SECTION 13421

PROGRAMMABLE LOGIC CONTROLLERS AND
COMPUTER CONTROL SYSTEM

PART 1 GENERAL

1.01 Summary

A. Section Includes:

1. The ISS shall furnish all labor, materials, equipment, services and incidentals required to install and place into operation computer-based monitoring and control system components. The system shall consist of a Remote IO (RIO) for interface with an existing PLC. The system shall utilize a LOP to provide the Operator Machine Interface (OMI) functions described. The combination of PLC, RIO, LOPI and related hardware and software is referred to as the DCS system.

2. All RIO and LOP hardware and software shall be supplied by the ISS. The ISS shall coordinate interconnection of equipment as shown on the Process and Instrumentation Diagrams.

3. All programming and configuration of the RIO and LOP for the control system components and functions shall be performed by the District's Programmer as specified in Section 13411.

4. The ISS shall provide ancillary devices, and services necessary to achieve a fully integrated and operational system.

5. All multi-conductor wire, coaxial, cable, fiber optic cable connectors and accessories for connecting the RIO, LOP, and related equipment will be furnished and tested under this Section. Installation of all multi-conductor wire and coaxial cable shall be performed as required by Section 16120. The ISS shall witness the installation and the testing and shall certify that they are suitable for use by the DCS system.

6. All factory and field acceptance testing of the control system equipment and software shall be performed by the ISS in coordination with the District's Programmer as specified in Section 13411.

B. Related Sections. See Related Sections for additional requirements applicable to this Section (typical).

1.   Section 13410 – Process Instrumentation and Controls – General Provisions.

2. Section 13411 – CCWD Special Control System Programming and Testing Requirements.

3. Section 13482 – Process Control Descriptions.

4. Section 13485 – Instrumentation Equipment List (including I/O point summary table).

5. Section 16120 – Conductors and Cables (600 Volt Maximum).

6. Section 16600 – Communications and Data Cabling System.

13421-1

1.02 References

A. Refer to Section 13410.

1.03 Submittals

A. Submittals shall be prepared and transmitted to the Construction Administrator for approval in compliance with Sections 01300 and 13410.

B. Cable installation and testing witness certification indicating that the cables installed are suitable for use with the DCS system components furnished.

1.04 Operation and Maintenance Manuals

A. Operation and Maintenance Manuals shall be provided for all devices furnished under this section in compliance with sections 13410.

1.05 Maintenance

A. Tools and spare parts shall be provided in accordance with Section 13410.

B. The following spare parts shall be provided as a minimum:

1. AI Module: 1 each

2. AO Module: 1 each

3. DI Module: 1 each

4. DO Module: 1 each

5. Remote I/O Communication Head End Module: 1

6. Remote I/O Communication Drop Module: 1

7. I/O Module Fuses: 1 for each 5 modules furnished

1.06 Description of System

A. To maintain compatibility with the District's existing system, the RIO furnished shall be Modicon-AEG and all LOP software shall be Wonderware Factory Suite. No alternatives are acceptable.

B. The following points are not intended to be a comprehensive list of the system's features, only a summary of the major functions of the system. The computer based monitoring and control system specified herein shall perform the following generalized functions:

1. Perform real-time process control, including proportional integral derivative control action, sequencing, process calculations, etc.

2. Collect and store accurate, reliable operating information for present and future uses.

3. Assist plant operating personnel by noting and communicating off-normal operating conditions and equipment failures.

4. Accumulate and store equipment running times for use in preventative maintenance.

13421-2

5. Provide color graphic displays and summary reports for use by the plant operating and supervisory personnel.

6. Provide trending for all analog values.

7. Provide control system diagnostics.

C. The system is generally detailed on the Control System Architecture as included in the Drawings. The system shall include the following major components:

1. Remote I/O for existing PLC network communications and other capabilities as specified herein and shown on the Drawings.

2. Local Operator Panel (LOP) color graphic monitor.

3. LOP control/graphic software, PLC programming software, and other application software as specified herein.

4. LOP shall be linked to other LOPs over an Ethernet (IEEE 802.3) based local area network (LAN).

5. The existing PLC and RIO shall be linked to each other over a Remote IO.

D. System configuration and programming shall be performed by the District's Programmer as follows:

1. All configuration and programming shall be done in complete conformance with the latest version of the CCWD Programming and Configuration Standards Manual.

1.07 Process Control Descriptions

A. Refer to Section 13482 – Process Control Descriptions.

1.08 Plc Input & Output List

A. Refer to Section 13485 for PLC I/O lists.

1.09 Delivery, Storage and Handling

A. Delivery, storage, and handling shall be in accordance with Sections 01600, 13410, and 13411.

1.10 Quality Assurance

A. Fiber optic materials and installers:

1. All fiber optic cable manufacturer shall provide installation procedures and technical support for all items supplied.

2. The fiber optic cable manufacturer shall provide installation procedures and technical support for all items supplied.

3. The fiber optic cable installer shall be factory certified to install fiber optic cable.

4. Fiber optic cables shall be 100% attenuation tested at the factory. The attenuation of each

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13421-3

fiber shall be provided with each cable reel. The attenuation shall be measured at 850 nm and 1300 nm for multi-mode fibers. The attenuation shall be measured at 1310 mn and 1550 nm for single-mode fibers. The manufacturer will store these values for a minimum of 5 years. These values shall be available upon request.

    5.   The fiber optic cable manufacturer shall be ISO 9001 registered.

B.   Fiber optic cable shall be manufactured by one of the following:

    1.   Siecor Corporation

    2.   Optical Cable Corporation

    3.   Hitachi Cable Manchester, Inc.

    4.   Belden Cable Corp.

PART 2   PRODUCTS

2.01   General

A.   All equipment, cabinets and devices furnished hereunder shall be heavy duty type, designed for continuous industrial service and shall comply with the requirements of Sections 13410 and based on the environmental conditions described in Section 15050. All equipment provided shall be of modular construction and shall be capable of field expansion through the installation of plug-in standard modules.

B.   Where there is more than one item of similar equipment required, all such similar equipment shall be the product of one manufacturer. All equipment models provided shall be currently in production at time of bid.

C.   All equipment furnished shall be suitable for operation on 120 VAC plus or minus 10%, 60 Hz, single-phase electrical power supply except where specifically noted otherwise.

D.   All equipment furnished shall be designed and constructed so that in the event of power interruption, the systems specified hereunder will resume normal operation without manual resetting when power is restored.

2.02   Programmable Logic Controllers (PLCs) and Remote IO

A.   General

    1.   The RIO and related hardware shall be as manufactured by Modicon – AEG to match the existing DCS system. No other manufacturers accepted.

    2.   The ISS and RIO provider shall certify all cable used in the system.

    3.   RIO shall be mounted in panel SUACP as specified in Section 13422.

B.   Input/Output Modules

    1.   General

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a. The I/O count and type shall be determined by the ISS as required to implement the functions specified plus an allowance for active spares as noted below.

b. The system shall include 25 percent (minimum of 4) of each I/O type at each RIO for future use. All spare points shall be active. Active spare points shall include all PLC configuration, all wiring between the I/O module and terminal block complete, and sufficient power supply capacity available to immediately put a point into service by connecting the terminal block to the external signal.

c. All outputs shall have field replaceable fuse protection and blown fuse indicators.

d. Power for sensing field dry contacts and powering analog instrument loops shall be provided by the ISS as a part of the system. The I/O power source shall have individual fusing and provided with a readily visible, labeled blown fuse indicators.

e. Provide surge protection for all outputs.

f. Where multiple mechanical components are provided for process redundancy, their field connections to I/O modules shall be arranged such that the failure of a single I/O module will not disable all mechanical components of the redundant system. The three sulfuric acid metering pumps shall be wired to different I/O modules. A minimum of 3 of each type of module shall be provided in SUACP.

3. Discrete I/O

a. The discrete outputs shall be a Form-A dry contact rated at 2.0 amp minimum continuous, with maximum inrush of 10 amps for 16 mSec. Discrete outputs shall be supplied with interposing relays for all NEMA 3 and larger starter loads. Interposing relays shall have a minimum contact rating of 10 amps and shall be DPDT configuration.

b. Discrete inputs shall be 24 VDC.

c. Discrete input modules shall be Modicon part number 140DDI35300.

d. Discrete output modules shall be Modicon part number 140DRA84000.

4. Analog I/O

a. All analog inputs and outputs shall have at least 12 bit resolution (i.e., to 1 part in 4096) and relative total accuracies within .025% of full scale.

b. Analog output modules shall produce a proportional, isolated 4-20 mAdc analog output signal. Output load drive capability shall be 600 ohms minimum for each output. Output response to system failure shall be field selectable for either last value or zero (4 mA).

c. Analog I/O modules shall have a maximum of 8 I/O per module.

e. Analog input modules shall be Modicon part number 140ACI03000.

f. Analog output modules shall be Modicon part number 140ACO02000.

5. Remote I/O

   a. The system shall utilize a remote input/output arrangement capable of operation at the physical locations as detailed on the Drawings.

   b. The remote I/O arrangement shall employ the same hardware components as the local I/O arrangement to minimize spare parts. Remote I/O systems that require different module styles are not acceptable.

   c. Diagnostic lights shall be provided for the remote I/O system. Lights shall be available to indicate power, continuity, and parity status for the I/O system.

   d. The remote I/O system shall consist of a Remote I/O Processor (Head) (Modicon part number 140CRP93100) and a minimum of one Remote I/O drop adapter (Modicon part number 140CRA93100) per PLC system.

   e. Remote I/O cable splitters shall be Modicon part number MA-0186-000.

   f. Remote I/O cable taps shall be Modicon part number MA-0185-000.

D. Local Operator Panel (LOP)

   1. Local Operator Panel shall consist of a Thin Client PC running Windows & and the current version of Wonderware Client. The LOP shall also consist of a 17" touch screen panel.

      LOP shall be Samsung NA – P-19-TRB or approved equal.

E. Ethernet Switch (Self Healing Ring Type)

   1. General Description

      a. Self Healing Ring Type Ethernet switch shall be 19" rack mountable with minimum of six (6) independent Ethernet 10/100 base RJ45 serial ports and two (2) fiber optics 100B-FX ports. Ethernet Fault recovery time is less than 250 milliseconds.

      b. Power Supply shall be 120VAC.

   2. Ethernet switch shall be TC Communications model number TC3720 or equal.

F. Ethernet Fiber Optic to Copper Converter

   1. General Description

      a. Ethernet Fiber Optic to Copper Converter shall be back panel mountable and industrial rated. It shall be able to convert or connect 10/100/1000Base RJ45 serial link to fiber optics. It shall include a minimum of four (4) fiber optic ST connectors, four (4) RJ45 serial ports and eight (8) LED indicator lights for Ethernet settings and Ethernet/Power status.

      b. Power supply shall be 120VAC.

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2. Ethernet Fiber Optic to Copper Converter shall be TC Communication model number TC3300 series or equal.

G. Communication Module (Ethernet)

   1. Communication module (CMM) shall be rack mounted and include one 10/100Base-TX Ethernet RJ45 port.

   2. CMM shall be Modicon Model Number 140NOE771-01, no equal.

H. Rack

   1. Remote I/O (RIO) rack:

      a. RIO rack shall be a single six (6) slot backplane including slots allocated for a CPU and power supply.

      b. RIO rack shall be Modicon model number 140 XBP 006 00, no equal.

   2. Remote I/O Processor:

      a. I/O Processor rack shall be a single ten (10) slot backplane including slots allocated for a power supply and RIO drops.

      b. Processor Rack shall be Modicon 140 XBP 010 00, no equal.

I. Remote I/O Cable

   1. Remote I/O trunk cable shall be one of the following as detailed on the Drawings:

      a. For copper wire sections: RG-11 coax as recommended by Modicon.

      b. For fiber optic sections: 62.5/125 micron fiber as recommended by Modicon-AEG.

   2. Remote I/O drop cable shall be RG-6 coax as recommended by Modicon.

J. Ethernet Cable:

   1. The Ethernet cable shall be one of the following as detailed on the Drawings:

      a. For copper wire sections: CAT5 22 AWG.

      b. For fiber optic sections: 62.5/125 micron fiber.

K. Converters and Repeaters

   1. The Modbus Plus fiber optic to copper converters and repeaters shall be Modicon part number 490NRP253 or 490NRP254 as appropriate.

   2. The remote I/O fiberoptic to copper converters shall be Modicon part number 490NRP954.

2.03 Computer Based Control System – Part of DCS Allowance

A. Bill of Material Request

1. To ensure the equipment of this section meets the District's and industry's most current standards, the Contractor shall request a Bill of Material/Model number from the District for all equipment and software in this section. The shop drawings shall be prepared and submitted on the District's Bill of Material. The products specified in this section are indicative of the equipment required only. Refer to Specification Section 00310 for DCS allowance.

B. General

1. All OMI software shall be the latest version of Wonderware Factory Suite, to match the WTP DCS system. No other products are accepted.

2. The PC operating system shall be Windows XP Professional, by Microsoft.

3. Provide all software on original CD-ROM, software publishers license, and a complete set of manual(s).

4. A two-year on-site warranty service contract shall be included with the computer. Warranty shall include all software upgrades during the warranty period. Provide latest software versions throughout the warranty period at no additional cost.

5. Provide all adapters, connectors, and cables required to interconnect the system.

2.04 Software

A. General Requirements

1. Software shall be modular, comprised of an integrated group of proven, standard software modules.

2. Provide all software in original unopened packaging on CD(s).

B. LOP Software

1. The process control software package shall be the latest version of Wonderware for Windows XP. Provide one view node license.

PART 3 EXECUTION

3.01 Factory Testing

A. Factory testing shall be in accordance with Section 13410.

3.02 Field Testing and Inspection

A. The entire Computer Based Monitoring and Control System shall be field tested as specified in Section 13410.

B. Copper cable and fiber optic cable installation, termination, and testing:

1. The ISS shall coordinate the cable installation with Division 16 as necessary to ensure cable is installed per the manufacturer's recommendations.

13421-8

2. The ISS shall provide all services to terminate and test the DCS cables.

3.03   **Training**

A. Training for the Computer Based Monitoring and Control System shall be as specified in Section 01758 and Section 13410.

END OF SECTION

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13421-10