and do not endanger the safety of any personnel.
- 5.3.2 The Contractor and the Contractor's employees, including any sub-contractors shall attend a safety orientation meeting of the vessel prior to the commencement of any work in order to familiarize the Contractor's employees with ship specific hazards and permit systems for work protocols as well as procedures for Security, Hazard Prevention, Hazard Intervention and Pre-Job Safety Assessments. The Contractor will have access to an uncontrolled copy of the Fleet Safety and Security Manual.
- 5.3.3 The Contractor shall comply with the Fleet Safety and Security Manual, DFO/5737 and shipboard work instructions in addition to the applicable Canada Labour Code regulations while performing work involving the following;
- Hot Work;
  - Work Aloft;
  - Confined Space Entry;
  - Gas Freeing for Entry and Hot Work;
  - Lock Out/Tag Out;
  - Pre-Job Safety Assessments.

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

#### **5.4 Access to Worksite**

- 5.4.1 The Contractor shall ensure the TA and CG staff has unrestricted access to the worksite at all times during the contract period as per SACC A9066C – Vessel – Access by Canada, 2008-05-12
- 5.4.2 CCG will ensure unrestricted access to the worksite. The contractor personnel must pass an enhanced security clearance for all personnel required to remain on the vessel during overnight seatrials as per SACC A9066C – Vessel – Access by Canada, 2008-05-12

#### **5.5 Workplace Hazardous Materials Information System (WHIMS)**

- 5.5.1 The Contractor must provide the TA with Material Safety Data Sheets (MSDS) for all Contractor supplied WHIMS controlled products.
- 5.5.2 The TA will provide the Contractor with access to MSD sheets for all controlled products on the ship for all specified work items.

#### **5.6 Smoking in the Work Space**

- 5.6.1 The Contractor must ensure compliance with the Non- Smokers' Health Act. The Contractor shall ensure that every employer, and any person acting on behalf of an employer, shall ensure that persons refrain from smoking in any work space under the control of the employer. The Contractor shall ensure that there is absolutely no smoking onboard the vessel.

#### **5.7 Clean and Hazard Free Worksite**

- 5.7.1 Before the Contractor starts any work on the vessel the Contractor's Quality Assurance Representative, the TA shall walk through each space and area where work is to take place, including access and removal routes and areas adjacent to those where the work is to be done as a result of this specification. The Contractor's Quality Assurance Representative shall take digital pictures of each area showing the outfit therein and download the photos in JPG format onto a CD or DVD or USB device. Each picture shall be dated and labeled as to the location on the vessel. Copies of this CD, DVD, USB are to be provided to the TA for reference purposes within 4 weeks of the start of the contract.
- 5.7.2 The Contractor, during the work period shall maintain those areas of the vessel which Contractor personnel use to access those areas where work is to be undertaken, in a clean condition, free from debris and remove garbage daily.

- 5.7.3 Areas that pose a hazard as a result of the specification work are to be secured and clearly identified by the Contractor with signage to advise and protect all personnel from the hazard in accordance with applicable Canada Labour Code requirements.
- 5.7.4 Upon completion of this contract, the Contractor shall be responsible for the removal of all garbage generated from the work of this specification and for returning the vessel to the state of cleanliness in which the vessel was at the start of the contract period.
- 5.7.5 Once all known work and final clean-up has been completed the Contractor's QA Representative, the TA shall perform a 'walk through' of the vessel to view all areas where work was performed by the Contractor. Any deficiencies or damage noted shall be recorded and compared to the photos and if deemed to have been caused by the Contractor as a result of the work the damage shall be repaired by the Contractor at no cost to the Coast Guard.

## **5.8 Fire Protection**

- 5.8.1 The Contractor must ensure the isolation, removal and installation of fire detection and suppression systems or any components thereof, is performed by a qualified technician. When the fire detection or fire suppression system is deactivated or disabled by the Contractor during the contract, the system(s) must be recertified by a qualified technician as fully functional. A signed and dated original copy of the certificate must be delivered to the TA before the end of the contract.
- 5.8.2 The Contractor must notify the TA and obtain written approval from the TA prior to disturbing, removing, isolating, deactivating / disabling or locking out any part of the fire detection or suppression systems, including heat and smoke sensors.
- 5.8.3 The Contractor must ensure protection against fire at all times including when working on the ship's fire detection and / or suppression system(s). This may be accomplished as suggested below and only with the written permission of the TA:
- Disabling only one portion of a system at a time;
  - By maintaining system function using spares while work is in progress;
  - Other means acceptable to and approved by the TA.

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

### **5.9 Touch-up / Disturbed Paint**

- 5.9.1 Unless stated otherwise, all new or disturbed steelwork is to have two coats of marine primer, compatible with the vessel's existing coating schedule.
- 5.9.2 The Contractor must prepare all new and disturbed steelwork to the paint manufacturer's standards prior to painting.

### **5.10 CCG Employees and Others on the Vessel**

- 5.10.1 CCG / DFO employees and other personnel such as manufacturer's representatives and/or TCMS or Class surveyors may carry-out other work including work items not included in this specification, onboard the vessel during this work period. Every effort will be made by the TA to ensure this work and the associated inspections and/or surveys do not interfere with the Contractor's work. The Contractor will not be responsible for coordinating the related inspections or payment of inspection fees for this work unless otherwise specified.

### **5.11 Regulatory Inspections and/or Class Surveys**

- 5.11.1 Any documentation generated by the above inspections and/or surveys to show that the inspections and/or surveys were conducted (i.e. original signed and dated certificates) must be provided to the TA .
- 5.11.2 The Contractor must not substitute inspection by the TA for the required regulatory inspections or class surveys.
- 5.11.3 The Contractor must provide timely advance notification (minimum of 24 hours) of scheduled regulatory inspections and/or class surveys to the TA so they may witness the inspection.

### **5.12 Test Results and Data Book**

- 5.12.1 The Contractor must develop a Test and Trials Plan which shall include as a minimum, all tests and trials stated in the specification. This plan shall be provided for TA review 2 week(s) prior to the originally scheduled Tests and Trials commencement.
- 5.12.2 All tests, measurements, calibrations and readings must be recorded, dated signed by the contractors representative and approved by the TA and Chief Engineer and provided in report format both in hard copy and electronic format, to the TA, and available to TCMS if requested.
- 5.12.3 Recorded dimensions shall be to a precision of three decimal places (unless otherwise stated) in the measuring system currently in use on the vessel.

- 5.12.4 The Contractor shall provide to the TA calibration certificates for all instrumentation used in the Test and Trials Plan showing that the instruments have been calibrated in accordance with the manufacturer's instructions.
- 5.12.5 Hard copy reports shall be bound, type written on letter size paper and indexed by specification number. Electronic copies shall be in unprotected Adobe PDF format with the exception of drawings which shall be in Cad format and provided on DVD or USB media. The Contractor shall provide 3 hard copies and 1 electronic copy of all reports.
- 5.12.6 All documentation from the contract period shall be inserted in a data book and delivered to the TA on completion of the contract.

### **5.13 Contractor Supplied Materials and Tools**

- 5.13.1 The Contractor must ensure all materials are new and unused.
- 5.13.2 The Contractor must ensure replacement material such as jointing, packing, insulation, small hardware, oils, lubricants, cleaning solvents, preservatives, paints, coatings etc. are in accordance with the equipment manufacturer's drawings, manuals and/or instructions and are approved for use by TCMS. The contractor is responsible for all costs ensuring materials meet TCMS requirements.
- 5.13.3 Where no particular item is specified or where substitution must be made, the TA must approve the substituted item in writing. The Contractor must provide information about materials used, certificate of grade and quality of various materials to the TA prior to use. The contractor is responsible for all costs ensuring materials meet TCMS requirements.
- 5.13.4 The Contractor must include in their bid all cost associated with all equipment, devices, tools and machinery such as craneage, staging, scaffolding and rigging necessary for the completion of the work in this specification.
- 5.13.5 The Contractor must include in their bid all cost associated with providing waste disposal services for any oil, oily waste or other hazardous or controlled waste generated by the work of this specification. The Contractor shall provide waste disposal certificates for all of the above generated waste and the disposal certificates shall indicate that the disposal was in accordance with Federal, Provincial and Municipal regulations in effect.

### **5.14 Government Supplied Materials & Tools**

- 5.14.1 The Contractor must include in their bid all cost associated with tools supplied unless otherwise stated in the technical specifications.
- 5.14.2 Where tools are supplied by the TA they shall be returned by the Contractor in the same condition as when they were borrowed. Borrowed tools must be inventoried and signed for by the Contractor on receipt and return to the TA. Any costs associated with repairs to borrowed tools are the responsibility of the Contractor.

- 5.14.3 Any Government supplied material (GSM) shall be received by the Contractor and stored in a secure warehouse or storeroom having a controlled environment appropriate for the equipment as per manufacturer's instructions. Any costs associated to material while in Contractors possession is Contractor's responsibility.

#### **5.15 Restricted Areas**

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

#### **5.16 Contractor Inspections and Protection of Equipment and the Worksite**

- 5.16.1 The Contractor must coordinate an inspection with the TA on the condition and location of items to be removed prior to carrying out the specified work or to gain access to a location to carry out the work.
- 5.16.2 The Contractor must repair or replace any item so damaged in this process. Materials used in any replacement or repairs must meet the criteria for Contractor supplied material noted above in section Contractor Supplied Materials and Tools.
- 5.16.3 The Contractor must protect all equipment and surrounding areas from damage. Work areas are to be protected from the ingress of water, welding and blasting grit etc. Temporary covers to work areas must be installed.

#### **5.17 Recording of Work in Progress**

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

#### **5.18 List of Confined Spaces**

- 5.18.1 The Contractor may request a list of the vessel's identified confined spaces at the Pre-Refit meeting.

#### **5.19 Lead Paint and Paint Coatings**

- 5.19.1 The Contractor shall not use lead based paints.
- 5.19.2 CG ships have been painted with lead based paints in the past and as a result some of the Contractor's processes such as grinding, welding and burning may release this lead from the coatings. The Contractor shall ensure that work areas are tested for lead content and that the work is performed in accordance with applicable regulations.

- 5.19.3 The Contractor must provide HC product approval for underwater hull surface paints controlled by HC and the Pest Management Regulatory Agency.

## **5.20 Asbestos Containing Materials**

- 5.20.1 The Contractor shall not use any asbestos containing materials.
- 5.20.2 Handling of any asbestos containing materials shall be performed by personnel trained and certified in the removal of asbestos in accordance with Federal, Provincial and Municipal regulations in effect and in accordance with the Fleet Safety and Security Manual. The Contractor shall provide the TA with disposal certificates for all asbestos containing material removed from the vessel indicating that the disposal was in accordance with Federal, Provincial and Municipal regulations in effect.

## **5.21 Removed Materials and Equipment**

- 5.21.1 All removed equipment as a result of this specification shall be disposed of by the contractor at their expense as per applicable provincial regulations as defined in the SACC A9055C - Scrap and Waste Material, 2010-08-16. All materials to be removed must follow the same route used for installing the new propulsion equipment.

## **5.22 Welding Certification**

- 5.22.1 For any work requiring the application of fusion welding for steel structures the Contractor and/or the sub-contractor welders shall be certified by the Canadian Welding Bureau in accordance with CSA Standards W47.1-03, latest revision – Certification of Companies for Fusion Welding of Steel Division 2 Certification as a minimum. Current copies of certification shall be provided to the IA.

## **5.23 Electrical Installations**

- 5.23.1 All electrical installations and repairs shall be carried out in accordance with the latest revisions of Transport Canada Marine Safety Electrical Standard TP127E and IEEE Standard 45 Recommended Practice for Electrical Installation on Ships.

## 6 TECHNICAL

- 6.1.1 The Contractor must provide general arrangement drawings, complete with dimensions, of all equipment to be installed. Drawings shall be supplied in PDF electronic format and Cad format.
- 6.1.2 The Contractor must supply all parts, materials, testing, tools and labor as part of the Contractor's responsibility and costs.
- 6.1.3 The contractor must identify all interference items impeding the installation/removal/refurbishment of equipment. The contractor must clearly identify the proposed route for removing old equipment ( as identified in section #3) and installing new propulsion equipment onto the vessel (ie: through existing hatches or through access holes cut in side of ship). All routes and removal of equipment must be pre-approved by the TA. Any modifications to structure shall be accompanied by approved engineered drawings and all costs shall be the responsibility of the contractor. The contractor is responsible for the temporary removal, storage and refitting to vessel of all equipment previously identified to the satisfaction of the TA or Chief Engineer.
- 6.1.4 The contractor shall take digital pictures of all areas affected to ensure areas are returned to pre-work period. A copy of these pictures shall be given to the TA and Chief Engineer.
- 6.1.5 All costs associated with gas freeing areas for hot work shall be the cost and responsibility of the contractor. This shall include costs associated with testing , proper certification for entry personnel and rescue team as per provincial regulations. No hot work shall proceed without prior approval of the TA or Chief Engineer.
- 6.1.6 The contractor must identify the weights of all equipment, wiring and structure to be installed to ensure ships stability is not affected.

- 6.1.7 The contractor must weigh all original fitted equipment removed from the vessel. This shall include all wiring and structure as well as equipment. Final weights shall be given to the TA and Chief Engineer.
- 6.1.8 No Equipment/wiring or interference items to be removed without prior approval from TA or Chief Engineer.
- 6.1.9 Contractor must follow appropriate asbestos abatement procedures where applicable as per Section 5.2 above. CCG shall be responsible for all existing asbestos abatement issues. All equipment locations/removal and wiring runs for this reason to be CCG approved.
- 6.1.10 All engineered drawings and system description must be submitted to be approved by the TA and TCMS before proceeding with work
- 6.1.11 The contractor must supply finalized drawings and manuals reflecting as fitted condition. All drawings to be in electronic CAD format as well as paper copy.
- 6.1.12 The contractor must identify all welding, cutting, burning, crane-age and installation needed and must be included in the cost of the bid. The contractor must supply personnel to supervise all removal/ installation work.
- 6.1.13 The contractor must supply all labour and materials for modifications made to busswork for connection of the new wiring. All modifications must be approved by the TA and Chief Engineer. The contractor must supply all labour and materials for all terminations of control, power , and signal wiring to new and existing equipment for the operation of the new systems installed.
- 6.1.14 The contractor must supply and install all labels that are to be replaced to reflect new equipment to be of similar type and securing arrangement to existing as identified in the TSOR.
- 6.1.15 The contractor must include in their bid costs responsible for retrofitting panels where equipment of different sizes or shapes to be mounted. Covering plates ( Contractor responsibility) and mounting arrangements to be approved by the TA before installation. Any modifications to existing panel doors to be similar in standard, material, design, strength, mounting and coated with the same standard and color paint as per the existing access doors.

- 6.1.16 The contractor is to ensure that there are to be no splices in existing wiring to be used. If existing wiring cannot be used, new wiring of appropriate voltage, insulation and AWG ratings to be ran from nearest terminal or connection point. All wire numbers to be replaced as per original.
- 6.1.17 The contractor must supply in their bid package all labour and supplies associated with the removal of cabling as identified in Section 22 . The contractor must include in their bid package all labour, materials, supplies and cable supply costs for the installation of new and re-used cabling as defined by the new installed equipment. The contractor must include in their bid the costs associated with ensuring that all new and existing watertight and fire-tight transits are returned to acceptable fire or watertight condition as defined by the location to the satisfaction of the TA or Chief Engineer.
- 6.1.18 The contractor must include in their bid all costs responsible for gathering of all measurements and info as required to perform the upgrade as defined in the project mandatories.
- 6.1.19 The Contractor must supply an electronic copy of proposed project schedule compatible with Microsoft project . Project to include all work associated with the contract as well supply and delivery of components and manpower needed. Schedule to include critical paths with dates and milestones as project proceeds.

## 7 PROOF OF PERFORMANCE

### 7.1.1 Pre work Testing/Trials

Prior to the commencement of work the contractor must perform live testing to ensure the existing drive parameters and operating performance is understood. This is to include all operating conditions as follows but not limited to:

- a) 1, 2 and 3 Main engines online as well as on split bus, including all separate combinations of Main engines.
- b) Voltage, current, frequency and harmonics readings on input and output of CCVs
- c) Torque readings on output of motors.
- d) Voltage, current, frequency and harmonics readings on excitation/controls and propulsion bus as well as hotel bus during all tests
- e) Response times for all operating condition are to be recorded ( 0-100% in all directions as well as crash reversals of all combinations of engines.
- f) Generator governor response including governor output and actual actuator response is to be recorded during all tests.
- g) Generator AVR voltage and current output to be recorded during all tests
- h) Chief Engineer must be given 48 hours notice prior to live testing. Vessel staff will be available to run up machinery to permit contractor observations.
- i) Current operation of telegraphs in various modes to be recorded.

All readings recorded to be made available with 1 hard copy and electronic format given to the Chief Engineer and TA for their approval.

### 7.1.2 Proof of new system

The contractor must assemble the new system at the contractors facility as far as possible and simulate the operation of the new drives in all operating conditions for the vessel. Factory acceptance tests to be witnessed by TCMS and the TA for their approval.

### 7.1.3 Dock Trials

The Contractor must supply in their bid all costs to conduct dock trials, (including the cost of contractor representatives required) to ensure correct operation of drives and associated components prior to sea trials. All testing to the satisfaction of TA, TCMS ,and Chief Engineer before sea trials can begin. Contractor must give 7 days notice to chief engineer before trials can begin. Coast Guard will provide crew and cover all costs of operating the vessel.

#### 7.1.4 Sea Trials

The Contractor must supply in their bid all costs to conduct sea trials(including the cost of contractor representatives required) in accordance with pre-approved plan. Trials shall include all but are not limited to Pre-work Trials to ensure drive operates as a minimum to Pre-work recorded parameters. New drive to satisfy all functional requirements as a minimum as laid out in Section 11. All tests must be to the satisfaction of the TA, TCMS and the Chief Engineer. Contractor must give 7 days notice to Chief Engineer before trials can begin. Coast Guard will provide crew and cover all costs of operating the vessel.

#### 7.1.5 Training

The Contractor must supply in their bid all costs to develop and perform a training package for a minimum of 10 personnel with details of additional cost per person of additional personnel if needed. Each training package to be available in hard copy and in electronic PDF format . Training to be in two sessions:

1. Operational procedures detailing the normal day to day operation of system including procedures for starting up and shutdown of system. Knowledge of critical and non-critical faults are to be included. (minimum 1 days per crew, 8hrs /day)
2. Troubleshooting procedures detailing critical and noncritical faults. This includes details on how to correctly reset faults and how to correctly check and record fault history. Training to include detailed procedures for routine calibration, testing and failure replacement of all components in the new system (Minimum 1 week, 8hrs/day)

**8 MACHINERY LOCK OUT, OPEN UP AND CLOSE UP FOR ACCESS**

Contractor shall provide lock out of machinery as per Regulations. Contractor is responsible for disassembly and reassembly of machinery and equipment, as necessary for the performance of the work.

## 9 DELIVERABLES

### 9.1 Spares

- 9.1.1 The contractor must include in their bid one set of spares which shall include at least 1 type of every electrical component as used in the propulsion system. This shall not include doors, framing, back-plates, din rail, etc. The spares shall also incorporate above the 1 minimum requirement
- a) 1 full set of power thyristors(12) as used on the new CCV to renew 1 phase.
  - b) A minimum of 10 fuses of every size and current rating
  - c) 2 Breakers of every size used
  - d) 2 position encoders
  - e) 1 spare accessory gear box with at least one spare of each ancillary gear attached, tach, rev counter, excluding the 2 encoders mentioned above
  - f) 10 spare capacitors of each type and capacity used
  - g) 10 spare resistors of each denomination and power rating used
  - h) 2 spare shaft bridge RPM gauges, 1 port, 1 stbd
  - i) 2 spare bridge telegraphs, 1 port, 1 stbd
  - j) 2 spare current transformers to match voltage regulators
  - k) 2 spare of every type of switch or pushbutton, including switch blocks
  - l) 2 spare power supplies of every different type (ie PLC's)
  - m) For the exciter 1 full set of spare thyristors, enough to rebuild unit after complete failure
  - n) 2 spare of every type of RTD or thermocouple
  - o) 2 spare voltage regulators for the generators
  - p) If cooling pumps are used, at least 2 spare pump/motor combinations
  - q) 2 spare cooling fans of every type
  - r) 2 full sets of any air filters if used , enough to renew both cycloconverters

## 9.2 Documentation

### 9.2.1 (Reports/Drawings/Manuals/Software)

The Contractor must supply in their bid all costs to supply the Canadian Coast Guard Technical authority with (3) hardcopies and (1) electronic copy of all the following to the TA

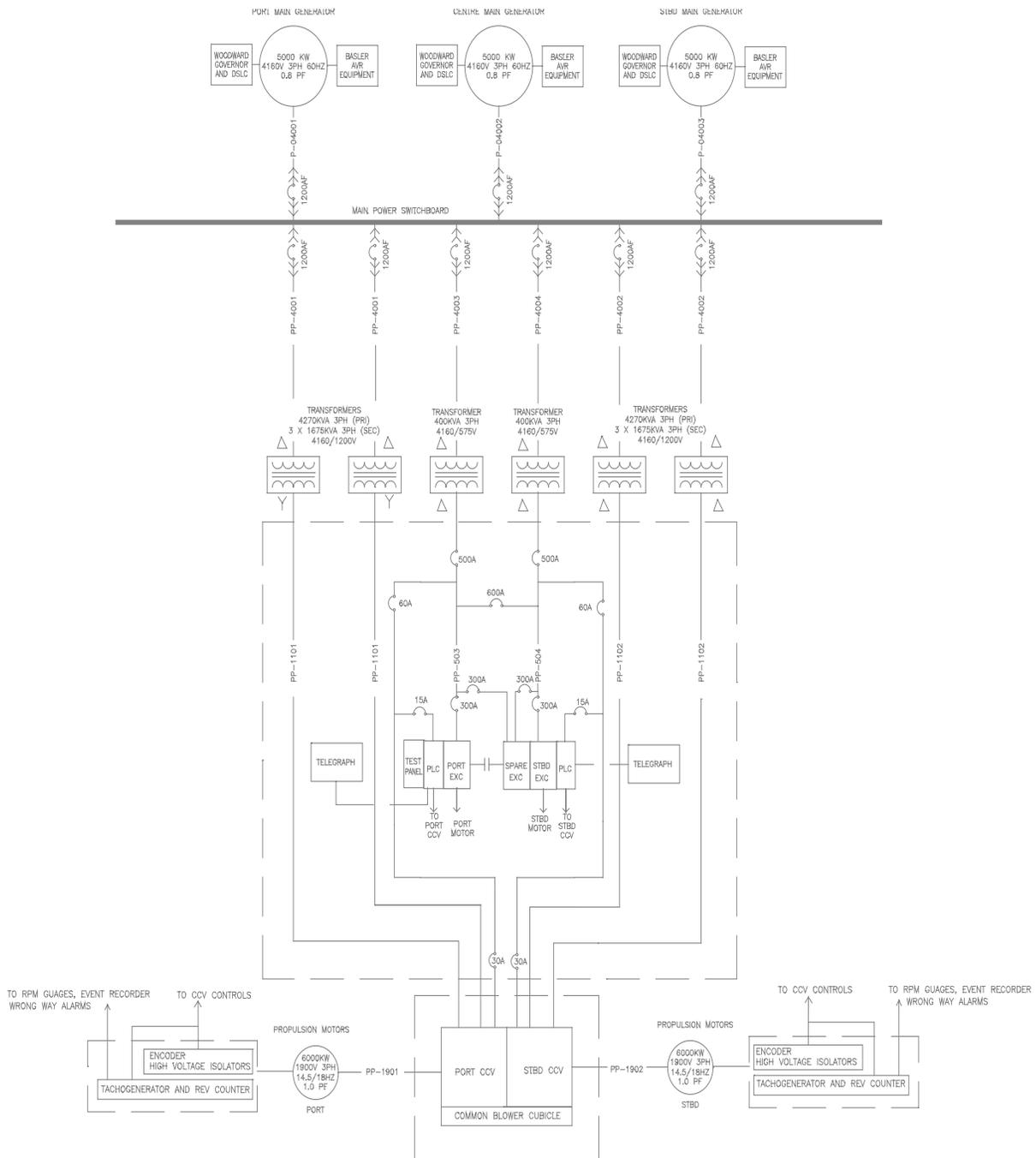
- a) All readings, videos(electronic only), photos, tests, defects.
- b) All hardware manuals from as-fitted equipment in English and an electronic copy of French to be provided if available from manufacturer.
- c) A complete listing of all parts and pricing with OEM manufactured specifications
- d) All engineered drawings Cad format, installation and operator manuals for installed equipment.
- e) All modified drawings from original in Cad format
- f) Complete listing of service FSR and location for installed equipment
- g) 3 hard copies of all software ( including PLC programs) on OEM supplied discs with installation procedures for all PLC's and equipment specific software
- h) All calibration and service procedures required for replacement of any components of new system
- i) The contactor shall supply a list of recommended spares for 1 year of operation
- j) The contractor shall supply a full priced listing with part numbers of all parts used with contact info for ordering

### 9.3 List of Acronyms

CA	Contract Authority (PWGSC)
CCG	Canadian Coast Guard
CCV	Cycloconverter
CGE	Canadian General Electric
CLC	Canada Labour Code
CSM	Contractor Supplied Material
CSA	Canadian Standards Association
CT	Current Transformer
CWB	Canadian Welding Bureau
DFO	Department of Fisheries and Oceans
ECR	Engine Control room
FSSM	Fleet Safety & Security Manual (CCG)
FSR	Field Service Representative
GSM	Government Supplied Materials
HC	Health Canada
IEEE	Institute of Electrical and Electronic Engineers
LOA	Length Over All
MSDS	Material Safety Data Sheet
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
PLC	Programmable Logic Controller
PWGSC	Public Works and Government Services Canada
SSMS	Safety & Security Management System
TBS	Treasury Board of Canada Secretariat
TCMS	Transport Canada Marine Safety
TA	Technical Authority – Owner’s Representative (CCG)
WHMIS	Workplace Hazardous Material Information System

10 FIGURES

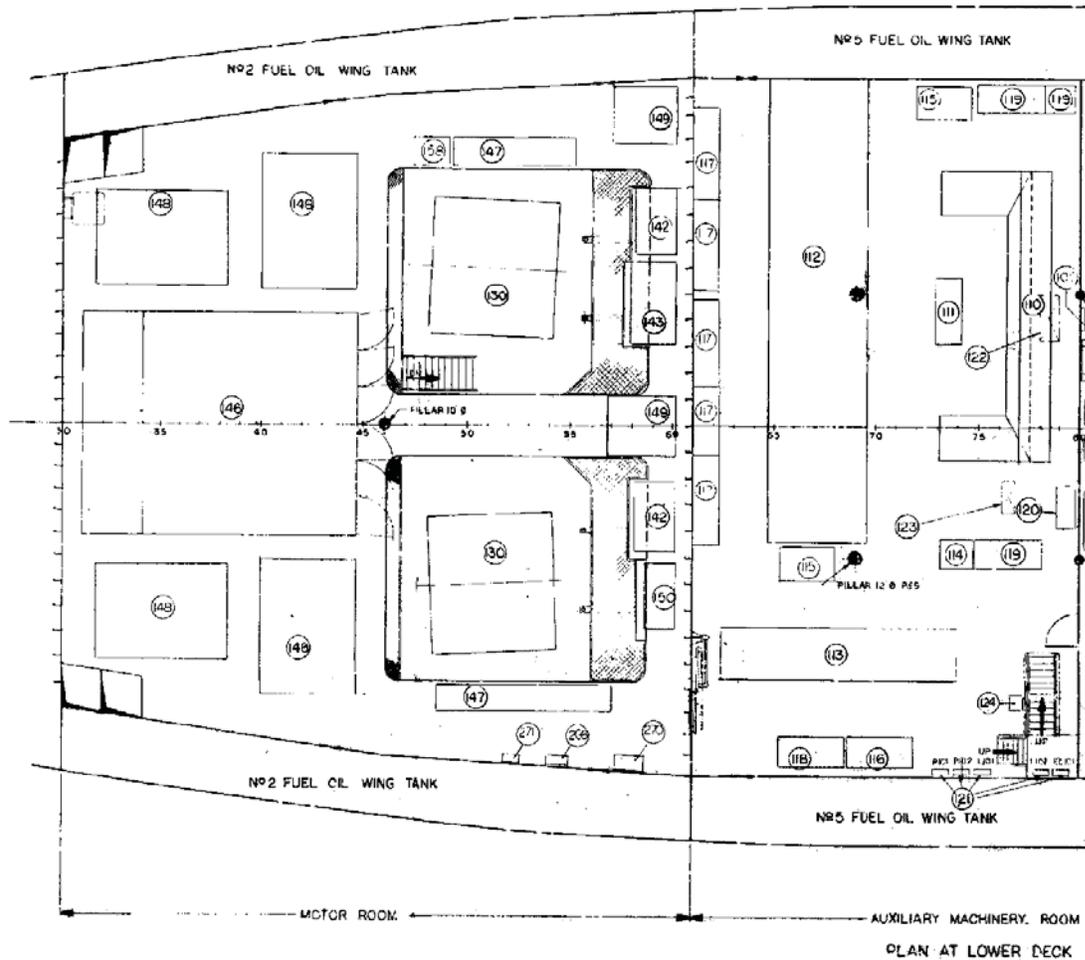
10.1 Figure 1 Propulsion System Basic Configuration Existing



### 10.2 Figure 2 Machinery Arrangement Layout Top View

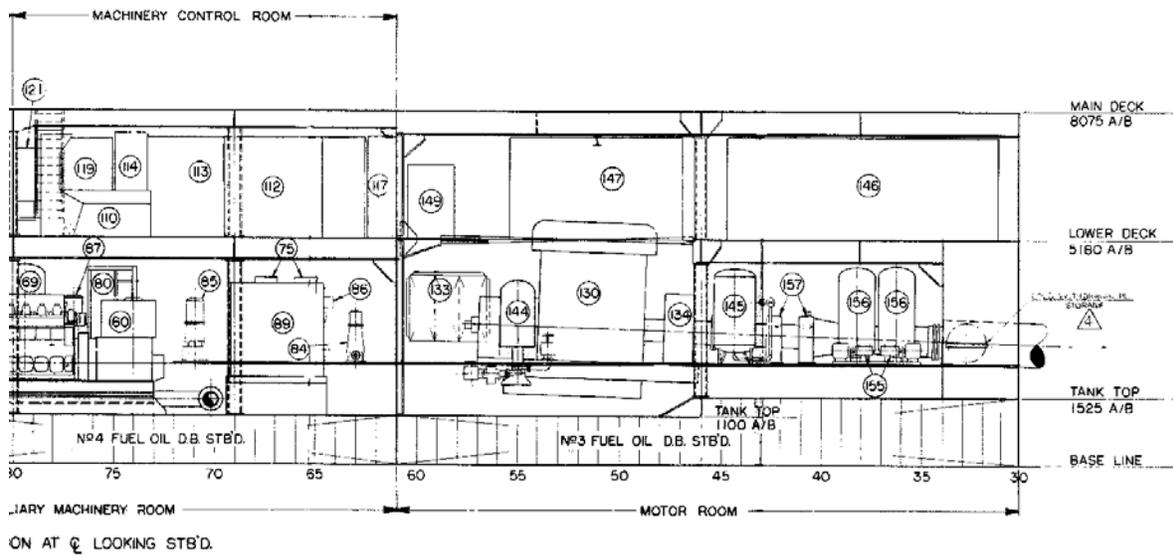
- 146 Cycloconverter , approximate dimensions 6.1M Length, 2.44M wide, 2.33M high per side(port or stbd)
- 148 Propulsion Transformer
- 147 Main and spare Exciter and PLC controls, approx dimensions 2.65M Length, 0.76M wide, 2.44M high stbd side, 3.87M Length, 0.76M wide, 2.44M high port side
- 130 Propulsion Motor
- 158 Test Panel approx dimensions 0.82M length, 0.76M wide, 2.44M high
- 112 Main Switchboard
- 119 Power management cubicle
- 110 ECR Console
- 114 Differential protection

**ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE  
CONFIRMED BY THE CONTRACTOR ON SITE**



**10.3 Figure 3 Machinery Arrangement Layout Side Profile**

- 146 Cycloconverter
- 148 Propulsion Transformer
- 147 Main and spare Exciter and PLC controls
- 130 Propulsion Motor
- 158 Test Panel
- 112 Main Switchboard
- 119 Power management cubicle
- 110 ECR Console
- 114 Differential protection



**10.4 Figure 4 Cycloconverter layout**



**10.5 Figure 5 Cycloconverter side profile**



10.6 Figure 6 MCR telegraphs, RPM and transfer control



10.7 Figure 7 Bridge telegraph and RPM gauge setup



**10.8 Figure 8 Wheelhouse Telegraph chain drive connection**



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**11 NEW PROPULSION FUNCTIONAL MINIMUM REQUIREMENTS ARE AS FOLLOWS:**

**The new propulsion system must provide stable operation under all load conditions:**

- 11.1.1 Provide independent starting, stopping and control of each shaft from zero to full speed in both forward and astern directions
- 11.1.2 Prevent operation of motor below 9 Rpm to prevent damage to bearings.
- 11.1.3 Ensure utilization of power allocated from the main power system as shown on the Propulsion System Characteristic Curves [Figure 9](#) and [10](#)

The telegraphs shall be automatically calibrated by the contractor for the number of generators online. Calibration shall be as follows:

- 11.1.4 With 3 main engines on line system overload level shall be 14210KW, with a linear relationship from zero to 145RPM corresponding to 6600KW per motor in Bollard condition, and a linear reduction in power to 12915KW for a maximum motor speed of 180RPM corresponding to 6000KW per motor for free running conditions. Prolonged overload conditions of the propulsion motor limited by automatic load control as outlined in 11.1.13
- 11.1.5 Total combined load to the propulsion system bus for 3 generators shall be automatically regulated to a maximum of 16500KW, 20625KVA through telegraph scaling. Both shafts to be regulated at the same time to ensure even load sharing between shafts.
- 11.1.6 With 2 Main engines on line, maximum telegraph reference shall be 90% of scale for an overload capacity of 11000KW, 13750KVA taking into account hotel and air bubbler load as well. Operation at this level shall indicate propulsion overload condition. The telegraph level shall be automatically regulated to provide a linear relationship between zero to bollard and full running speed.
- 11.1.7 With 1 Main engine on line, maximum telegraph reference shall be 70% of scale for an overload capacity of 5500KW, 6875KVA taking into account hotel and air bubbler load as well. Operation at this level shall indicate propulsion overload condition. The telegraph level shall be automatically regulated to provide a linear relationship between zero to bollard and full running speed.
- 11.1.8 The system shall provide automatic re-calibration and limiting of propulsion current levels to a safe level and automatic limiting of diesel engine loading and unloading to a safe margin of the power available during all operating conditions of the vessel.
- 11.1.9 Provide automatic control of each propulsion motor such that for any given telegraph setting, the power available shall be fully utilized, but not exceeded as conditions vary and requirements of the bubbler and ship service bus are met.

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- 11.1.10 Frequency shall be maintained at 60hz within a +/- 4% excursion for all conditions of loading and unloading for all operating conditions except crash reversal when excursion can be +5% to -10%
- 11.1.11 Repositioning of the telegraphs for a lower telegraph speed shall not require dynamic or absorption of regenerative power. The vessel shall be allowed to coast down until the reduced power value is reached to maintain the lower vessel speed. This condition applies for all speed controller requests over the range to zero speed. Only by repositioning the telegraphs in the opposite direction of rotation shall regenerative power absorption be required with the retarding power in proportion to the change in telegraph position
- 11.1.12 The input current to each propulsion system shall be limited in the stall condition to 200% of the current level corresponding to power available (No of engines) and Bus loading. The limit shall be reduced to 100% as the motor voltage comes to full value. The limit shall be maintained from stalled to intermediate speed within the capabilities of the diesel engines.
- 11.1.13 When all 3 main engines are connected, the propulsion motor shall be capable for 30 seconds of developing 250% of rated torque at the stalled condition with 200% stator current flowing
- 11.1.14 All conditions of stall shall be considered, including stall when starting the ship from rest in ice, to sudden stoppage of the propeller from full speed (ie: hitting multi-year ice in astern)
- 11.1.15 The motor shall be capable of developing infrequent peaks of 250% of rated torque.
- 11.1.16 The input current of each propulsion system, at the motor bollard condition shall be limited to 110% of current level corresponding to the number of main engines online. Gradually the limit shall be reduced to 100% as the overload approaches the 2 hour limit.
- 11.1.17 The rate of rise of the input current for each propulsion system shall be limited during the motor stall condition to (1) Per unit per second. The rate of rise of input power as the motors accelerate shall be limited to 1 PU per 10 seconds.
- 11.1.18 The propulsion drive shall provide automatic control of the operation of the propulsion motors in overcurrent condition such that when cooldown period is determined, reduction in rated current shall be enabled for cooling purposes as per set time.
- 11.1.19 The drive shall be capable of reversing direction of speed in one direction to any speed in the other direction in under 15 seconds with 250% of torque and 200% of stator current levels, corresponding to power levels available determined by engines connected. The system shall provide the minimal reversal time with permitted excursions of the voltage and frequency as outlined in 11.1.10

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11.1.20 The drives shall provide means of absorbing regenerative power into the main generator sets and ship service loads during crash reversals and stalls of the propellers.

11.1.21 Crash reversals from full speed ahead to full power astern shall not exceed 15 seconds

11.1.22 Logic controls shall be enabled to control engine speed and inhibit reverse power protection during crash reversals. This applies to moving the telegraph from the ahead position to any astern position and vice versa.

## 12 TELEGRAPH SYSTEM

Outlined are requirements of the Engine Order Telegraph(EOT) system

- 12.1.1 4 positions in total (port and stbd each location) Engine Control Room (ECR), Bridge Center, Bridge port wing, Bridge stbd wing .
- 12.1.2 Both telegraph at each control station to be able to be manipulated with one hand operation ( except for MCR position) or independent of each other.
- 12.1.3 Telegraph to have astern direction in RED and ahead direction WHITE. Background colour to be BLACK.
- 12.1.4 Telegraphs to be scaled from 10-0-10 with minor adjustable indents at each 10 percent location . Major adjustable indents to be located at Stop , Dead slow, Slow, Half and Full in each direction.
- 12.1.5 Telegraphs to have adjustable brake .
- 12.1.6 Telegraphs to have LED adjustable dimmer (scaled 0-100%) per each station except ECR
- 12.1.7 Telegraph to have at least Nema 2 protection against dust and liquid intrusion
- 12.1.8 All telegraphs to have pointer indicating EOT position actual vs ordered
- 12.1.9 All telegraph handles not in use to follow position of EOT in command only on bridge. ECR telegraph pointer only to follow bridge.
- 12.1.10 Bridge center and ECR positions to have dual communication bus with new propulsion scheme . Loss of communication on one bus, will switch over to secondary and sound failure alarm. Secondary channel shall be monitored when not in use for defects. Buses in consideration are industrial Ethernet Cat 5 or Fiberoptic industrial ethernet . Other networks will be considered, however the advantages of such over the above mentioned must be clearly identified.

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12.1.11 Failure of one telegraph station shall not affect other units and shall indicate alarm to the ECR and bridge by way of visual and audible alarm.

12.1.12 All telegraphs to incorporate wrong way buzzer and LED light. Time delay for alarm to be adjustable ( Time delay to be adjustable by CCG service personnel for testing purposes). Alarm shall not activate under normal operating conditions.

12.1.13 Telegraphs to have 2 independent power supplies . Loss of one supply shall sound alarm locally and in the ECR. Loss of one supply shall not interrupt control of station in command.

12.1.14 ECR Telegraph system shall be able to take control of system independent of position of Bridge telegraphs at any time. Doing so shall activate visual and audible alarm at both locations.

12.1.15 A history of EOT commands and throttle positions must be connected to the telegraph recorder which is a Siemens Step 7-300 PLC with integrated logging PC mounted in the port E/R console.

12.1.16 All telegraph positions and alarms to be able to be sent to Alarm and monitoring SCADA system in the ECR. Current A&M is Siemens S7-400 with IMAC 55 Scada software and profibus communication network.

12.1.17 By default at startup or power up ECR shall have master control. Indication shall be evident in both ECR and Bridge. Before transfer can be initiated both E/R and Bridge telegraphs have to match. This is for transfer to the bridge only. When bridge is ready for control, bridge will select STANDBY pushbutton. Lighted pushbutton shall flash and sound buzzer until acknowledged by bridge. ECR will push local STANDBY PB and then transfer switch in ECR shall be rotated to W/H and light shall illuminate to solid and buzzer is silenced.

12.1.18 When on bridge control, ECR shall be able to take back control from the bridge without interaction from the bridge. Telegraphs do not have to match for transfer to be accomplished. The local ECR rotary switch need only be rotated to ECR control. Doing so shall flash LED lights and buzzer until silenced by bridge. Normal operation would entail bridge pushing **FINISHED WITH PROPULSION** button . This shall flash the E/R **Finished with propulsion LED** and buzzer until rotary switch is turned to E/R control. This will silence buzzer and ECR LED light will be lit at both ECR and bridge.

## 12.2 Propulsion Motor Encoder and Speed Feedback with Wheelhouse Meters

The existing accessory drive package fitted to the non-drive end of the propulsion motors shall be removed and replaced with a directly coupled position encoder and speed feedback unit similar to the picture below:

Existing gearbox with Tach, Henchel counter and encoder.



Directly coupled "Hubner" as fitted on CCGS Laurier with dual encoders.



- 12.2.1 The contractor shall provide a position encoder to be used with the cycloconverter.
- 12.2.2 The contractor shall provide a speed feedback unit to be used for the wheelhouse and motor control room shaft speed meters. The method for shaft speed feedback can be digital or analog.
- 12.2.3 The contractor shall provide the mounting flange and all associated hardware needed for securing the encoders / sensors to the shaft.
- 12.2.4 The new encoders shall be fitted such that transient shock loads from the propeller and shafting shall not be transmitted into the encoder.

### 13 VOLTAGE REGULATION SYSTEM

- 13.1.1 The new voltage regulation system for the 3 main generators must take place in the same footprint as the old units.
- 13.1.2 Any digital displays shall be mounted in the door for each generator.
- 13.1.3 The New voltage regulator must be capable of supplying rated voltage and current needed to satisfy the short circuit curve for the generator as shown in [Figure 11](#).
- 13.1.4 The new regulator must be cable of supplying a minimum of 20 amps at rated excitation voltage to ensure generator voltage does not collapse under severe transient loads or short circuit conditions.
- 13.1.5 New regulators must include current boost units to meet TP127e rules.
- 13.1.6 The Current boost units shall require matching 4160 current transformers.
- 13.1.7 The new voltage regulators must include diode monitors .
- 13.1.8 The new voltage regulators must incorporate excitation limiters.

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#### 14 Minimum system protection requirement.

- 14.1.1 Instantaneous and time overcurrent protection system at the propulsion system feeders . (Provided by Siemens Siprotec relays existing).
- 14.1.2 Differential protection for phase to phase faults of the drive transformers. Transformer secondary Current Transformer's mounted in current Cycloconverter. Primary Current Transformer's and relays. (Provided by Siemens Siprotec relays existing).
- 14.1.3 Differential protection for phase to phase faults from drive input to motor neutral.
- 14.1.4 Static overcurrent, circulating current, cell loss, phase loss, undervoltage , cooling loss, voltage unbalance and excitation loss at the drive.
- 14.1.5 Ground fault protection at the motors .
- 14.1.6 Any modifications to the current Siprotec protection relays to ensure compatibility with the new propulsion system shall be the cost and responsibility of the contractor.

#### 15 DRIVE SYSTEM PROTECTION

Fault protection shall be provided by the incoming AC feeder breakers, protection relaying is Siemens Siprotec existing .

- 15.1.1 In the event of a fault the applicable circuit breaker to be tripped.
- 15.1.2 In the event of high overcurrents associated with rapid stalling of the propeller, only the firing pulses of the drive shall be suppressed and the stall light energized. Reset of the suppression logic shall be by returning the telegraph to the stopped position as long as no faults during overcurrent condition occurred which prevent safe operation of the drive.

**16 THE REQUIRED PERMISSIVE LOGIC TO ACHIEVE READY STATUS OF THE DRIVE SHALL CONSIST OFF:**

- 16.1.1 Propeller turning gear disengaged.
- 16.1.2 Propulsion equipment cooling water is flowing.
- 16.1.3 At least one Main engine is connected to the Medium Voltage Switchboard.
- 16.1.4 Drive cooling arrangement is operational .
- 16.1.5 Propeller shaft brake disengaged.
- 16.1.6 Propulsion excitation and control is available.
- 16.1.7 Propulsion system feeder breaker is closed.
- 16.1.8 All critical faults cleared from drive .
- 16.1.9 Any of the above conditions shall prevent the drive from running. If the drive was in previously ready condition, loss of any one or combination shall extinguish ready light and prevent operation of drive until fault is cleared. Alarm shall be issued to the A&M system to indicate fault. A detailed fault shall also be indicated locally at drive.
- 16.1.10 In a normal shutdown situation (propulsion put offline by E/R personnel) all faults shall be autoblocked by the A&M system. The autoblock feature shall not disable alarms that have caused a fault before shutdown. These alarms are to remain active until rectified by CCG E/R staff or factory service personnel.

## 17 CONTROL SCHEME

- 17.1.1 Protection scheme shall ensure power cannot be applied to motor if less than minimum excitation available. ( TP127E Section 24.5, there shall be no automatic circuit-opening devices except those affording short- circuit or phase-failure protection for the main propulsion circuit).
- 17.1.2 Control scheme shall provide for transfer of telegraph control from the control room to the bridge wheelhouse console. Transfer shall require telegraphs to be in the stopped position. Transfer and status of transfer control shall be indicated at all control consoles including wing consoles on bridge. Recovery of the control room console shall be possible at all times.
- 17.1.3 There shall be a standby brushless exciter supply capable of being switched to either propulsion motor. The spare exciter shall provide full control and protection of the exciter as per the main unit. Visual indication must be available showing exciter is being operated by the spare unit locally and in the control room. Indication of steps to switch excitation supply to be posted in area .
- 17.1.4 Logic is to be provided to turn off the anti-condensation heaters in the motors, transformers and drives during operation in the form of voltage free contacts. Provision is to be made to be able to turn off the anti-condensation heater for the drives manually at each local cabinet by way of a selector switch. An LED indicator light (white) shall show if heat is energized.
- 17.1.5 Logic to be provided by way of voltage free contacts to control the propulsion motor blowers and associated drive blowers/cooling scheme.
- 17.1.6 Provide visual ground detection indication for all the control circuits.
- 17.1.7 Provide visual ground detection indication for each propulsion motor.

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17.1.8 Provide a solid state fault finder at each cyclo-converter unit to monitor listed propulsion system faults, auxiliaries and permissive functions. Fault finder as a minimum to be capable of designating faults into three separate classifications:

- a) Class 1: for immediate trip
- b) Class 2: alarm condition requiring immediate attention
- c) Class 3: equipment problems not requiring immediate attention

17.1.9 Fault finder shall be capable of displaying 1st, 2nd, and 3rd faults. More faults can be recorded but fault must be able to clearly show progression of fault sequence, ie: 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, etc. Fault history to remain until cleared by service personnel.

17.1.10 Fault indication to be sent to the Alarm and Monitoring system and to stay active until cleared by shipboard crew service personnel . In a normal shutdown situation (propulsion put offline by E/R personnel) all faults shall be autoblocked by the A&M system unless critical faults are active before shutdown sequence.

17.1.11 Drives to have the ability of remote diagnostics by Canadian Coast Guard and supplier Tech Support . Contractor to give clear details on requirements for minimum performance of remote diagnostics due to slow network speeds while at sea.

## 18 AUTOMATIC SEQUENCE START

The Contractor shall provide contacts for automatic sequence starting and stopping of system auxiliaries. Initiation and display of sequence shall be provided in the control room console and bridge as per existing scheme.

- 18.1.1 Provide means to form a permissive function with contacts supplied by others from all necessary pre-conditions for each propulsion system with display of pre-conditions at the control room console .
  
- 18.1.2 Provide sequence for "OFF-READY-ON" selector switch located in main control console.
  - a) "OFF-TO-READY" Initiate the sequence to turn on Motor blowers and drive cooling system.
  - b) If all permissives met turns on Propulsion System Ready Light.
  - c) "READY-TO-ON"
  - d) When power is on , the control shall lift the suicide on the drive.
  - e) Turns on propulsion system ON light when drive is ready to go.
  - f) "ON-TO-READY"
  - g) If propulsion control lever is in stop position then suicides regulators.
  - h) "READY-TO-OFF"
  - i) shuts off motor and drive cooling ( if cooldown period required, cooling to stay on until manufacturer minimum determined temperature is achieved)
  
- 18.1.3 Provide means to automatically start spare drive cooling when the in use unit fails. The loss of drive cooling protection shall not trip drive until sufficient time has been allowed to start the standby unit. Successful start of the standby unit shall not cancel the alarm in the fault finder pertaining to the failed unit.
  
- 18.1.4 Provide status indicating signals by means of voltage free contacts for machinery control room console indicating lights for the following:
  - a) Motor stall
  - b) Propulsion system ready
  - c) Propulsion system fault
  - d) Propulsion system on

## 19 ENVIRONMENTAL REQUIREMENTS:

The equipment shall be designated for the following service conditions:

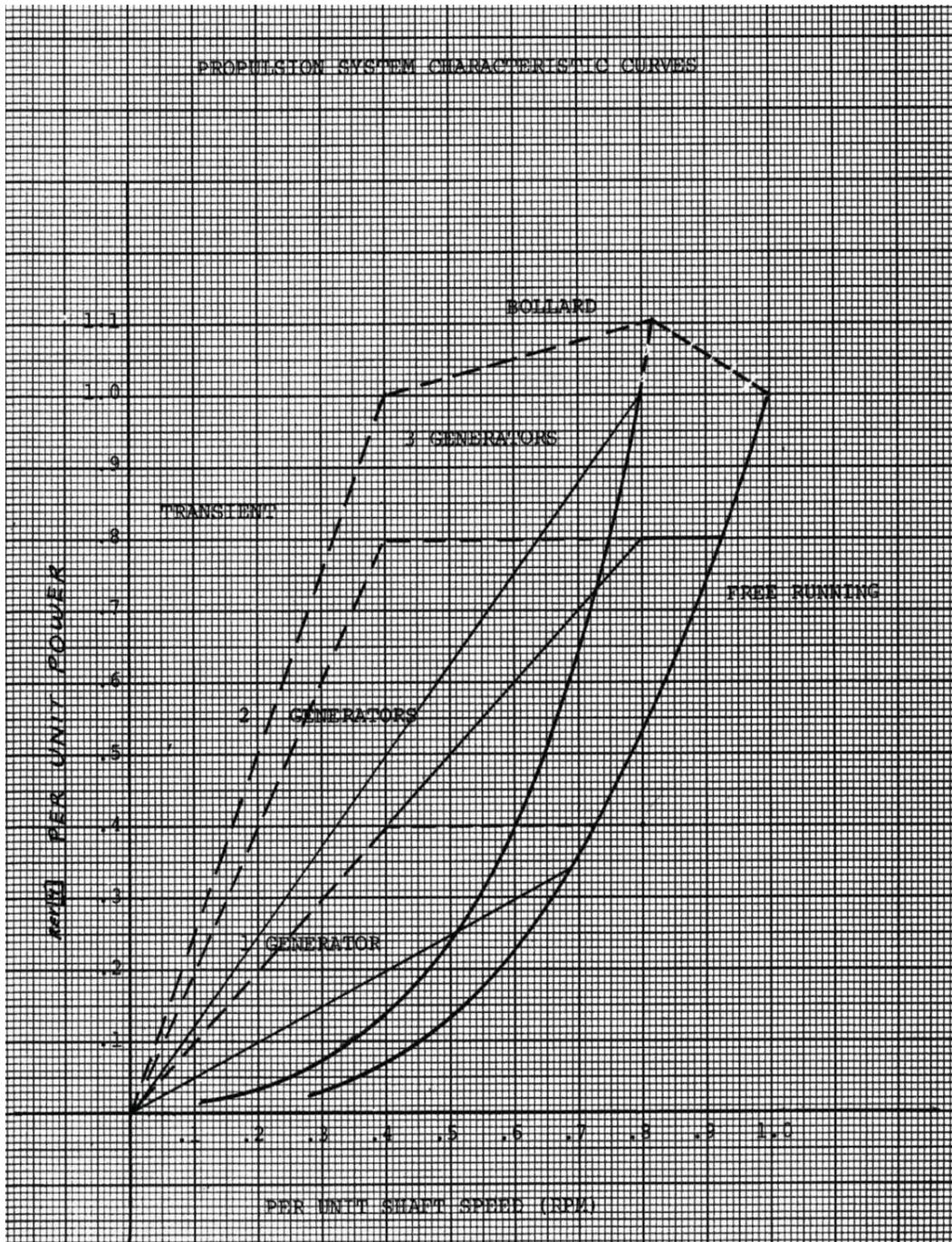
- a) Air temperature range of 0°C to 55°C and shall operate without deterioration in air temperature peaks up to 70°C.
- b) Water temperature, minus 2°C winter; 30°C summer.
- c) Inclination in all directions from the mounting position 22.5°, rolling 22.5°, 10 seconds full period; and linear vertical acceleration of  $\pm 1.0g$ .
- d) Under the following conditions of relative humidity: – 95% r. h. at temperatures up to 45°C; and – 70% r. h. at all other relevant temperatures.
- e) Shock loading: 2.5 g horizontal, 1.5 g vertical.
- f) Under the following vibration conditions: – 2.0 - 13.2 Hz, displacement amplitude  $\pm 1.0$  mm; – 13.2 - 80.0 Hz, acceleration amplitude  $\pm 0.7$  g, maximum acceleration .7 g natural frequencies at supports for equipment and parts of equipment shall not lie within the 0 - 80 Hz range, except that where they can not be kept outside this range by constructional design methods, the vibration shall be damped so that undue amplification is avoided.
- g) Any conditions not mentioned to follow most current version TP127E, section 22 or IEEE45.

## 20 TECHNICAL REQUIREMENTS

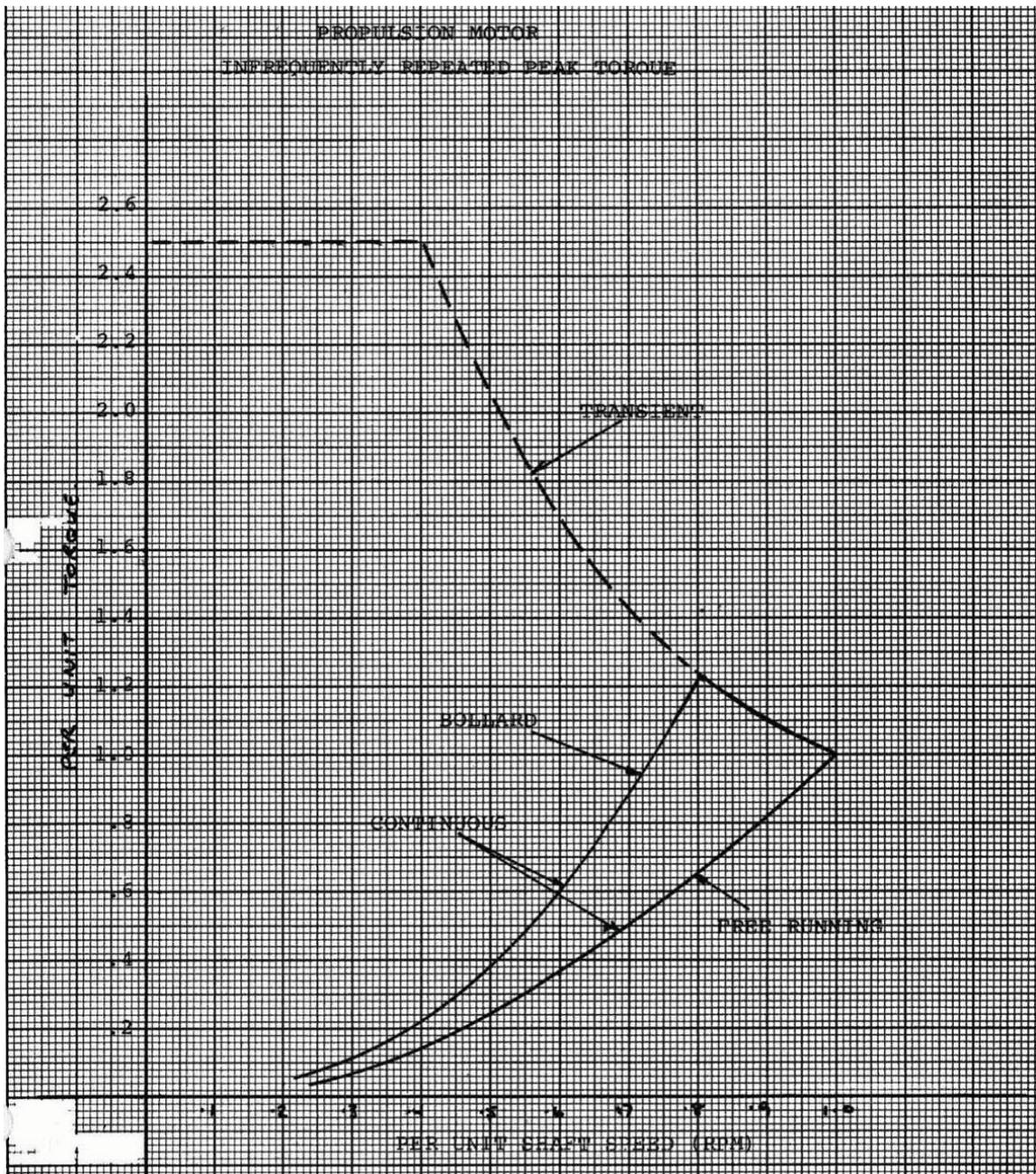
- 20.1.1 Nameplates - All devices are to be identified by nameplates of black plastic laminate with white engraved legend, in both English and French, English portion of nameplate to be in uppermost section of nameplate, and shall be adequately secured by means of screws to prevent loosening under conditions of heavy vibration.
- 20.1.2 All indicating lights to be Light Emitting Diode with test function available. All bridge lights to be dimmable. All other lights in control room and at drives shall not be dimmable. Colors applied to lights as per TP127E table 17-4.
- 20.1.3 Any existing Circuit breakers that need to be replaced to meet the requirements of the new propulsion system shall be at the cost of the contractor.
- 20.1.4 Existing wiring to be removed as identified in Section 22 . Existing cable glands or transits not used for new replacement wiring to be blanked off to ensure fire-proof and watertight integrity as defined by location and to the approval of the TA, Chief Engineer and TCMS.
- 20.1.5 All new cabling to be TC approved marine cable as per Section 13 of TP-127E. Installation shall be as per Section 13 of TP-127E. All cables to have integrated marine braid with outer PVC jacket where it passes through watertight bulkheads . This shall not apply to special communication cable used (ie: Canbus, Profibus, serial) All cables shall have non-corrosive metal tags identifying cables at every entry and exit point and transit location. Tags to be affixed using non-corrosive metal fasteners. Installation and cost of all new transits, cable trays, hangers and securing arrangements responsibility of contractor. All cables to be secured used metallic non-corrosive clips or ties. All cable routes to be approved by the TA and chief engineer before installation.

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- 20.1.6 Enclosures/Cabinets - All new enclosures and Cabinets are to be suitable for the location including driptrays and drip shields, handles and are to be approved by TCMS and the TA before installation. All existing cabinets that are to be re-used shall have new mounting plates/covers or doors fabricated of sufficient metal to retain existing panel integrity. Detailed plans to be submitted to the TA and Chief Engineer before approval .
- 20.1.7 The new drive to meet requirements of section 24 and 25 of TP127E .
- 20.1.8 The new drive to meet requirements of Power quality and harmonic distortion From IEEE45, 31.3.2
- 20.1.9 The existing sound powered telephone system to be incorporated into drive to permit communication with ECR, unless drive is proven to be not susceptible to interference from UHF or VHF radio transmissions
- 20.1.10 Software supplied for the operation of all new equipment shall be supplied with full licensed copies of software on disc/USB that can be installed and working onsite and off-line without contacting manufacturer due to unreliability of communications in the Arctic. Full electronic and printed versions of software including system nomenclature of all PLC programs shall be supplied. All master OEM passwords to enable or disable all functions of installed system to be provided to the TA and Chief Engineer. All computers and laptops used for normal use and maintenance/troubleshooting shall be provided with spare imaged hard drives per unit as per the final installed version.
- 20.1.11 Diagnostic Computers/special test gear (at contractors expense) shall be provided with appropriate communication software and cabling to monitor/diagnose/modify programming as needed. All special tools and test equipment needed for routine tests/calibration and maintenance to be provided at the contractors expense.
- 20.1.12 Spare 120volt electrically isolated outlets must be available for connecting powered test instruments.

21 DIAGRAMS

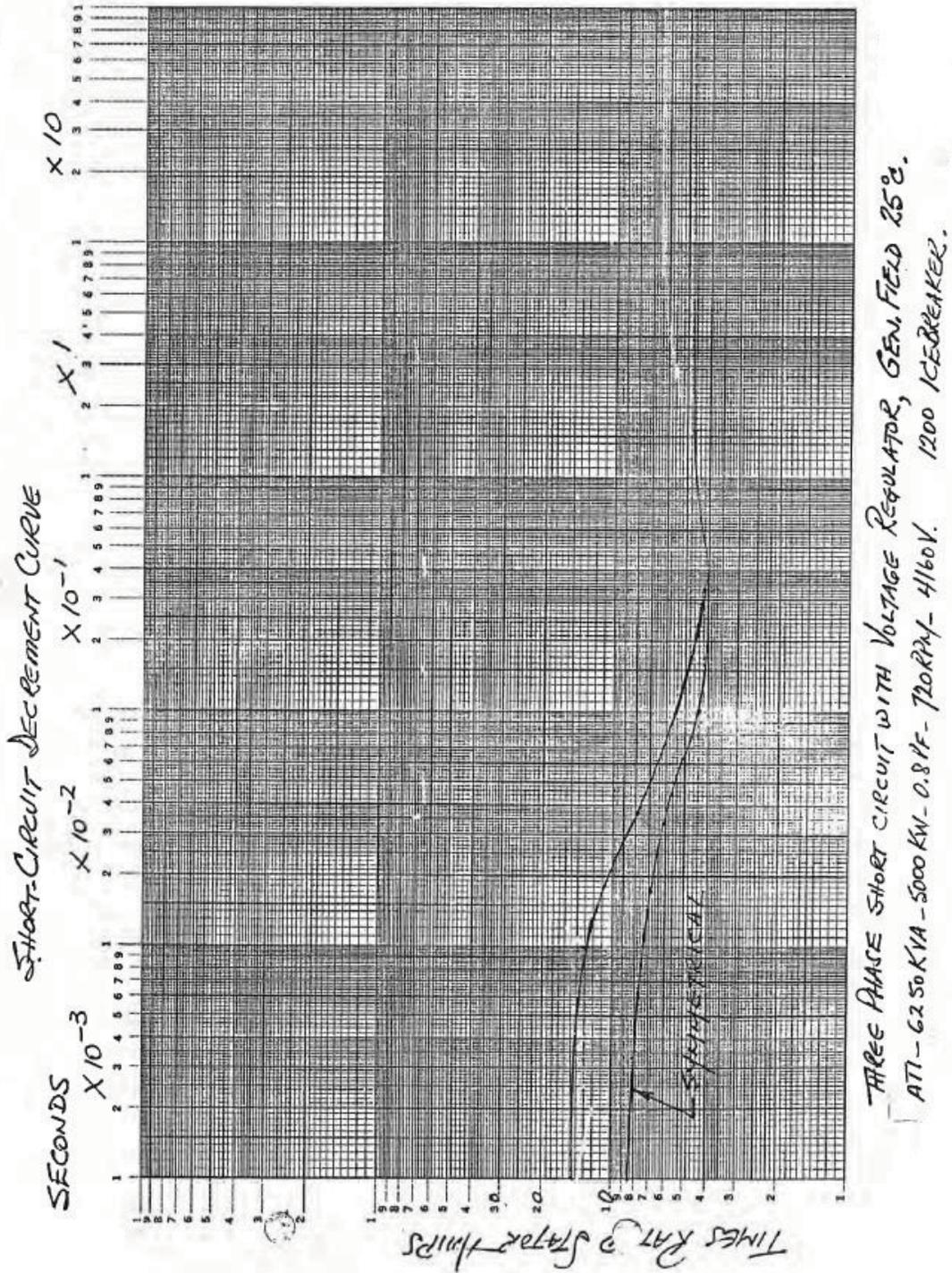


21.1 Propulsion System Characteristic Curves Figure 9



21.2 Propulsion Motor Infrequently Repeated Peak Torque Figure 10

21.3 Generator Exciter short Circuit Decrement curve Figure 11



22 EXISTING WIRING CONNECTIONS TO BE REMOVED BY THE CONTRACTOR

Cable identification sheet

Cable Identifier and type	Equipment	Starting location/ Deck and space	Terminal # if applicable	DWG Number	Termination location/ deck and space	Dwg number	Cable purpose	Terminal # if applicable
PP-148 , 6C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, #20-21	34-0826-01 sht 20	Sbd CCV excitation unit	34-0826-01 sht 23	unknown	
PP-165, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBB term 19-, 20	34-0826-01 sht 20	Port wing console/WH	34-0842-02	Shaft RPM	
PP-166, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBB term 22-23	34-0826-01 sht 20	stbd wing console/WH	34-0842-02	Shaft RPM	
PP-127A, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG term 5-6	34-0826-01 sht 20	HTG contactor Pnl P-521	34-0800-14 sht 23	Prop motor condensation htr control reference	term 22-23
PP-133 , 2C #16 Correct	Port CCV Excitation	Lower deck Aft -Motor room	1TBA term 25,26,27	34-0826-01 sht 20	W/H center console	34-0842-01	W/H center console - Port telegraph	TB20 Term 45&47 TB21 Term 101,103,105,107 EP-101-9 One leg (coil) other leg TB 25, VPS16 TB21 Term 78,79
PP-140, 8C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE term 36, 37	34-0826-01 sht 20	W/H center console	34-0842-01	PDRVON, PSTALL, p100%Pwr Limit Relays	
PP-163, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBB TERM 16,17,18	34-0826-01 sht 20	W/H center console	34-0842-01	Port Shaft RPM	
PP-116, 8C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE TERM 12-17	34-0826-01 sht 20	MCR console , control rm	34-0841-01 sht 6 & 7	ECR console off - ready- run	TB7 -39,40, TB9-74,75,77,79
PP-132, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 22,23,24	34-0826-01 sht 20	MCR console, control rm	34-0841-01 sht 6	Telegraph Pot (Port Shaft) Speed Ref	TB9 - 5,7
PP-135, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBB TERM 13,14,15	34-0826-01 sht 20	MCR console , control rm	34-0841-01 sht 6	WRONG WAY ALARM	TB9 - 79,80
PP-139, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBB TERM 10,11,12	34-0826-01 sht 20	MCR console , control rm	34-0841-01 sht 11	EVENT RECORDER	TB10 -5,6
PP-160, 16C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 9,10,12,14,16,18,20	34-0826-01 sht 20	MCR console , control rm	34-0841-01 sht 9,10	propulsion indicating lights, P & S excitation interlock	TB4 -38-41, TB1A-24
PP-138A, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 9,10	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 10	Breaker trip contacts	TB3 - 1023, 1022
PP-105, 2C#14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 1,2	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 8	Cross Current Compensation/ Breaker Close	TB5, -VPS1-1390 & 1377
PP-106, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 3,4	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 8	Cross Current Compensation/ Breaker Close	TB5 VPS1-1/891 & 877
PP-107, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 5,6	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 3	Cross Current Compensation/ Breaker Close	TB5 VSP1-1/390 & 377
PP-108, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 7,8	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 7	Propulsion con/indication/interlock	TB1 761 RELAY CR2
PP-111A, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 9,11	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 10,11	Breaker closed status contact	TB1-B35 (x2)
PP-123, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 4,5	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 9	Total KW from switchgear	TB2-WTP,WTN
PP-124, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 7,8	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 9	Total Amps from switchgear	TB2 FTP & FTN
PP-125, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 10,11	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 9	Line frequency from switchgear	TB2 ITP & ITN
PP-128, 12C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 21,46	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 10	T1 & T2 TR PERM, Main switchboard test	TB3 1002 & 1002A
PP-129, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 21,22	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02 Sht 13	Reverse Pwr Relay Contacts Both CCV's	TB5 1324 & 1325
PP-130, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 23,24	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 8	NC Reverse power contacts from both sides	TB3 824 & 825
PP-131, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 25,26	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 3	NC Reverse power contacts from both sides	TB3 324 & 325
PP-138, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 13,14	34-0826-01 sht 20	Main SWBD, control rm	34-0800-02, sht 11	Beaker trip contacts	TB3 1122 & 1123
P-SSB-C30, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 16,17	34-0826-01 sht 20	SS Swbd, control room	34-0800-03, sht 2	RPM adjustment pot (centre console)	VPS3 & 2-19
PP-109, 20C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 25-40	34-0826-01 sht 20	Port Vital MCC, control rm	34-0800-05, shts	Port propulsion blowers running signal	term 5,6 all sheets

PP-126, 20C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 23-34 3TBF, Term 35,36,39-44, 3TBG, Term 1-4, 7-8,11-12	34-0826-01 sht 20	Port Vital MCC, control rm	10-17 34-0800-05, shts 11-13	Port prop blowers, start/stop	Term 1A,2,3,VSP1 all sheets
PP-126A, 20C #14	Port CCV Excitation	Lower deck Aft -Motor room		34-0826-01 sht 20	Port Vital MCC, control rm	34-0800-05, shts 14-17	Port prop blowers, start/stop	Term 1A,2,3,VSP1 all sheets
PP-110, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 41-42	34-0826-01 sht 20	Sbtd Vital MCC, control rm	34-0800-06, sht 8	Sbtd propulsion blower running signal	Term 6 and 5
PP-104, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 43-44	34-0826-01 sht 20	MCC #3, control room	34-0800-09, sht 9	Sbtd propulsion blower running signal	Term 6 and 5
PP-113, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 16,17	34-0826-01 sht 20	Prop xfmr T1	34-0826-01 sht 8	T1 Fan control	TB3, T3, T16
PP-112-3-1, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 45,46	34-0826-01 sht 20	Prop xfmr T1	34-0826-01 sht 8	T1 Fan control	TB1, L4, spare
PP-114, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 14,15	34-0826-01 sht 20	Prop xfmr T2	34-0826-01 sht 9	T2 Fan control	TB3, T3, T16
P-112-6-1, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 27,28	34-0826-01 sht 20	Prop xfmr T2	34-0826-01 sht 9	T2 Fan control	TB1, L4, spare
P206-7-1, 3C #12	Port CCV Excitation	Lower deck Aft -Motor room	3TBC, Term 1-3	34-0826-01 sht 20	Power panel P-206, junction box in prop mtr room???	32-0800-18	Anti condensation heat	Junction box (shared with sbtd and card test panel)
EL-101-14, 2C #12	Port CCV Excitation	Lower deck Aft -Motor room	3TBA, Term 1.2	34-0826-01 sht 20	Power panel EL-101-14	32-0880-08	Cubicle lighting	
EL-101-15, 2C #12	Port CCV Excitation	Lower deck Aft -Motor room	3TBB, Term 1,2	34-0826-01 sht 20	Power panel EL-101-15	32-0880-08	Cubicle receptacle	
Ea-1u1/7, 4c #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 15-18	34-0826-01 sht 20	LSU #1, prop mtr rm, tank top	34-0832-01 sht 6	Port cv fault & new fault	X10, Term 1,2
PP-149, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 34-36	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	STBD???? Telegraph speed ref	1TBA, Term 28-30
PP-150A, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 1, 7	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Port Field Healthy	3TBD, Term 1, 2
PP-156, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 22, 23	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Power feed	3TBD, Term 2,3
PP-157, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 28-30	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Port Field Current Ref	1TBA, Term 16-18
PP-160A, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 1-2	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Contact for power limit	3TBD, Term 5,6
PP-223, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 4-6	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Total KW from switchgear	1TBA, Term 4-6
PP-224, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 7-9	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Total Amps from switchgear	1TBA, Term 7-9
PP-225, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 10-12	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Line frequency from switchgear	1TBA, Term 10-12
P-256, 4C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 45, 3TBG, Term 34-36	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Low speed and reverse power output relays (S6), power limit light 110%	3TBD, Term 23, 3TBE, Term 24-26
PP-257, 12C #14	Port CCV Excitation	Lower deck Aft -Motor room	2TBA, Term 1-12	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Port/ Spare exciter supply for interlocking	2TBA, Term 1-12
PP-258, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 38,39	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Contact "PFLDX", Spare excitation contactor	3TBG, Term 35,36
PP-249, 2C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 31-33 3TBE, Terms,	34-0826-01 sht 20	Sbtd CCV excitation unit	34-0826-01 sht 23	Port telegraph speed ref. (centre console)	1TBA, Term 31-33
PP-152, 2C #14	Port CCV Excitation	Lower deck Aft -Motor room	24,25,27,29,31,33,35	34-0826-01 sht 20	Port CCV Fan cubicle #1	34-0826-01 sht 18	Fan control	3TBB, Term 1-7
PP-TEL/1 4C #16	Port CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 1-3	34-0826-01 sht 20	CCV unit #6	34-0826-01 sht 17	Sound powered telephone	1TBA, Term 16-18
PP-127, 6C #14	Port CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 37-38, 3TGB, Term 5-6	34-0826-01 sht 20	CCV Fan cubicle #1	34-0826-01 sht 18	Fan control	MTBA, Term 3,5,7,8

PP-128A, 4C #14	Port CCV Excitation	Lower deck Aft-Motor room	3TBF, Term 21,45, 3TBF, Term 20,33	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	T1 & T2 High voltage permission drive island stop	3TBA, Term 30,31,42,43
PP-141, 2C #16	Port CCV Excitation	Lower deck Aft-Motor room	1TBB, Term 7-9	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	Tach Feed back to vector controller	1TBA, Term 37-39
PP-142, 2C #16	Port CCV Excitation	Lower deck Aft-Motor room	1TBB, Term 4-6 3TBD, Term 1-13,18,19,24,45	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	RPM Gauge in MEM panel	1TBA, Term 34-36
PP-150, 20C #14	Port CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 10,16	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	Various S-6 Inputs	3TBA, Term 9,10,12,13,16-29,35,36
PP-154, 2C #16	Port CCV Excitation	Lower deck Aft-Motor room	3TGB, Term 29-30	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	Excitation Amp Meter	3TBB, Term 1-2
PP-155, 2C #16	Port CCV Excitation	Lower deck Aft-Motor room	3TGB, Term 31-32	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	Excitation Volt Meter	3TBB, Term 3-4
PP-151, SPECIAL COM	Port CCV Excitation	Lower deck Aft-Motor room	Rack1 (1/0) Series six	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	Communication to MEM in CCV	DS-3820 transition module
PP-101, 2C #14	Port CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 18,19	34-0826-01 sht 20	Port Propulsion motor	34-0826-01 sht 24	Shaft brake limit switch	Term 1 & 2 at limit
PP-102, 2C #14	Port CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 20,21	34-0826-01 sht 20	Port Propulsion motor	34-0826-01 sht 24	Shaft turning gear	Term 1 & 2 at limit
PP-103, 2C #14	Port CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 22,23	34-0826-01 sht 20	Port Propulsion motor	34-0826-01 sht 24	Cooling water flow switch	Term 1 & 2 at switch
PP-134, 2C #16	Port CCV Excitation	Lower deck Aft-Motor room	1TBB, Term 1,2	34-0826-01 sht 20	Port Propulsion motor	34-0826-01 sht 24	Tachometer	Term 1+, Term 2 -ve
PP-146, 2TW #16	Port CCV Excitation	Lower deck Aft-Motor room	1TBC, Term 1-6	34-0826-01 sht 20	Stbd CCV excitation unit	34-0826-01 sht 23	Stbd CCV excitation cubicle unit #3-5-6 Analog out power limit to other side	1TBC, Term 1-6
PP-147, 4TW #16	Port CCV Excitation	Lower deck Aft-Motor room	MTBB, Term 2-4, 7-9, 12-14	34-0826-01 sht 20	Stbd CCV excitation unit	34-0826-01 sht 23	Stbd CCV excitation cubicle unit #3-5-6 Spare exciter supply for interlocking	MTBB, Term 2-4, 7-9, 12-14
PP-145, 1TW, #16	Port CCV Excitation	Lower deck Aft-Motor room	1TBC, Term 7-9	34-0826-01 sht 20	CCV unit #9	34-0826-01 sht 14	Port CCV unit#9- MCR average power meter	03HX 1FM2, Term 4-5
EC-303, 4TW #16	Port CCV Excitation	Lower deck Aft-Motor room	1TBA, Term 13-15	34-0826-01 sht 20	MCR cubicle C4	34-0831-01 sht 2,15	Crash stop signal	X64, Term 2, X2, Term 13
PP-265, 1TW pr #16	Stbd CCV Excitation	Lower deck Aft-Motor room	1TBB, Term 19-21	34-0826-01 sht 23	W/H wing consoles Port	34-0842-02 sht 2	SHAFT rpm W/H WING CONSOLE Correct	TB30, Term 21,22
PP-266, 1TW pr #16	Stbd CCV Excitation	Lower deck Aft-Motor room	1TBB, Term 22-24	34-0826-01 sht 23	W/H wing consoles Stbd	34-0842-02 sht 5	SHAFT RPM W/H WING CONSOLE Correct	TB40, Term 21,22
PP-233, 1TW pr #16	Stbd CCV Excitation	Lower deck Aft-Motor room	1TBA, Term 22-24 2TBA, Term 4, 3TBE, Term 40, 3TBF, Term 19-20	34-0826-01 sht 23	W/H Center Console	34-0842-01	W/H center console-telegraph pot (Stbd shaft) speed ref. Mounted on end common shaft crawl space	TB 20 Term 92,94
PP-240, 6c #14	Stbd CCV Excitation	Lower deck Aft-Motor room	3TBF, Term 5,6 Stbd Prop Control Cubicle	34-0826-01 sht 23	W/H Center Console	34-0842-01 Sht 4	Stbd Stall Relay W/H Center Console and Stbd Prop O/L Relay	TB21 Term 106, Term VPS1, 129
PP-227A, 2C #14	Stbd CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 12-17	34-0826-01 sht 23	HTG contactor panel P521	34-0800-14 sh 23	STBD Prop mtr anti-condensation heat control to W/H transfer	Term 24-25
PP-216, 8C #14	Stbd CCV Excitation	Lower deck Aft-Motor room	1TBA, Term 19-21	34-0826-01 sht 23	E/R Console	32-0841-01 sht 6	ECR CONSOLE-Off-Ready-Run E/R to W/H transfer	TB9, Term 41,42
PP-232, 1TW pr #16	Stbd CCV Excitation	Lower deck Aft-Motor room	1TBB, Term 10-12	34-0826-01 sht 23	E/R Console	32-0841-01 sht 6	ECR CONSOLE-telegraph pot (Stbd Shaft) Speed ref	TB9, Term 14, 16,23
PP-239, 1TW pr #16	Stbd CCV Excitation	Lower deck Aft-Motor room	3TBF, Term 9-14, 3TBF, Term 7-8,10,12,14,16,18, 3TBE, Term 43	34-0826-01 sht 23	E/R Console	32-0841-01 sht 11	EVENT RECORDER ECR WING CONSOLE	TB10, Term 11,12
PP-260, 16C #14	Stbd CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 1-2	34-0826-01 sht 23	E/R Console	32-0841-01 sht 9	MCR propulsion indicating lights, P & S excitation interlocks	TB4, Term 42-44
PP-205, 2C #14	Stbd CCV Excitation	Lower deck Aft-Motor room	3TBE, Term 1-2	34-0826-01 sht 23	E/R Console	32-0841-01	Breaker Close 3361 contacts G1 Online	Cell 13, TB5, Term 1379 & VSP2

PP-206, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 3-4	34-0826-01 sht 23	Main Switchboard	34-0800-02 sht 8	Breaker Close 33G2 contacts G2Online	Cell 8, TB5, Term 879 & VSP2
PP-207, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 5-6	34-0826-01 sht 23	Main Switchboard, MCR	34-0800-02 sht 3	Breaker Close 33G3contacts G3Online	Cell 3, TB5, Term 379 & VSP2
PP-208, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 7-8	34-0826-01 sht 23	Main Switchboard, MCR	34-0800-02 sht 7,8	RELAY CR2, CELL 7-AG 1 online	Cell 7, TB1, Term 763 TB5, 879
PP-211A, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 9,11	34-0826-01 sht 23	Main Switchboard, MCR	34-0800-02 sht 5	T3 & T4 breaker closed status contact	Cell 6, TB1, Term 835 TB5, 879
PP-228, 12C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 43,45, 3TBG, Term 31-32, 41-44	34-0826-01 sht 23	Main Switchboard, MCR	34-0800-02 sht 5	T3 & T4 TR PERM, main switchboard test contacts	Cell 5, TB3, Term 502 & 502A
PP-238, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 9-10	34-0826-01 sht 23	Main Switchboard, MCR	34-0800-02 sht 5	T3 breaker trip contact	Cell 5, TB3, Term 522 & 523
PP-238A, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 25-26	34-0826-01 sht 23	Main Switchboard, MCR	34-0800-02	T4 breaker trip contact	Cell 6, TB3, Term 622 & 623
PP-210, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 41-42	34-0826-01 sht 23	Port Vital MCC, MCR	34-0800-05	CCV Blower running signal	
PP-209, 20C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 27-40, 43-44	34-0826-01 sht 23	Stbd Vital MCC, control rm	34-0800-06	stbd propulsion blowers running signal	
PP-226, 20C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 21-32	34-0826-01 sht 23	Stbd Vital MCC, control rm	34-0800-06	stbd propulsion blowers start/stop signal	
PP-226A, 20C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 33-34,37-42, 3TBG, Term 1-8	34-0826-01 sht 23	Stbd Vital MCC, control rm	34-0800-06	stbd propulsion blowers start/stop signal	
PP-204, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 45-46	34-0826-01 sht 23	MCC #3, control room	34-0800-09	CCV Stby blower run signal	
PP-213, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBD, Term 21-22	34-0826-01 sht 23	T3, Prop mtr room	34-0826-01 sht 10	MCC #3	
P-112-9-1, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 29-30	34-0826-01 sht 23	T3, Prop mtr room	34-0826-01 sht 10	T3 Fan control	TB3, Term T3, T16
PP-214, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 27-28	34-0826-01 sht 23	T4, Prop mtr room	34-0826-01 sht 11	T3 Fan control	TB1, L4, spare
PP-112-12-1, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 19-20	34-0826-01 sht 23	Heating compartment panel P206	34-0800-18	T4 Fan control	TB3, Term T3, T16
P206-7-2, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBB, Term 1,2	34-0826-01 sht 23	Panel EI-101, control rm	32-0880-08	T4 Fan control	TB1, L4, spare
EL-101-15, 2C #12	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBA, Term 1,2	34-0826-01 sht 23	Panel EI-101, control rm	32-0880-08	T4 Fan control	TB3, Term T3, T16
EA-LU1/32, 4C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 13-16 27,28,30,32,34,36,38	34-0826-01 sht 23	Prop mtr room, LU1	34-0832-01 sht 6	anti-condensation heaters power	TB1, L4, spare
PP-252, 12C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 13-15	34-0826-01 sht 23	Prop mtr room	34-0826-01 sht 18	Exciter and ccv receptacles Cyclo Fault-Converter fault/ New fault	x903 4 & 6
PP-167, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 1-3	34-0826-01 sht 23	Prop mtr room	34-0826-01 sht 14	Fan cubicle unit #1	3TB, Term 11-17
PP-TEL/2 2TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBF, Term 43-44, 3TBG, Term 32-33	34-0826-01 sht 23	Prop mtr room	34-0826-01 sht 17	Port CCV Unit 9- Port field current ref	03HX, Term 10,12
PP-228A, 4C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBB, Term 7-9	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	Sound powered telephone CCV unit 6-Phone 2 controller cubicle	1TBA, Term 16-18
PP-241, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBB, Term 4-6	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	T3 & T4 high voltage permission Drive Island stop	3TBA, Term 37-40
PP-242, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 10,16, 3TBD, Term 1,8-18, 25-26, 3TBH, Term 15-17	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	Tach feed back to vector controller	1TBA, Term 37-39
PP-250, 20C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	Rack1 (1/0) Series six	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	RPM Gauge in MEM panel	1TBA, Term 34-36
PP-251 (CGE special cable)	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 19-20	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	Various S-6 Inputs	3TBA, Term, 9,10,12,13,16-26
PP-254, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 19-20	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	CGE Special Cable, CCV Unit 6	DS-3820 transition module
								3TB, Term 1-2

PP-255, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 21-22	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	Excitation Volt Meter	3TB, Term 3-4
PP-267, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBA, Term 25-17	34-0826-01 sht 23	CCV unit # 6, Prop mtr room	34-0826-01 sht 17	Stbd field current ref	04HX, Term 10,12
PP-227, 6C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBG, Term 23-14	34-0826-01 sht 23	CCV unit #1, Prop mtr room	34-0826-01 sht 18	anti-condensation heaters	MTBA, Term 4,6,9,10
PP-201, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 18-19	34-0826-01 sht 23	Stbd Propulsion motor	34-0826-01 sht 25	Shaft Brake limit switch	Limit switch terminals
PP-202, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 20-21	34-0826-01 sht 23	Stbd Propulsion motor	34-0826-01 sht 25	Shaft turning gear limit switch	Limit switch terminals
PP-203, 2C #14	Stbd CCV Excitation	Lower deck Aft -Motor room	3TBE, Term 20-21	34-0826-01 sht 23	Stbd Propulsion motor	34-0826-01 sht 25	Cooling water flow switch	Limit switch terminals
PP-234, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBB, Term 1-3	34-0826-01 sht 23	Stbd Propulsion motor	34-0826-01 sht 25	Tachometer feedback	Tach junction box
PP-245, 1TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	1TBC, Term 7-9	34-0826-01 sht 23	Stbd CCV unit#6	34-0826-01 sht 17	Average Motor Power from Stbd CCV	04HX, Term 4,5
PP-247, 4TW #16	Stbd CCV Excitation	Lower deck Aft -Motor room	MTBB, Term 2-4	34-0826-01 sht 23	ECR Console	34-0841-01 sht 13	M/E Tacho, M/E Despermes PME,CME,SME	Term 25,26,13
PP-233A, 1TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	1TBA, Term 31-33	34-0826-01 sht 17	w/h Center Console	34-0842-01 Sht 4	Stbd Telegraph reference	Term 20 Term 91,93
PP-232A, 1TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	1TBA, Term 28-30	34-0826-01 sht 17	ECR Console	34-0841-01 sht 6	Stbd Telegraph reference	Term 13, 15
PP-261, 1TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	04HX, Term 1,2	34-0826-01 sht 17	ECR Console	34-0841-01 sht 10	MCR console power meter	Term 15, 16
PP-211, 2C #14	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBA, Term 8,11	34-0826-01 sht 17	Main SWBD cell 5, control rm	34-0800-02 sht 5 & 6	T3 & T4 transormer breaker open	TB1, Term 845, TB1, Term B46
PP-217, 24TW, 12PR	Stbd CCV UNIT 6	Lower deck Aft -Motor room	2TBA, Term 1,4-7,10-12, 2TBB, Term 1,4-6,10-12, 2TBC, Term 4-6,10-12	34-0826-01 sht 17	Relay cabinet, control room	34-0800-02 sht 16	Transformer differential??	TB1, Term 6A101-303
PP-220, 2 TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBA, Term 5-7	34-0826-01 sht 17	Main SWBD cell 5, control rm	34-0800-02 Sht 5	120 Vac from Synchronising Buss Cell 9	TB3, Term 2BV 20,21,23
EL-101-14, 2C #12	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBD, Term 1-2	34-0826-01 sht 17	Panel EI-101, control rm	32-0880-08	Exciter and CCV lighting	Breaker 14
EL-101-15, 2C #12	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBE, Term 1-2	34-0826-01 sht 17	Panel EI-101, control rm	32-0880-08	Exciter and CCV receptacles	Breaker 15
P-206-6, 3C #12	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBF, Term 1-3	34-0826-01 sht 17	Panel P-206, heating comp	32-0800-18	anti-condensation heaters	Breaker 6
EA-LUJ/34, 2C #14	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBA, Term 30,31	34-0826-01 sht 17	Prop mtr room, LU1	34-0832-01 sht 5 & 6	Stbd motor ground fault? Neutral ground voltage low set point	X10, Term 3, X903, Term 9
PP-507, 3C #8	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBA, Term 43-45	34-0826-01 sht 17	Stbd excitation unit #2	34-0826-01 sht 22	Drive control power bus tie (Spare exciter/control power)	4TBA, Term 1-3
PP-221, 4TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	1TBA, Term 1-9	34-0826-01 sht 17	Stbd Propulsion motor	34-0826-01 sht 25	High voltage isolator	Term 1-9
PP-222, 2C #14	Stbd CCV UNIT 6	Lower deck Aft -Motor room	3TBA, Term 14,15	34-0826-01 sht 17	Stbd Propulsion motor	34-0826-01 sht 25	High voltage isolator	Term 1,2
PP-236, 16TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	04HX, Term 2-25, 1TBE, Term 1-6	34-0826-01 sht 17	Stbd Propulsion motor	34-0826-01 sht 25	Encoder	2TB, Term 1-11, 14
PP-237, 2TW #16	Stbd CCV UNIT 6	Lower deck Aft -Motor room	1TBA, 25-27	34-0826-01 sht 17	Stbd Propulsion motor	34-0826-01 sht 25	Encoder	1TB, Term 1-14
PP-133A, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	1TBA, Term 31-33	34-0826-01 SHT 14	W/H Center Console	34-0842-01 Sht 4	W/H center console-telegraph pot (Stbd shaft) speed ref.	TB 20 Term 44,46
PP-132A, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	1TBA, Term 28-30	34-0826-01 SHT 14	ECR Console	34-0841-01	ECR Console, Port telegraph reference	TB9, Term 760-52P, 760-50P
PP-161, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	03HX, Term 1-2	34-0826-01 SHT 14	ECR Console	34-0841-01	Port average power meter	TB5, Term 9,10, 376
PP-111, 2C #14	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 8,11	34-0826-01 SHT 14	Main SWBD cell 10, control rm	34-0800-02 sht 10	Transformer T2 breaker close contact	TB1, Term B46

PP-117, 24TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	2TBA, Term 4-6, 10-12, 2TBB, Term 4-6, 10-12, 2TBC, Term 4-6, 10-12	34-0826-01 SHT 14	Relay cabinet, control rm	34-0800-02 sht 16, Siemens 41162236-00	Transformer differential connections	TB1, Term 11A101-11A100, 10A101-10A100
PP-118, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 1-2	34-0826-01 SHT 14	Main SWBD cell 10, control rm	34-0800-02 sht 10	Transformer T2 CT connections	TB2, Term 10X11, 10X21
PP-119, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 3-4	34-0826-01 SHT 14	Main SWBD cell 10, control rm	34-0800-02 sht 10	Transformer T2 CT connections	TB2, Term 10X12, 10X22
PP-120, 2TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 5-7	34-0826-01 SHT 14	Main SWBD cell 5, control rm	34-0800-02 sht 5	Xfmr T3 4160/120 control connections	TB3, Term 28V11-13
PP-218, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBC, Term 1-2	34-0826-01 SHT 14	Main SWBD cell 5, control rm	34-0800-02 sht 5	Transformer T3 CT connections	TB2, Term 5X11, 5X21
PP-219, 1TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBC, Term 3-4	34-0826-01 SHT 14	Main SWBD cell 5, control rm	34-0800-02 sht 5	Transformer T3 CT connections	TB2, Term 5X12, 5X22
Ea-Lu1/9, 2c #14	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 40-41	34-0826-01 SHT 14	Prop mtr room, LU1	34-0832-01 sht 5 & 6	Neutral ground voltage	X10, Term 3, X903, Term 8
PP-506, 3C #8	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 44-46	34-0826-01 SHT 14	Port exc unit, prop mtr rm	34-0826-01, sht 19	Spare exciter control power	4TBA, Term 7-9
PP-121, 4TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	1TBA, Term 1-9	34-0826-01 SHT 14	Port Propulsion Motor	34-0826-01, sht 24	High voltage isolator	Term 1-9
PP-122, 2C #14	Stbd CCV UNIT 9	Lower deck Aft -Motor room	3TBA, Term 14, 15	34-0826-01 SHT 14	Port Propulsion Motor	34-0826-01, sht 24	High voltage isolator	Term 1,2
PP-136, 16TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	03HK, Term 2-24, 1TBE, Term 1-6	34-0826-01 SHT 14	Port Propulsion Motor	34-0826-01, sht 24	Encoder	1TB, Term 1-14
PP-137, 2TW #16	Stbd CCV UNIT 9	Lower deck Aft -Motor room	1TBA, Term 1-9	34-0826-01 SHT 14	Port Propulsion Motor	34-0826-01, sht 24	Encoder	2TB, Term 1-11, 14
P-04001-EXC, 2C #14	Port Generator	Lower engine rm fwd	Term 1-2	34-0826-01 sht 2	Main Swbd cell 14	34-0800-02, sht 14	Field dc supply	VPS1, Term 13F+, 13F-
P-04002-EXC, 2C #14	Center Generator	Lower engine rm fwd	Term 1-2	34-0826-01 sht 4	Main Swbd cell 7	34-0800-02, sht 7	Field dc supply	VSP3, Term 8F+, 8F-
P-04001-EXC, 2C #14	Port Generator	Lower engine rm fwd	Term 1-2	34-0826-01 sht 2	Main Swbd cell 2	34-0800-02, sht 2	Field dc supply	VSP1, Term 3F+, 3F-
PP-1101-3, 6 x 1C #600MCM	Transformer T1	Lower deck Aft -Motor room	Z1, 1,2 Z2, 3,4 Z3, 5,6	34-0826-01 sht 8	Port Drive cubicle unit 11, L3	34-0826-01, sht 12	Cyclo port power converter C	L1, 1,2 L2, 3,4 L3, 5,6
PP-1101-2, 6 x 1C #600MCM	Transformer T1	Lower deck Aft -Motor room	Y1, 1,2 Y2, 3,4 Y3, 5,6	34-0826-01 sht 8	Port Drive cubicle unit 12, L3	34-0826-01, sht 12	Cyclo port power converter B	L1, 1,2 L2, 3,4 L3, 5,6
PP-1101-1, 6 x 1C #600MCM	Transformer T1	Lower deck Aft -Motor room	X1, 1,2 X2, 3,4 X3, 5,6	34-0826-01 sht 8	Port Drive cubicle unit 13, L3	34-0826-01, sht 12	Cyclo port power converter A	L1, 1,2 L2, 3,4 L3, 5,6
PP-1101-4, 6 x 1C #600MCM	Transformer T2	Lower deck Aft -Motor room	Z1, 1,2 Z2, 3,4 Z3, 5,6	34-0826-01 sht 9	Port Drive cubicle unit 11, L3	34-0826-01, sht 12	Cyclo port power converter A	L1, 1,2 L2, 3,4 L3, 5,6
PP-1101-5, 6 x 1C #600MCM	Transformer T2	Lower deck Aft -Motor room	Y1, 1,2 Y2, 3,4 Y3, 5,6	34-0826-01 sht 9	Port Drive cubicle unit 12, L3	34-0826-01, sht 12	Cyclo port power converter B	L1, 1,2 L2, 3,4 L3, 5,6
PP-1101-6, 6 x 1C #600MCM	Transformer T2	Lower deck Aft -Motor room	X1, 1,2 X2, 3,4 X3, 5,6	34-0826-01 sht 9	Port Drive cubicle unit 13, L3	34-0826-01, sht 12	Cyclo port power converter C	L1, 1,2 L2, 3,4 L3, 5,6
PP-1901 10 x 3C #350	Port CCV, unit 8	Lower deck Aft -Motor room	L1-L3 30 conductors	34-0826-01 sht 13	Port Propulsion motor	34-0826-01, sht 24	Port propulsion motor power	L1-L3 power
PP-112, 1C #10	Port CCV, unit 8	Lower deck Aft -Motor room	3UTBA, Term 1	34-0826-01 sht 13	Port Propulsion motor	34-0826-01, sht 24	Port propulsion motor neutral	Neutral
PP-1102-3, 6 x 1C #600MCM	Transformer T3	Lower deck Aft -Motor room	Z1, 1,2 Z2, 3,4 Z3, 5,6	34-0826-01 sht 10	Stbd Drive cubicle unit 11, L3	34-0826-01, sht 15	Cyclo Stbd power converter C	L1, 1,2 L2, 3,4 L3, 5,6
PP-1102-2, 6 x 1C #600MCM	Transformer T3	Lower deck Aft -Motor room	Y1, 1,2 Y2, 3,4 Y3, 5,6	34-0826-01 sht 10	Stbd Drive cubicle unit 12, L3	34-0826-01, sht 15	Cyclo Stbd power converter B	L1, 1,2 L2, 3,4 L3, 5,6

PP-1102-1, 6 x 1C #600MCM	Transformer T3	Lower deck Aft -Motor room	X1, 1,2 X3, 5,6	X2, 3,4	34-0826-01 sht 10	Stbd Drive cubicle unit 13, L3	34-0826-01, sht 15	Cyclo Stbd power converter A	L1, 1,2 L2, 3,4 L3, 5,6
PP-1102-4, 6 x 1C #600MCM	Transformer T4	Lower deck Aft -Motor room	Z1, 1,2 Z3, 5,6	Z2, 3,4	34-0826-01 sht 11	Stbd Drive cubicle unit 11, L3	34-0826-01, sht 15	Cyclo Stbd power converter A	L1, 1,2 L2, 3,4 L3, 5,6
PP-1102-5 6 x 1C #600MCM	Transformer T4	Lower deck Aft -Motor room	Y1, 1,2 Y3, 5,6	Y2, 3,4	34-0826-01 sht 11	Stbd Drive cubicle unit 12, L3	34-0826-01, sht 15	Cyclo Stbd power converter B	L1, 1,2 L2, 3,4 L3, 5,6
PP-1102-6, 6 x 1C #600MCM	Transformer T4	Lower deck Aft -Motor room	X1, 1,2 X3, 5,6	X2, 3,4	34-0826-01 sht 11	Stbd Drive cubicle unit 13, L3	34-0826-01, sht 15	Cyclo Stbd power converter C	L1, 1,2 L2, 3,4 L3, 5,6
PP-1902 10 x 3C #350	Stbd CCV, unit 8	Lower deck Aft -Motor room	L1-L3 30 conductors		34-0826-01 sht 16	Stbd Propulsion motor	34-0826-01, sht 25	Stbd propulsion motor power	L1-L3 power
PP-212, 1C #10	Stbd CCV, unit 8	Lower deck Aft -Motor room	3UTBA, Term 1		34-0826-01 sht 16	Stbd Propulsion motor	34-0826-01, sht 25	Stbd propulsion motor neutral	Neutral
PP-153, 4c, #14	CCV Fan Cubicle	Lower deck Aft -Motor room	3TBA, Term 1-4		34-0826-01 sht 18	Port vital MCC, control room	34-0800-05, sht 10	Port CCV Blower start/stop control	Term 1A, 1-3
P-0503-13, 3C #10	CCV Fan Cubicle	Lower deck Aft -Motor room	4TBA, Term 1-3		34-0826-01 sht 18	Port vital MCC, control room	34-0800-05, sht 10	Port Blower power	T1-T3
PP-253, 4c, #14	CCV Fan Cubicle	Lower deck Aft -Motor room	3TBA, Term 5-8		34-0826-01 sht 18	Stbd vital MCC, control room	34-0800-06, sht 8	Stbd Blower start/stop control	Term 1A, 1-3
P-0504-11, 3C #10	CCV Fan Cubicle	Lower deck Aft -Motor room	4TBA, Term 4-6		34-0826-01 sht 18	Stbd vital MCC, control room	34-0800-06, sht 8	Stbd Blower power	T1-T3
PP-158, 4C, #14	CCV Fan Cubicle	Lower deck Aft -Motor room	3TBA, Term 9-12		34-0826-01 sht 18	MCC #3, control room	34-0800-09, sht 9	Stby Blower start/stop control	Term 1A, 1-3
P-506-15, 3C #10	CCV Fan Cubicle	Lower deck Aft -Motor room	4TBA, Term 7-9		34-0826-01 sht 18	MCC #3, control room	34-0800-09, sht 9	Stby Blower power	T1-T3
PP-503A, 3x3C #4/0	Port Excitation Breaker	Lower deck Aft -Motor room	L1, L2, L3 outgoing		34-0826-01 sht 21	Stbd Excitation cubicle	34-0826-01, sht 21	Port Excitation Feed	02YA06J, 02YA08J, 02YA10I
PP-504A, 3x3C #4/0	Stbd excitation breaker	Lower deck Aft -Motor room	L1, L2, L3 outgoing		34-0826-01 sht 21	Stbd Excitation cubicle	34-0826-01, sht 21	Stbd Excitation Feed	02YA38J, 02YA40J, 02YA42J
PP-505B, 3 x3C #4/0	Stbd Excitation cubicle	Lower deck Aft -Motor room	02YA06J, 02YA08J, 02YA10J		34-0826-01 sht 21	Port Excitation cubicle, unit 5	34-0826-01, sht 19	Port Excitation Feed Control Power Crossover to other Exciter	02YA06J, 02YA08J, 02YA10I
PP-505C, 3c #4	Stbd Excitation cubicle	Lower deck Aft -Motor room	4TBA, 1-3		34-0826-01 sht 21	Port Excitation cubicle	34-0826-01, sht 19	Control Power Crossover to other Exciter	4TBA, Term 1-5 Unable to find these cable markings. Cables Bolted to common point 04WB06M, 04WB18N, 04WB30P
PP-505D, 2 x3C #4/0	Port Excitation cubicle #5	Lower deck Aft -Motor room	04WB06M, 04WB18N, 04WB30P		34-0826-01, sht 19	Stbd Excitation cubicle Unit 2	34-0826-01, sht 22	Spare excitation feed. Output from Spare Exciter	F1-F3 exciter connection box
PP-503-Exc, 2 x3C #4/0	Port Excitation cubicle #5	Lower deck Aft -Motor room	03VC06E, 03VC08E, 03VC10E		34-0826-01, sht 19	Port propulsion motor	34-0826-01, sht 24	Excitation to motor	F1-F3 exciter connection box
PP-504-Exc, 2 x3C #4/0	Stbd Excitation cubicle unit 2	Lower deck Aft -Motor room	04VC06E, 04VC08E, 04VC10E		34-0826-01, sht 22	Stbd propulsion motor	34-0826-01, sht 25	Excitation to motor	F1-F3 exciter connection box