SECTION 16925

SCADA SYSTEM APPLICATIONS PROGRAMMING

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Programming and configuration of the SCADA system (Server and Workstations) is by Owner Representative, herein defined as Application Programmer. Application Programmer shall perform all specific programming for this project; assist in Pre-Operational Testing, Operational Testing and Commissioning.

B. The Application Programmer and/or Construction Manager will be actively engaged in Pre-Operational Testing, Operational Testing and Commissioning. These efforts shall be combined efforts of the Application-Programmer, Construction Manager, System Integrator, Electrical Contractor, and Contractor.

C. The Contractor shall facilitate testing as outlined in the electrical specifications for systems described in the supplemental SCADA applications programming descriptions such that hardware, software and application programming are tested completely and all applicable test documentation is completed. The Contractor shall assume that a minimum of 120 hours (non-cumulative) will be required to assist in this task.

D. SCADA application programming descriptions are provided in supplementary information attached to this specification. They are intended to supplement the Process and Instrumentation Diagram (P&ID) drawings and other details included in the Contract Drawings and Specifications. The combination of this information shall be used to facilitate testing and preparation.

1.02 RELATED SECTIONS

A. Section 16050 – General Electrical

B. Section 16050 – Factory and Field Testing

1.03 SUBMITTALS

A. Provide submittals and drawings as specified in Section 01300 – Submittal Procedures.

PART 2 – PRODUCTS

2.01 SCADA APPLICATION SOFTWARE

A. The SCADA software, and all associated drivers and licenses, will be furnished, installed, loaded, configured by Applications programmer.

B. The SCADA system shall utilize terminal services allowing a user to access the SCADA application and data on a local plant computer such as Operator Workstations over the network.

PART 3 – EXECUTION

3.01 SOFTWARE DEVELOPMENT

A. The programming, setup, and configuration of SCADA Server and Operations workstations shall be done by the Application Programmer.

B. Suppliers of packaged systems shall provide SCADA interface registers locations and descriptions for those systems to enable SCADA system applications programming. The Application Programmer shall setup and configure all graphic screens, trends, reports, etc. for all packaged systems.

C. The SCADA system configuration shall be completed in parallel with PLC panel construction and tested during factory and field testing.

****END OF SECTION****

SUPPLEMENTAL 16925

SCADA SYSTEM APPLICATIONS PROGRAMMING

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Programming and configuration of the SCADA system (Servers, Workstations and SCADA interface computers) is by Owner Representative, herein defined as *Application Programmer*. Application Programmer shall perform all specific programming for this project and assist in Pre-Operational Testing, Operational Testing and Commissioning.

1.02 RELATED SECTIONS

A. Section 16050 – General Electrical

B. PLC Programming

C. Section 16920 – SCADA System Hardware

D. Section 16926 – SCADA System Description

1.03 QUALITY ASSURANCE

A. SCADA programming and integration performed under this Section shall be by an integrator who has been regularly engaged in control integration of water and wastewater treatment systems.

PART 2 – PRODUCTS

2.01 SCADA APPLICATION SOFTWARE

A. The SCADA software shall consist of a human machine interface (HMI) system with support for supervisory and process control, real-time data acquisition, alarm and event management, historical data collection, report generation, local or remote telemetry communications to PLC's/RTU's and internet/intranet access. The software shall be easy-to-use with an object-oriented graphics development environment and shall have an open architecture, which utilizes the latest in Microsoft Windows 2003 Server and Windows XP Professional client/server and peer-to-peer networking technology from Microsoft.

B. The SCADA system shall utilize terminal services allowing a user to access the SCADA application and data on a local plant computer (view node) over the network.

C. SCADA application software shall be compatible with the SCADA system hardware and operating system provided.

D. Communications driver program for communications from SCADA to the Allen Bradley PLCs. Communications driver shall be Top Server AB PLCs Communications Suite OPC+IO Server covering the AB Control Logix and Compact Logix, PLC5, SLC, Micrologix processors – serial and Ethernet protocols.

E. The SCADA application software shall be Wonderware v 10. Provide one licensed copy for each SCADA server computer and view client node.

PART 3 – EXECUTION

3.01 SOFTWARE DEVELOPMENT

A. The programming, setup, and configuration of SCADA Servers and Operations workstations shall be done by the Application Programmer.

B. Suppliers of packaged systems shall provide SCADA interface registers locations and descriptions for those systems to enable SCADA system applications programming. The Application Programmer shall provide all graphics and integration of all packaged systems.

C. The SCADA system configuration shall be completed in parallel with PLC panel construction and tested during factory and field testing.

3.02 SCADA CONFIGURATION

A. General

1. The SCADA application software shall allow Operators to interface with any controlling devices; to display process data, equipment status, and alarm information. The system shall transfer operator initiated control commands to the controlling PLC(s).
2. The Programmable Logic Controller(s) within the system shall perform all process control. The SCADA system shall not perform any control or function that would, on its own, change the way a controlling device (PLC or dedicated controller) controls the process. All commands must be initiated by an Operator and not be the programming of the SCADA system. All timers, totalizers, counters, or any other control function devices will be implemented in the PLC.

B. Communications

1. The SCADA system shall monitor for communications and shall post an alarm if a PLC fails to respond to message queries.
2. The SCADA system shall track a ratio of completed message to missed messages in a 100 entry shift register. Therefore, the communications integrity to each station will be displayed as a percentage of completed messages. Show message integrity percentage on SCADA overview screen.

3. The SCADA system shall re-transmit interlock data from one PLC/RTU to another for the purposes as described in this section as noted in the PLC Programming specification.

C. Graphic Screens:

1. Graphic screens will be modeled after the P&IDs and mechanical drawings as shown in the contract drawings. If a screen is busy and/or cluttered the screen shall be split into two or more screens for easy use and readable.

2. Setup color convention shall be similar to the City of Galt's Municipal Service Center existing SCADA system or as noted below:

   a. Background colors:
      1) Window - Black.
      2) Changeable variable points - Pale Yellow.
      3) Non-Changeable variable points - Light Blue.

   b. Control Switch Colors
      1) Hand - Red.
      2) Off - Grey.
      3) Auto - Green.

   c. Pump and Equipment Colors
      1) Run - Green.
      2) Off - Red.
      3) Fail - Gold.
      4) Ready/Available - White.

   d. Water Valve Colors
      1) Closed – Red
      2) Modulating – Purple
      3) Open – Green
      4) Undetermined – Grey

   e. Circuit Breaker Colors
      1) Closed – Green
      2) Open – Red

   f. Relay Logic Colors
      1) Closed Relay Contact – Green
      2) Open Relay Contact – Red

3. Display all analog values on the graphic screens with bar graph, symbols, and analog readout along with its associated alarm setpoints arranged next to bargraph in ascending order (i.e. low alarm setpoints at bottom and high alarm setpoints near the top).

4. All equipment shown on the display graphics shall look similar to the device supplied in the field. If a symbol is not provided as a standard, the programmer shall create the object within the SCADA system. All equipment symbols (pumps, piping, valves, switches, etc.) shall be drawn with a 3D look.

5. Graphic screen(s) shall display station main parameters in process flow format similar to that shown on the P&ID diagrams.

6. Setup control parameter screen listing all setpoint registers. All settable values shall be changeable from the graphic screens permitted with the appropriate password.
7. Provide an alarm summary screen listing all alarms. Flashing Alarm Indication. Acknowledge button to acknowledge alarms displayed.
8. Provide a historical alarm and event information screen listing all alarms and events. Querying alarms and events shall be either (selectable) time-based and duration based.
9. All values shall be displayed with engineering units.
10. Analog values shall be displayed with the resolution as described above.
11. Display indicating a new alarm regardless of the screen currently displayed.
12. Menu screen with jump buttons to all screens.
13. Jump button displayed on all screens to go to a menu screen.
14. Jump button displayed on all screens to go to the last screen.
15. Provide the following graphic screens:
    a. Overviews of plant/station/area refer to P&ID drawings – one per P&ID (minimum).
    b. Setpoint screens for each device to configure alarms, timers, etc.
    c. Control screen to allow configuration of operation per the control strategies. Provide "pop-up" menus for each device as needed.
    d. Alarm configuration screen with setpoint listings and descriptions.
    e. Totalization (flow and/or runtime) for all devices.
    f. Trending screens for each analog device.
    g. Alarm summary screens with acknowledge and reset.
    h. Configure drop down menus and "go-to" buttons for each screen.

D. System Security

1. As a minimum, provide the following password protected modes:
    a. Operator level 1 – Display Mode to allow monitoring.
    b. Operator level 2 – Limited Operations Mode to allow control functions to be performed limited to that operator's area of responsibility.
    c. Operator level 3 – Supervisory Operations Mode to allow control functions to be performed for all areas.
    d. Operator level 4 – Configure Mode to allow programming, system configuration, computer operating system access, and engineer functions to be performed.
    e. Administrator – System Manager Mode to all password and account privilege access.
2. Provide an on-line method for users to change their passwords.
3. Provide security to protect unauthorized access to the password file.

4. Provide the means to prevent unauthorized access to the operating system command line.
5. Log password changes and login information to a secure file.
6. Automatically log out users after 5 minutes of non-use.

3.03 TESTING

A. The SCADA system shall be tested with the PLC control systems as defined in other sections. The SCADA system shall be ready for testing at the Factory Test and again at the Field Test. The SCADA application programmer shall be performing testing, making corrections and/or on stand-by during all testing. There shall be no time limit to perform such testing and completion will be as determined by the Owner's Representative.

B. Provide testing as specified in other specification sections.

3.04 TRAINING

A. The SCADA programmer shall provide a minimum of 8 hours of training for 4 to 6 of the Owner's engineering, operations, and maintenance personnel. The training shall consist of the following minimum sessions:

1. 4 hours – SCADA Configuration and Maintenance Course shall include:
   a. Training in entering configuration mode and creating symbols, assigning references, editing tag database.
   b. Making data back-ups and creating a back-up schedule.
   c. Making SCADA configuration back-ups.
   d. Restoring SCADA system to its original form.
   e. Hard Disk Drive Cleanup.
2. 4 hours – SCADA Operations Course shall include:
   a. Screen Usage.
   b. Password Heirarchary.
   c. Do's and Don'ts.
   d. Reports and File Management.
   e. Remote Access.

****END OF SECTION****

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