SECTION 13306 PROCESS CONTROL SOFTWARE - CONTROL NARRATIVES

PART 1 GENERAL

1.01 SUMMARY

A. Process Control Narratives (PCN's) describe to programmers exactly how to configure the system and shall be created before the system is programmed. These documents define the system's logic in detail so they can program it and review and sign-off of PCN content from system Owner is required before system programming is to commence.

1.02 SYSTEM DESCRIPTION

A. This section provides functional descriptions of the PLC and computer software requirements for the Instrumentation and Control System as indicated on the design drawings. These descriptions are intended to provide details of the operating concept of the plant or site-specific process equipment and shall describe in detail every operating feature and software/hardware interlocks.

B. A sample process control narrative is in attachment A. This process control narrative is only a sample to show the level of detail and general format expected.

1.03 SUBMITTALS

A. Format: Text and picture documents shall be provided in color to insure the accuracy of each item. No black and white copies will be accepted. The colors used in the printed submittal shall accurately depict the colors and shapes proposed for use on the final system. In addition to paper copies, CONTRACTOR shall supply editable electronic files in their native format.

B. Shop Drawings: Submit in accordance with contract documents, Shop Drawings and product data for products provided under this Section.

1. PCNs shall be included in the submittal process.

2. Operator Interface and Supervisory Control: Submit color images of each proposed operator interface screen and images of historical trending. Describe color schema, mouse button use, function key controls and communication protocol with PLCs. Provide a flow diagram showing screen navigation. Show sample event and alarm log outputs.

3. Data Management and Reporting: Describe data collection, and reporting scenarios. Describe data file storage management including backup and archive operations.

4. HMI Security; Document every user name and password required for any new or modified control. This document should be hand delivered to the CONSTRUCTION MANAGER to maintain system security, along with all backups and configuration files.

5. Workshop schedule. Screen development workshops shall be conducted with the OWNER at the OWNERS site. One (1) 4-hour workshop shall be scheduled for every $50,000 of construction value.

6. I/O listing of every PLC.

C. In addition to submitting the documents above for review, an updated version of the documents shall be submitted as part of the O&M Manuals. The document shall be revised to document any additional changes to control scheme that are established throughout the project process.

1.04 QUALITY ASSURANCE

A. Codes and Standards:

1. National Electric Code.

2. Applicable State and local requirements.

3. American National Electrical Manufacturers Association.

4. American Water Works Association.

5. International Electrotechnical Commission

6. International Society of Automation.

B. Proposed graphic screens report formats, and security shall be reviewed with the Owner and Engineer throughout the configuration process. The INTEGRATOR'S programming personnel shall attend the initial review meeting. A second review meeting, held at approximately 50 percent completion, but prior to the factory acceptance test, shall also be held. Both meetings shall be held at project site.

PART 2 PRODUCTS

2.01 PROCESS CONTROL NARRATIVES

A. The Process Control Narrative (PCN) is a written description of key control system elements. It focuses on detailing the manual and automatic modes of process control. Short bullet point phrases are used, rather than long descriptions.

B. PCNs serve different purposes at different steps of the process life-cycle. The narrative is used for one or more of the following purposes:
   1. Background for planning and design of improvements.
   2. Process control software description.
   3. Operations manual.
   4. Operations practices review.

C. The PCN contains, but is not limited to, the following elements:
   1. Process description
   2. SCADA Control Configuration (PLC/HMI/Network) description
   3. Process control system description, operation, and sequencing
   4. Process flowsheets for each major process control
   5. Failure Scenarios
   6. Alarming descriptions
   7. Hardwired and software interlocks, and permissives
   8. Trending requirements
   9. Complex calculations used for process controls

10. SCADA Tags

D. PCN drafts are created during the preliminary design and expanded with more detail during the detailed design, implementation, commissioning, and operation.

E. Each PCN should be identical regarding format. The pre-design process narrative shall list, in generic terms, the equipment to be controlled and the proposed methods to be used. The final process narrative will be an expansion/enhancement of the pre-design narrative and shall precisely define the equipment, points, tag names, equipment coding, methods of control and monitoring.

F. The process description defines how each process is operated. The control system description describes hardware and software required to perform the control strategies including tagging information and setpoints.

G. The provided PCN for each facility defines the control strategy for the equipment in a detailed English Language Description (ELD). However, it does not necessarily define tags associated with SCADA signals, alarms, setpoints or data messaged values. It is the responsibility of the CONTRACTOR to update the PCN for each facility to include all applicable SCADA tags for:

1. Messaged data values, interlocks and permissives between PLCs
2. Operator setpoint values
3. SCADA Alarms
4. Default Setpoint parameters
5. Hardcoded timer values

H. Three (3) submittals per PCN shall be provided for OWNER review. The first two submittals shall be before any programming begins. The third before commissioning begins.

I. The CONTRACTOR is to supply an updated PCN for each facility to the engineer for review at the end of the contract. The intent is to have a record of the final software configurations and commission setpoints as part of the O&M manual.

2.02 OPERATOR INTERFACE

A. Graphic Screen Displays. The CONTRACTOR shall be responsible for developing and configuring the custom graphic displays. Each piece of major process equipment that is monitored by the control system shall be displayed on one or more graphic screens utilizing situational awareness graphics. These are essential for maximizing the value of the SCADA system. Graphics/Screens shall be designed to include but not limited to:

1. Effective navigation (multiple forms defined, limit number of mouse clicks)

2. Display layouts and hierarchy (Level 1 – Operation Overview, Level 2 – Unit Control, Level 3 – Equipment Detail, Level 4 – Diagnostic mimics)

3. Develop symbols/faceplates (Example: each pump represented on a mimic/display should present data the same way)

4. Provide legend screen (Define the use of color, fonts, equipment symbols, alarming, etc.)

5. Provide a print screen button

6. Information integrity (maintenance on instrumentation not clearly identified, instrumentation has failed, alarms with improper settings)

7. Trends (each display/mimic generally has one or two values that would be better understood if presented as a trend)

B. Alarming shall utilize the EEMUA 191, ISA-18.1, and RP77.60.02-2000 standards for structure, implementation, display and occurrence. Provide specific details for points that have alarming parameters. Alarm classification (priority level), display requirements, and alarm messaging are to be included. The time required for the operator interface to display an alarm shall not exceed 5 seconds. Alarms shall be defined in the PLC not the HMI software. Alarms shall have an operator adjustable delay timer setpoint to be used as a buffer. Alarms shall be able to be enabled and disabled from the HMI. Digital alarms shall be invertible from the HMI.

C. Graphical Operations

1. Display Information

a. Screens shall include equipment status (On\Off\Opened\Closed) indications. Include but not limited to analog instruments such as indicators, manual loading stations, and controllers.

b. The SCADA HMI software shall display information necessary to support all requirements specified, including: operator commands; alarm notification; system graphics as specified and as shown, incorporating dynamic data; and curve plotting.

2. Trending

a. Provide on-screen trending displays that are user definable that operate from either previously collected historical data or from real-time variables. Provide facilities for user selection of colors, time (horizontal), and measurement (vertical) scales. Accommodate real-time sampling intervals as short as 1 second. Real-time trends shall show alarm setpoints. Historical trend displays shall have time-scale panning controls. INTEGRATOR is responsible for creating trending displays for all systems provided under this contract.

3. System Menus and Displays

a. The user shall be able to call up the following displays by dedicated function key, pull down menu or by icon and shall be able to page forward and backward on linked multiple page displays. The system menu and index displays shall also contain icons which can be used to call up subsequent displays.
b. System Menu (list of all graphics and menus).
    1) Index (list of all PLCs).
    2) Alarm Summary (list of all uncleared alarms).
    3) Communication Screen (shall include PLC to PLC, PLC to Switch, Computer to Switch, and PLC to RIO connections).
    4) Alarm History screen

c. Navigation to any system graphics shall be no more than three mouse clicks away from any other screen. Navigation shall follow the OWNERS existing SCADA system.

D. INTEGRATOR shall include 10 additional spare screens as directed by OWNER in base bid. The screens shall be developed during CONSTRUCTION MANAGER progress Meetings and Startup.

2.03 HMI SECURITY

A. Using operator interface and operating system software, implement a security system to restrict access to parts of system. Provide the OWNER with a current list of users and groups. Then request a list of users and groups from the OWNER to be created, modified or deleted for the current Contract. The system shall maintain a disk file logging all operators logged onto the system, alarm acknowledgments, commands issued and all database modifications for each password. Each password shall be definable as to the functions that the operator can perform. Provide following groups as a minimum:

1. Administrator - All permissions of Supervisor and Access to the SCADA software development including the ability to create, modify and delete users.

2. Supervisor - All permissions of Operator and ability to modify critical process specific setpoints.

3. Operator - Access to all displays, change normal operational sequences, place equipment Out-of-Service and acknowledge alarms.

4. View - View only.

B. As part of the graphics design and review process with the OWNER provide the list of operational parameters then can be modified via the SCADA terminals and a place for feedback allowing the OWNER to select which group can modify.

PART 3 EXECUTION

3.01 PROCESS CONTROL NARRATIVE TEMPLATE

A. Table of Contents

B. SCADA Security Groups

C. SCADA Security Users (Username, Full Name, Group, Password (leave blank))

D. Process Areas

1. Loop Description Title

2. Associated Equipment

3. Associated PLC/RTU

4. Flow Charts

5. Operational Modes
   a. Local Manual Mode
   b. Local Auto Mode
   c. Remote Manual Mode
   d. Remote Auto Mode
   e. PLC Power Failure Mode

6. Calculations

7. Alarms

8. Setpoints
   a. Process Setpoints
   b. Alarm Setpoints
   c. PID Setpoints

9. Security (of Setpoints)

10. Coordination (Communications required with other PLCs)

END OF SECTION

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