SECTION 13442

PROGRAMMABLE LOGIC CONTROLLERS

PART 1- GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and test the programmable logic controllers (PLCs) as shown in the Instrumentation Drawings and described in Specification Section 13440. Operator terminals (OPT) will be provided to monitor and control operating parameters within the PLCs.

B. Related Work Specified Elsewhere.
   1. Process Controls and Instrumentation - Section 13440.
   2. Communication Network - Section 13445
   3. Electrical work is specified in Division 16.
   4. Instrumentation Drawings.
   5. Control Loop Descriptions - programmed by others - Appendix A

1.2 QUALITY ASSURANCE

A. The PLC's and operator terminals form an integral part of the overall control system for the facility and as such all PLC's shall be the product of one manufacturer. The Contractor shall provide all coordination as necessary to ensure that all PLC's, whether provided by the Instrumentation Supplier, individual equipment manufactures or others, are by the same manufacturer.

B. The manufacturer or its authorized representative shall provide complete technical support for all of their products.

1.3 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions of the Construction Contract, Section 01340 (Submittals) and Section 13440.

B. Ladder logic will be fully documented including a listing of each task/function.

1.4 DELIVERY, STORAGE AND HANDLING

A. In accordance with Section 13440.

PART 2 - PRODUCTS

2.1 GENERAL

A. The PLC shall consist of rugged components designed specifically for industrial environments. The PLC shall consist of a power supply and one or more racks containing a central processing unit (CPU) module, I/O modules and PLC network interface module(s). All components shall be housed in structurally secure enclosures.

B. The central processing unit CPU shall be modular and fully enclosed within a durable plastic shroud. When mounted on the system base, the modular CPU shall not occupy more than one available slot.

C. The I/O system shall be modular. Each module shall be fully enclosed within a durable plastic shroud. When mounted on the system base, each I/O module shall not occupy more than one available slot.

D. All components within the controller family shall be manufactured with a high degree of durability. All switches and other operator-controlled devices shall be of the size and durability for their intended use as is normally offered for industrial applications. All signal cables furnished by the manufacturer shall be constructed so as to withstand, without damage, all normal use and handling.

E. In order to minimize spare parts stocking requirements, the controller family shall have a high degree of interchange ability. The system shall incorporate a modular design using plug-in assemblies with pin and socket connectors. Wherever possible, all assemblies and sub-assemblies performing similar functions shall be interchangeable. The system design shall accommodate the replacement of assemblies without having to disconnect field wiring. Wherever possible, removable connectors shall be used to connect field wiring to the individual circuit board assemblies. All major assemblies and sub-assemblies, circuit boards, and devices shall be identified using permanent labels or markings each of which indicates the manufacturer's catalog number and a product manufacturing date code.

F. Refer to the control panel descriptions in 13440 2.2.

2.2 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. Programmable Logic Controller shall be capable of performing the functions described Specification Section 13440 and 13441, with the following minimum specifications:

1. Min. Memory: 64 Kilobytes of programmable memory with EEPROM backup.
2. Max. Scan Time: 1 ms/K
3. Max. Bit Execution Time: 0.4 microseconds
4. Min. Number of I/O points (discrete or analog): 960
5. Power: 110/220 VAC power supply. Each PLC shall be connected to an uninteruptable power supply (UPS).
6. Required agency approvals:
   UL Listed (UL 508)
   CSA Certified (CSA 142)
7. External communications. Each PLC shall contain both an RS-232/485 Port and an Ethernet port.
8. Digital input modules shall be 1746-IB16 24 VDC or 120 VAC. Modules shall be limited to 16 inputs.
9. Digital output modules shall be 1746-OW16 relay modules.
10. Analog input modules shall be 1746-N18 and operate on 4-20 mA.
11. Analog output modules shall be 1746-N041 configured to drive 4-20 mA into a 750 ohm load.

12. Chassis size: All backplanes shall be 10-slot, model 1746-A10.
13. All power supplies shall be P4.
14. Programming, and diagnostic software shall be Windows based via Relay Ladder Logic (RLL) custom programming tools for the PLCs.
15. Programming of the PLC will be provided by the Owner under a separate contract.
16. Future Connections: Provide a minimum of the following for future connections:
    a. 20% additional discrete inputs per PLC (rounded up) wired to terminals
    b. 20% additional discrete outputs per PLC (rounded up) wired to relays blocks with terminals.
    c. four (4) additional analog input per PLC wired to terminals
    d. two (4) additional analog outputs per PLC wired to terminals
    e. two (2) module spaces for future input, output, or special modules
    f. one (1) space for future 7 bank PLC extension backplane
17. Spare Parts: Provide a minimum of the following spare parts:
    a. none
18. Acceptable Programmable Logic Controller (PLC):
    a. Allen Bradley SLC 5/05 - L553
    b. No equivalent

2.3 OPERATOR TERMINALS

A. Operators Terminal: OPT
   1. General: Provide an operator terminal at each control panel to continuously indicate status of equipment, change operational parameters and indicate alarm status as described in Section 13440 and 13441. The operator terminal shall be fully compatible with the PLCs provided.
   2. Screen Size: 10 inch color matrix screen with a min. resolution of 640 X 480 pixels with field replaceable backlight.
   3. Interface: Touchscreen rated at 1 million cycles (min.)
   4. Memory: 1 MB minimum application and graphic memory.
   5. Clock: Provide integral real time clock with battery backup.
   6. Communication: Operator terminal shall be provided with interface and cable, to connect to either the facility Ethernet Network.
   7. Power: 120V AC or 24V DC
   8. Operating Temperature: 32-130°F
   9. Enclosure: NEMA 12 with NEMA 4X touchpad
   10. Configuration and programming of the operator terminal will be provided by the Owner under a separate contract.
   11. Provide all cables required to connect the operator terminal to the communication port on the PLC.
   12. Acceptable Operator Terminal (OPT-1):
       a. Allen Bradley Panel View 1000 color touchscreen with Ethernet module
       b. No equivalent

2.4 PLC NETWORK - Refer to Section 13445

2.5 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

A. UPS Power Supply Backup System:

1. Provide an uninterruptible 120-volt backup power supply for each PLC to maintain continuous operation of PLC, operator terminals, monitoring instrumentation and control circuits during a power outage.
2. The UPS shall be provided with surge arresting capabilities to prevent sudden surges to the attached electrical control systems.
3. The UPS will be either rack mounted inside the control panel, located in the bottom section of floor stand type control panels or provided an independent wall mounted enclosure.
4. Provide appropriate electrical disconnect or provision to easily remove and bypass the UPS
5. The UPS shall be type rated for industrial use and capable of supplying standby power to all connected control panel equipment and circuits for a minimum of fifteen (15) minutes at full load. UPS minimum rating shall be 850 VA for control panels.
6. Equivalent to APC Backup Pro, Ferrups or equal.

PART 3 - EXECUTION In accordance with Section 13440

END OF SECTION