**TC01307 - The Service and Repair of Direct Current ("DC") and Alternating Current ("AC") Electric Motors**

**DRAFT SPECIFICATION – SUBJECT TO CHANGE**

Below is a short excerpt from the specification within the Tender document. This is subject to amendment and is provided to give suppliers an indication of the works required to enable them to decide if this opportunity is of interest/suitable:

**CONTENTS**

 Introduction

1.0 Scope of Work

2.0 General repair / overhaul procedure

3.0 Assembly

4.0 Final testing

5.0 Final assembly and load testing

6.0 Inspection procedures

7.0 Cleaning procedures

8.0 Machining procedures

9.0 Document procedures

10.0 Painting specification

11.0 Lead times for repairs

12.0 Warranty

13.0 Emergency Response

14.0 Non-Performance/Unsatisfactory Performance

15.0 Site Visits

**INTRODUCTION**

Hutchison Ports (UK) Limited acting as agent for The Felixstowe Dock and Railway Company; Harwich International Port and Thamesport (London) Limited (“the Purchaser”) operates three Ports within the UK and the Services are required at all three namely the Port of Felixstowe (“PoF”), Suffolk, and to a lesser extent at Harwich International Port (“HIP”), Essex and London Thamesport (“LTP”), Rochester, Kent.

Each Port is operated by a separate subsidiary of Hutchison Ports (UK) Limited and each subsidiary company shall be responsible for meeting the obligations in the Agreement for their respective Port.

The term of the Agreement will be three (3) years unless terminated earlier in accordance with Clause 13 of the Form of Contract.

The Tenderer’s employees will be expected to attend a mandatory Port Health and Safety induction prior to obtaining a security pass. No access to secure areas shall be granted without the pass.

The Contractor’s performance will be measured in accordance with Key Performance Indicators, see Schedule 3 of the Form of Contract.

The Purchaser cannot guarantee the amount of Services that will be required.

Tenderers will be required to attend a site visit at the Port of Felixstowe prior to submitting their tender response. Prior to attendance Tenderers will be required to complete Health Declaration Forms. Additionally, as part of the tender adjudication process, the Purchaser may visit the Tenderers’ premises.

The Effective Date of the Agreement will be 1st October 2024.

**1.0 SCOPE OF WORK**

Introduction

1.1 The relevant Purchaser will notify the Tenderer by telephone call or email when the collection of a motor/alternator is required. The Purchaser will advise the Tenderer:

1. The Gate-pass number the motor/alternator has been allocated to (which must be quoted to the relevant Purchasers Stores personnel upon collection);

2. The Stock/Item number to be collected and its unique Port identification number;

3. Urgency and timescale in which the motor/alternator is to be collected (this will be detailed on the Gate-pass);

4. Brief details of the failure, if known.

The Tenderer will be required to:

 1. Collect the motor/alternator within the requested timescale;

 2. Strip and assess the motor/alternator;

3. Submit a report and firm price and advise the completion date for every job submitted in writing (including email) within 5 working days of the Contractor receiving a motor.

Upon receipt of assessment reports and quotations the Tenderer will be given authorisation to undertake the necessary repair work by the receipt of an official Purchase Order Number. No remedial work should be undertaken by the Tenderer without authorisation from the relevant Purchaser and the Purchaser reserves the right to withhold payment for any remedial work undertaken without authorisation.

1.2 All readings to be taken with certified testing equipment and recorded. All readings to be submitted along with final test documentation.

High voltage testing of encoders/AVR units should be avoided, as this will harm internal components.

The Tenderer shall carry out the Services at its own premises, the Tenderer will transport the equipment from and to the relevant Port the costs for which are included in the Charges detailed in Appendix 2.

No equipment shall be removed from the Port(s) or returned to the Port(s) without first reporting to the relevant Purchaser’s Stores Department.

* 1. Service and repairs shall consist of:-
* Transport (both collection and delivery from/to the relevant Port);
* Test readings (prior to and after repair);
* Basic overhauls;
* Rewinds where necessary;
* Mechanical repairs where necessary;
* Balance where necessary;
* Modifications on instruction from the Purchaser;
* Load testing; and
* Documentation.
	1. The Tenderer shall provide all materials including bearings and brushes.
	2. A basic overhaul shall consist of:-
* Transport (both collection and delivery);
* Dismantle, clean and check;
* Clean brush gear;
* Supply and fit specified carbon brushes;
* Skim and undercut commutator if required;
* Supply all bearings and seals (the Purchaser reserves the right to provide these as “Free Issue” items);
* Fit shaft fitment (provided by the Purchaser);
* Clean, wash, dry out and re-vanish all winding assemblies;
* Assemble, check and re-paint;
* Testing in accordance with paragraphs 4 and 5;
* Test readings and documentation.
	1. Motors shall be securely tied down using a minimum of two (2) bands on to a suitable pallet prior to delivery. The pallet shall be suitable for off-loading by the Purchaser by forklift truck.

The pallets shall be provided free of charge by the relevant Purchaser.

The bands shall be provided by the Tenderer.

**2.0 GENERAL REPAIR /OVERHAUL PROCEDURES**

* 1. Dismantle the machine taking note of all obvious defects and any special or non-standard items of associated equipment. Internal and external connections are to be sketched and diagrams made of connections within the machine and recorded. All relevant parts should be identified and recorded listing the appropriate information. Bearings details and brush grades along with their conditions are to be recorded. Proof mark all relevant parts. The correct polarisation to be preserved on reassembly.
	2. Check all mechanical components and record any defects found, all parts are to be thoroughly cleaned, prepared and painted with anti-tracking paint where applicable.
	3. Test armature windings for continuity and insulation resistance by means of certified testing equipment. Visually inspect and record all defects. Comparative tests to be completed bar to bar using milli voltmeter or dctor. Insulation resistance measurements, record readings.
	4. In the case of winding repairs that shows signs of moisture penetration care should be taken to use low voltage test equipment so that the stoving process may be considered to improve the test results up to acceptable levels set by the Purchaser. All test results are to be recorded and recommendations/actions recorded.
	5. To carry out tests to windings by means of inspection and tests to check for damage to coils or insulated components.
	6. Specific repair/overhaul – Series Field

2.6.1 Check motor nameplate details and correct field content.

* + 1. Connect suitable low voltage direct current supply to output leads of field to ensure that all joints are secure and test for failures.
		2. Switch on supply and increase current to motor value specified upon the nameplate measure current and record results.
		3. Check for uniform distortion amongst coils and test for overheating whilst on test.

2.7 Specific repair/overhaul – Shunt Field

* + 1. Check motor nameplate for field voltage and current.
		2. Connect suitable supply and increase voltage to nameplate value. Check that current is as per nameplate, record voltage and current readings.
		3. Measure the voltage across each field coil and record.
		4. Field coils are to be cleaned and repaired by the following method:

Arrange for support of the pole shoe and its coil and remove each from the yoke. Inspect all field coils and test. All associated parts are to be cleaned in accordance with the processes within this specification. Any damaged items including leads or cables are to be replaced to a minimum of Class F Specification (British Standard 6195:1993).

All flanges are to be repaired or replaced. Any loose wiring within the field coils or interpole coils are to be cleaned and re-insulated by impregnating with Class F thermosetting varnish and stoving to the relevant temperature (150-200 C) for a specified period.

* + 1. Refurbishing of armatures

Armatures are to be cleaned in accordance with paragraph 7, Cleaning Procedures and then impregnated with a Class F thermosetting varnish or air drying Class F varnish.

* + 1. Replacement of armatures

Armatures that are supplied as suitable replacements will be treated with insulation by the method of Vacuum Pressure Impregnation (“VPI”) with a Class F thermosetting varnish.

* + 1. Brush gear

The brush gear will be visually inspected and checked for condition and any defects recorded. The brush arm support ring is to be thoroughly cleaned and painted with anti-tracking paint. The brush arms and boxes should be blasted with abrasive substance and thoroughly dried in an oven. The brush ear terminal insulation will be inspected: repaired or replaced to specification.

If there is an arm that supports or braces the support ring and is insulated, this must be inspected and an insulation test to be carried out. All readings must be recorded and submitted along with the final test documentation.

**3.0 ASSEMBLY**

3.1 All windings and relevant components are to be tested for insulation resistance prior to assembly and results recorded.

3.2 Install new bearings and seals all suitably lubricated to manufacturers’ specification.

3.3 Bearings that are installed will meet with the approval of the Purchaser’s specification and the motor manufacturers’ specification.

3.4 Seals that are installed will meet with the approval of the Purchaser’s specification and the motor manufacturers’ specification.

3.5 All brush boxes to be set with correct alignment and correct gaps against the commutator. New brushes to be correctly bedded and all traces of carbon dust to be removed. Ensure the correct null point of brush gear where applicable.

3.6 Balancing of all rotary parts to be completed to British Standard 6861: part 1: 1987 – ISO 1940/1-1986, BS6861-2:1997, ISO 1940-2:1997, BS ISO 21940-14 2012. Balance quality requirements for rigid motors. Check operation of brush and tensioning devices, test brush tensions and record readings on documentation.

3.7 Recommend bearing used by the Purchaser for the repair of motors are as follows: R.H.P/S.K. F/N.T.N or equivalent quality. Any deviation from this specification must be agreed with the relevant Purchaser.

3.8 Replacement brushes to be original motor specification unless otherwise stated by the relevant Purchaser.

1. **FINAL TESTING**

The final tests will be carried out in line with the following specification:

* Check insulation resistance and record readings on:
	+ All windings (minimum 100 MΩ)
	+ Armature/Interpoles (minimum 100 MΩ)
	+ Heaters and associated equipment (minimum 100 MΩ)
	+ All tests to be completed to specification using certified test equipment at twice working voltage (minimum 500 V Megger)
1. **FINAL ASSEMBLY AND LOAD TESTING**

5.1 To carry out rotary operational tests at working voltage and record current readings, rotational speeds, vibration readings and bearing temperatures. Results of these tests to be accurately recorded and submitted in line with documentation requirement in paragraph 9, the Purchasers are to be informed of any deviation from specified values.

5.2 To load test motor to agreed load current and check commutation for a period of 15 minutes in each direction. These tests to be carried out in conjunction with a representative from the relevant Purchaser unless authorised otherwise.

**6.0 INSPECTION PROCEDURES**

6.1 The machine will be treated with two coats of a recommended paint covering. The motor is to be clearly marked with:-

* Repairs job number and date of repair in the form of (dd/mm/yy);
* The relevant Purchaser reference number (EM) suitably marked in a clear area; and
* Specification plates (if applicable).

6.2 Shafts to be protected with anti-corrosive treatment. All exterior covers, end shields or access plates to be supplied with suitable gasket materials or sealed to give good moisture resistance.

**7.0** **CLEANING PROCEDURES**

The method of cleaning of motor windings and associated equipment shall be suitable for the repair and carried out in a thorough manner in accordance with the following requirements.

7.1 Steam cleaning

Remove all loose foreign matter with the aid of an airline, or in the case of thick sludge the thickest build up should be scraped off with aid of a spatula or board. The job should be stood either vertically or at an angle to the horizontal to give good drainage from the frame. With the pressure set at 500 PSI and nozzle temperature at 83 degrees C the jet is to be directed behind the windings flushing out dirt out into the bore and away from the windings. Then, either by reducing pressure or moving the lance back, the windings with frayed tape cover or little protective varnish are cleaned at half the normal pressure.

7.2 Stoving

The cleaned winding is stoved at 110-130 degree C until the insulation resistance is measured at a suitable temperature. The windings are then again blown with air to remove any dust before insulation readings are taken.

* 1. Solvent cleaning

Remove as much loose dust as possible by some mechanical means i.e. compressed air blowing or mechanical brushing. Completely saturate by either brushing, pouring the end windings with dislocation fluid. Allow to stand for 30 minutes by which time most of the contamination will have been loosened. Flush away the loosened contamination with flushing fluid using any mechanical means that may assist the cleaning process. Pouring, brushing or pumping the fluid on to the windings will usually suffice.

Repeat this process two or three times until the flushing fluid is coming away in a fairly clean state. The windings should then be allowed to dry for 3 to 4 hours. The insulation resistance should be measured and should show a level well above the specified amount.

**8.0 MACHINING PROCEDURES**

This specification covers the skimming of commutators in the lathe as part of armature refurbishment or repair:

* Set up the armature in the lathe true to the bearing seatings;
* Check other seatings for truth over the length of the armature;
* Mark risers;
* Skim commutator using a sharp industrial diamond/ tungsten carbide tip tool with 14 degree top rake angle;
* Undercut the mica segments to remove all debris using an undercutting machine (non-manual method);
* Remove all sharp edges from commutator bars;
* Carry out all final tests as specification; and
* On completion wrap commutator with protective material for transportation to storage at the relevant Purchaser’s premises.

**9.0 DOCUMENT PROCEDURES**

9.1 All documentation regarding the repair process and associated testing to be submitted with the final motor report on returning the motor to the relevant Purchaser’s stores building. Motors will not be accepted into Stores or payment made without the associated fully completed paperwork.

* 1. Documentation per repair or overhaul shall include as detailed:-

9.2.1 JOB AS RECEIVED:

This documentation is required when attending a new job and should display the following information:

* FDRC/HIP/LTP order number;
* FDRC/HIP/LTP vocab number;
* EM number (Purchaser reference number);
* Contractor job number;
* Date;
* Photographs of motor as received including photographs of dismantled motors;
* Summary of faults outside basic overhaul;
* Contractor comments and recommendations; and
* FDRC/HIP/LTP to sign for approval for repair.

If further services are required the Tenderer shall not proceed without instruction to do so from the relevant Purchaser.

* + 1. JOB COMPLETED:

The same documentation as above supplied when services are undertaken plus the following:

* Photographs of repaired motor;
* Test results; and
* Tenderers comments
	+ 1. INVOICING

The Tenderer shall raise an invoice with the following back up information:

1. FDRC/HIP/LTP order number;
2. FDRC/HIP/LTP vocab number;
3. EM number;
4. Size (kw) ;
5. Make;
6. Repair date;
7. Invoice number;
8. All relevant Charges identified by the applicable repair number and description;
9. Labour chargeable (outside of normal working hours);
10. Call out charges (outside of normal working hours);
11. Materials, itemised and priced;
12. Justification notes; and
13. General comments.

The required format is shown in Appendix A.

**10.0 PAINTING SPECIFICATION**

10.1 The Tenderer will provide the preparation and painting process applicable to machines for dockside and other hostile environments. All castings and steel components to be thoroughly cleaned of rust and loose particles by shot-blasting or abrading.

10.2 The surface to be painted must be clean and free from any grease or dirt compounds. The initial protective prime coating is to be applied immediately or within 2 hours of the material being laid bare.

10.3 The paint treatments to be applied by conventional methods to cover approximately 50-75 microns per coating and give good protection from environmental conditions. An overall total depth of coat should be 180 microns.

10.4 RAL colour to be used – RAL9016 (Traffic White)

10.5 Adequate means of protection to be provided prior to and whilst being transported.

**11.0 LEAD TIMES**

Tenderers are to complete the table below **(NOT REQUIRED AT PQQ STAGE)** detailing lead times from communication by the Purchaser to the Tenderer of the requirement for basic motor/alternator overhauls in accordance with Maintenance Schedules 1 – 4.4 of Appendix 2 applicable to AC/DC motors to 500kw and alternators to 600kva.

|  |  |  |
| --- | --- | --- |
| Equipment | Maintenance Schedule | Lead Time |
| Motors:  | 1 |  |
|  | 2.1 |  |
|  | 2.2 |  |
|  | 2.3 |  |
|  | 2.4 |  |
|  | 3.1 |  |
|  | 3.2 |  |
|  | 3.3 |  |
|  | 4.1 |  |
|  | 4.2 |  |
|  | 4.3 |  |
|  | 4.4 |  |
| Alternators: | 1 |  |
|  | 2.1 |  |
|  | 2.2 |  |
|  | 3.1 |  |
|  | 3.2 |  |
|  | 3.3 |  |
|  | 4.1 |  |
|  | 4.2 |  |
|  | 4.3 |  |
|  | 4.4 |  |

**12.0 WARRANTY**

No motor will be accepted without full warranty being provided upon its return. As motors are a rotating stock item and may not be installed immediately upon return to the relevant Purchaser **the warranty period is to commence when the motor is installed in the relevant equipment.**

 Any applicable warranty costs are included in the Charges detailed in Appendix 2.

**13.0 EMERGENCY RESPONSE**

The Tenderer will provide a 24 hour 7 days a week, including Bank Holidays, emergency response service to include attendance to site (FDRC/HIP/LTP) and available manned workshop facilities for emergency repairs. Attendance to site is required within 3 hours of a telephone call from the Purchaser requesting attendance.

**14.0 NON PERFORMANCE/UNSATISFACTORY PERFORMANCE**

The Ports are 24 hour, 364 days a year operations. The implications of failing to adhere to the Purchaser’s requirements as set out in this Specification are extensive and severe. In the event that the Tenderer fails to satisfactorily perform the Services then the Purchaser shall have the right to terminate this Agreement in accordance with Clause 13.3(a) of the Form of Contract.

**15.0 SITE VISITS**

The Purchaser shall, when it deems necessary, visit the Tenderer’s premises in order to inspect various parts of the Services being undertaken as and when required. The Purchaser shall contact the Tenderer prior to arriving at the premises.

**APPENDIX A**

**Example required invoice format**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| G/P O/N | VOCAB | EM | KW | MAKE | REPAIR DATE | INVOICE | 1 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 3.2 | 3.3 |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|   |   |   |   |   |   |   | O/H | Arm | Shunt | Inter | Ser | Hsg | Shft | Coup |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **DC Unit** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.4 | 5.5 | 6.1 | TOTAL COST | NORMAL HOURS | OVERTIME HOURS | JUSTIFICATION NOTES |   |   |   |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|   |   |   |  | 0 | **0** | **0** |  | 0 | 0 | 0 |   |
| Therm | Heat | Comm | Brake | Norm | Enh 1 | Enh 2 | Mats |   |   |   |   |
|  |  |  | Rate |  |  |  |  |  |  |  |   |
|  |  |  | Hrs |   |   |   |  |  |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |
|  |   |  |  |  |  |  |  |  |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  | **Missing Items**(not included within quote) |
|  |  |  |  |  |  |  |  |   |  |  |   |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |  |  |   |
|  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |