1.0 GENERAL REQUIREMENTS:

1.1 Scope Of Work:

1.11 Work includes, but is not limited to, providing all materials and technical direction required to replace the existing ABB Tyrak Midi dc drive control system with new firing control circuitry on GPA crane Savannah 15.

As a minimum, the scope of work shall include:

- All drive hardware, software, and communications interfaces to replace the existing Tyrak Midi hoist / gantry drive.
- All drive hardware, software, and communications interfaces to replace the existing Tyrak Midi trolley / boom drive.
- Elementary drawings for crane drive and control system
- Ethernet hardware to interface to the crane plc and crane management system
- All drive diagnostic software tools required for upload, download, configuration, and trending.
- Software Licenses including GE Fanuc Cimplicity 6.0 development version, 1000 points and GE Fanuc Machine Edition
- Site Engineering
- Commissioning

1.12 GPA will install the new drive control equipment per contractor supplied elementary drawings.

1.13 GPA will provide crane programmable controller with Genius, Profibus, or GE EGD communications protocol for control interface to the new dc drives.

1.14 The successful vendor shall supply programmable logic controller software to coordinate / integrate the design of the new dc drives with the GE Fanuc RX3i or GE Fanuc 90-30 programmable controller.

1.15 The successful vendor shall provide new system elementary drawings for the programmable controller, auxiliary devices, GPA motor control center, and new drive system.

1.16 It is required that the Vendor has produced three (3) or more similar systems, which have been in successful operation for at least (3) years on ship-to-shore cranes within North America. Vendor shall list locations below:
1.17 Vendor shall provide all necessary network communication devices, safety devices, peripheral devices, and interlocks required for safe and efficient operation of the dc drive system.

1.18 It is not the intent of this specification to restrict the design or manufacture of the dc drive system. However, the specifications set forth herein are the minimum requirements acceptable to GPA.

1.2 Design Standards:

1.21 The design, materials, manufacture, and performance requirements for the ground level display shall meet or exceed the provisions of the latest applicable codes and standards of the following organizations:

- ANSI - American National Standards Institute
- ASME - American Society of Mechanical Engineers
- IEEE - Institute of Electrical and Electronic Engineers
- NEC - National Electric Code
- NEMA - National Electrical Manufacturer’s Association
- UL - Underwriter’s Laboratory

In addition, the dc drive system provided shall be in accordance with all federal, state, county, municipal codes, laws, or ordinances as applicable.

2.0 Technical Requirements:

2.1 General:

2.1.1 The drive system shall be GE Toshiba DC2000, TMEIC Toshiba TM-DC, ABB DCS600, or comparable.

2.1.2 The drive system shall provide for stepless, regulated, regenerative control of all motions over the entire operating speed range.

2.1.3 All drives shall be true digital with three phase, full wave conversion providing four quadrant operating capability for speed and torque.
2.1.4 Drive system shall be suitable for operation with owner’s existing diesel alternator power supply and shall not be adversely affected by voltage or frequency fluctuations caused by impact loading of the crane.

2.1.5 All drive components, boards, relays, displays, etc shall be of heavy-duty design, all components shall be of high quality materials and construction, and all materials used in the manufacture of the hardware shall be new.

2.1.6 All drive components shall be designed for continuous operation, 24 hours per day, 365 days per year.

2.1.7 All drive components shall be designed for operation in outdoor, high salt atmosphere with ambient temperature ranges from 15 degrees F to 105 degrees F and 95% humidity. Elevation is at sea level.

2.1.8 To ensure the new drive system feel and response matches the existing performance of the present drive system the contractor shall make chart recordings for hoist raise / lower and trolley forward / reverse no load, 25% of full load, 50% of full load, 75% of full load, and full load. In addition contractor shall make chart recordings for gantry left / right. “As left” tuning of the drive system shall match the “as found” tuning of the system.

2.1.9 Control power for the electronics shall be separate from the main incoming supply for the scr power bridge. To achieve desired isolation vendor shall provide Sola transformer model MCR 63-23-230-8 or approved equal.

2.1.10 Each drive shall be capable of supplying 200% of it’s motor rated current for a minimum of 10 seconds while operating at the maximum ambient temperature.

2.2 Operator Interface:

2.2.1 The acceleration and deceleration of the drives shall be under the control of the operator, except if the operator moves the master switches too rapidly, acceleration and deceleration shall be limited, automatically, to pre-determined values.

2.2.2 The drive interface with the operator’s joystick shall be linear, without any steps. The operator shall not feel any transition from low speed to high speed or from high speed to low speed.
2.2.3 The predetermined values for minimum rate of change shall be separate and independently adjustable for forward acceleration, forward deceleration, reverse acceleration, and reverse deceleration.

2.2.4 Each value for acceleration and deceleration shall be adjustable in the range of at least 0.0 to 20.0 seconds from zero to maximum speed with the adjustment resolution being a minimum of 0.1 seconds.

2.3 Crane Control:

2.3.1 Automatic motor field weakening shall be provided for the main hoist motion to provide faster hoisting and lowering speeds for loads less than rated by maintaining constant horsepower at the motors. The contractor shall provide the “as left” speed vs load torque performance to the GPA upon completion of commissioning. The “as left” performance shall duplicate the “as found” performance as closely as possible.

2.3.2 Hoist Load Limited Speed function shall be performed in the drive or the crane plc. The calculation to determine the speed for a given load condition shall be executed continuously throughout the entire raise or lower motion and shall limit the hoist speed as required to prevent overspeed. While operating in the load limited speed region the hoist drive shall run at the calculated load speed with no speed instability i.e. “hunting”. The calculated speed for a given load shall not be affected by any action of the crane operator.

2.3.3 The hoist and boom hoist drives shall provide electronic overspeed protection as a backup for the mechanical overspeed devices.

2.3.4 The hoist, trolley, and boom hoist drives shall be speed regulated.

2.3.5 The gantry drive shall be CEMF regulated with adjustable IR compensation.

2.3.6 All motor field supplies shall be digitally controlled, current regulated, and capable of maintaining regulation over the entire temperature range of the drive motors under all conditions. An electronic field loss detection shall be incorporated for each field circuit. When the drive is not operating the field supply shall be set at an economy level of 50% to 70% of nominal rated field.

2.3.7 Drives shall include electrical isolation to prevent interaction (cross talk) between drives due to scr bridge firing.
2.3.8 Each power thyristor shall have series reactors, as necessary, for effective di/dt protection.

2.3.9 Line voltage transient protection shall be provided by means of a critically damped line filter.

2.3.10 Static instantaneous overcurrent protection shall be provided in each branch of each armature circuit. Contractor shall set instantaneous overcurrent limits per the existing settings.

2.3.11 Each drive shall have independently adjustable current limit overrides to limit each motion armature current to a predetermined value. Contractor shall set instantaneous overcurrent limits per the existing settings.

2.4 Diagnostic System

2.4.1 Each drive shall include a display, which will allow for review of all drive parameters, diagnostic ram variables, and diagnostic messages.

2.4.2 A keypad programmer shall allow the user to review and/or changes drive parameters.

2.4.3 Access to parameter settings shall be restricted by means of a password or hardware jumper.

2.4.4 Authorized personnel shall be able to access and change any parameter setting.

2.4.5 Each drive shall include a diagnostic system, which will give fault and troubleshooting information for functions that are internal to the drive.

2.4.6 The diagnostic system shall include a memory capable of storing faults, which can be retrieved by the maintenance technician or electrician via the crane diagnostic center.

2.4.7 One desktop computer for the crane diagnostic center shall be provided with all contractor and owner supplied software installed as well as all communications drivers, interconnecting cables, and ethernet hubs needed to communicate to the drives and programmable controller.

2.4.8 One GE Fanuc diagnostic display panel model IC754VSI12CTD-CC shall be supplied with ethernet communications interface for mounting in the operators cabin.
2.5 Site Engineering and Commissioning

2.5.1 Successful vendor shall provide the services of a trained, qualified service engineer to provide technical direction to owner’s personnel during installation of equipment.

2.5.2 Successful vendor shall provide the services of a trained, qualified service engineer to start up, fully test, and commission the system.

2.5.3 Successful vendor shall demonstrate all system functions to GPA’s designated representative and shall make any corrections as required to comply with this specification.

2.5.4 During the warranty period the qualified field engineer’s shall be either available in a local office or shall be capable of arriving at the crane within four hours after GPA notification.

2.5.5 Successful vendor shall warrant the drive system for a period of one year from date of installation. Warranty shall include all vendor-supplied materials, vendor supplied software, and shall include any and all labor and travel related expenses to correct any and all deficiencies discovered during the warranty period.

2.5.6 Successful vendor shall provide the services of a trained, qualified service engineer to perform a complete check of the system, including chart recordings of each main motion, after three months, six months, and one year of operation.

2.5.7 Successful vendor shall load any and all diagnostic tools and software onto owner’s existing radio frequency crane server and shall demonstrate remote operation of all diagnostic tools from the GPA maintenance facility to the crane.

2.6 Documentation:

2.6.1 With Proposal:

- One line communication layout drawing
- Detailed description of all major components
- Proposed schedule for completion of the installation
- Vendors Time and Material Rates
2.6.2 With Award of the Work:

- Listing of all software version numbers and software license numbers for all required OEM software.
- Three (3) copies of system backup / recovery disk on CDROM or approved equal.
- Three (3) complete sets of operating and maintenance manuals.
- One (1) price list of recommended spare parts.
- Three (3) sets of “as built” elementary drawings.
- One (1) CD of all autocad drawings and maintenance manuals.

3.0 Options:

3.1 PLC Software Development:

3.1.1 Vendor shall specify additional cost to provide all plc software for control of the machine.

Specify additional cost $ ____________________________

3.2 Crane Management System

3.1.2 Vendor shall specify additional cost to provide install all crane management system software.

Specify additional cost $ ____________________________

3.3 Installation Services:

3.3.1 Vendor shall specify additional cost to install new hardware and terminate all wiring per the elementary drawings.

Specify additional cost $ ____________________________

3.4 Training:

3.4.1 Vendor shall specify additional cost to provide the services of a trained, qualified service engineer to perform two weeks of on site training and all training materials for up to 20 people.

Specify additional cost $ ____________________________