

## SECTION 40 96 45.19 – PROCESS CONTROL SOFTWARE FOR ELECTRICAL DISTRIBUTION CONTROL SYSTEMS

### 1.01 SUMMARY:

A. <sup>A17</sup>**Scope:** This Section covers the performance requirements, design, supply, development, installation, training, testing, commissioning, and technical support for complete process control systems (PCSs) of the electrical distribution control systems (EDCSs) as part of the Works.<sup>A17</sup> This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 40 96 45.19-1.

B. **Related Sections:**

TABLE 40 96 45.19 - 1: <sup>A9</sup> Related Sections <sup>A9</sup>	
1.	Section 01 81 26 - Communications, Control, Safety, and Security Systems.
2.	Section 40 00 00 - Process Systems Integration.
3.	Section 40 70 00 - Electrical Supervisory Control and Data Acquisition System.
4.	Section 40 95 13 - Process Control Hardware.
5.	Section 40 96 45 - Process Control Software.
6.	Section 40 96 45.13 - Process Control Software for LMCSs.

### 1.02 REFERENCES

A. **Applicable Publications:** Refer to Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.02.

### 1.03 REQUIREMENTS:

A. **Electrical Power Distribution Operation Description:** This PCS may be designed using the Employer's Programmable Logic Controller (PLC) platform for a master human-machine interface (HMI) – slave PLC configuration or it may be designed using master HMI – other monitoring equipment configuration, which shall be compatible and capable of transferring data to the HMI via Open Process Control (OPC), active-X, or both. The following shall be the system's key features:

1. **Sequence of Events (SOE):** The PCS shall capture and store SOE information on fault events of all electrical equipment using both analog and status input tags. Timestamp resolution shall be 1 mS or better.
2. **Remote Reset:** All main breakers shall have the capacity to be reset remotely by means of user request. Remote reset feature on a particular device shall permit attempts up to three instances per hour. If limit is exceeded, the remote reset feature shall be disabled until user physically presses the reset button on the related machinery local control panel.

3. **Monitoring of System Status:** All the information in monitoring devices shall be available at the HMI.
4. Configuration and setting of event alarms and triggers.
5. Event capturing and data logging.

#### **1.04 DESIGN CRITERIA / SYSTEM PERFORMANCE:**

##### **A. General:**

##### **1. Problem to be Solved:**

- a. Provide Employer’s electrical personnel at each new Locks Complex with a system to monitor and control electrical distribution. The level of EDCS information shall have greater detail than that of interest to the Employer’s power dispatcher that will use the SCADA system specified in Section 40 70 00 (*Electrical Supervisory Control and Data Acquisition (SCADA) System*).
- b. Simplified, seamless integration of commercial hardware and software making maintenance easy and training requirements minimal.
- c. Use of standard equipment, controllers, devices, and instrumentation across the Locks Complex.
- d. Use of standard fault tolerance and common failure mode avoidance concepts applied across the Locks Complex.

##### **2. Restrictions to be Considered:** (reserved)

- ##### **B. Power Distribution Station (PDS):** The PDS shall be an interactive HMI application used exclusively to monitor the electrical distribution process values, generate alarms, reset faults, datalog and trend process values, analyze data, diagnose problems, suggest solutions, output reports and data, and access and generate work orders to external Computerized Maintenance Management System (CMMS) application.

##### **1. General:**

- a. The main display shall be designed to run on four monitors using a single large desktop. The main display shall show the 480 VAC power distribution or the DC power system, divided in four quadrants. The main display shall include a title bar, a menu bar, a tool bar and a status bar, always visible and consistent throughout the application. Only the top quadrants shall include the title, menu and tool bars. Only the bottom quadrants shall include a status bar. The main display graphics shall be scaled and sized to fit each of the quadrants without requiring multiple page-displays or scrolling.

- b. The mouse pointer shall navigate the four quadrants as it does normally on a single monitor display.
- c. Where an Active-X object for a device or function is expected, and such object is not available for the device or function, the pop-up display shall be developed in its place to allow display of device variables and configuration or to do the required function.
- d. “Are you sure?” dialog windows shall be necessary when energizing and de-energizing a power circuit.

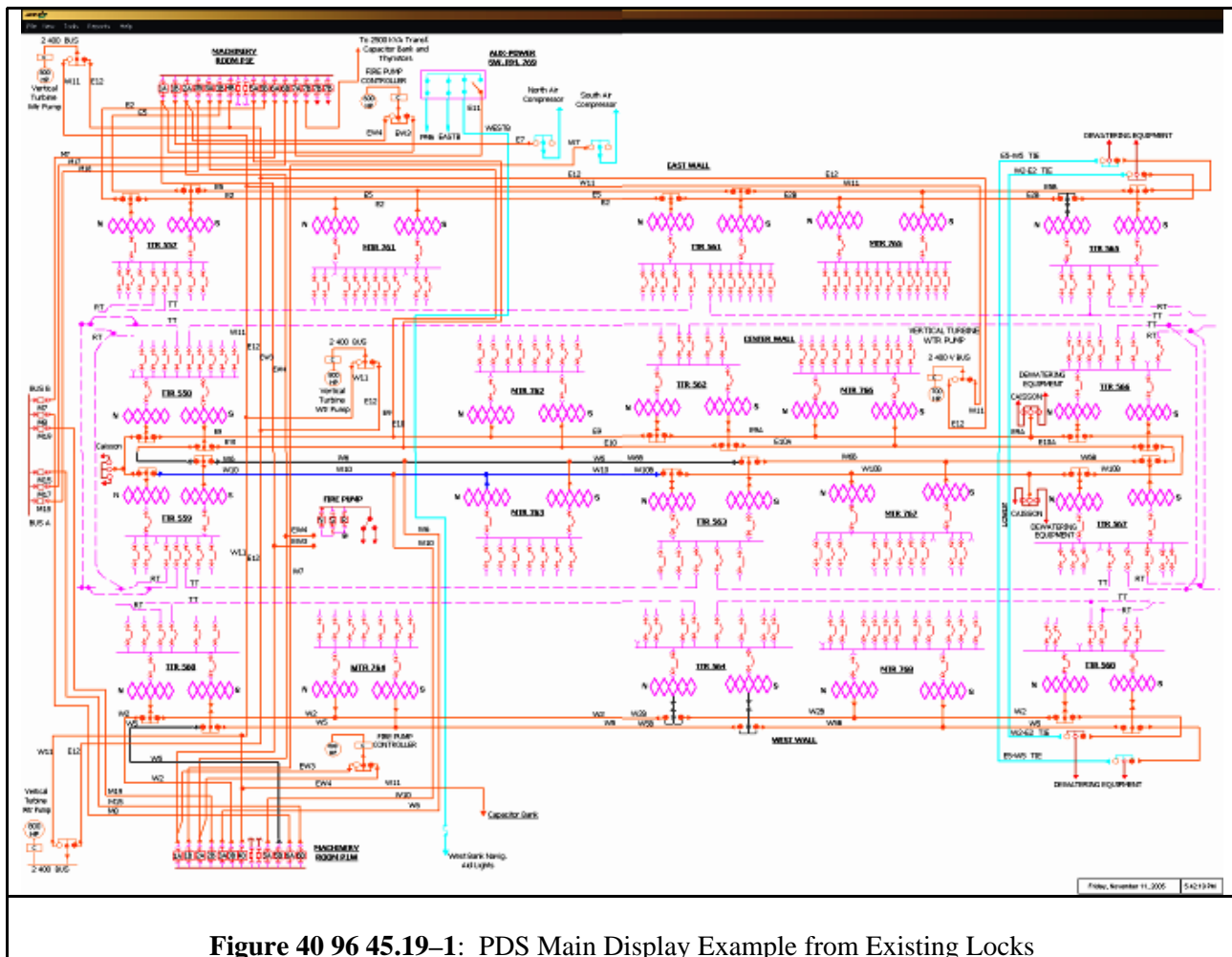


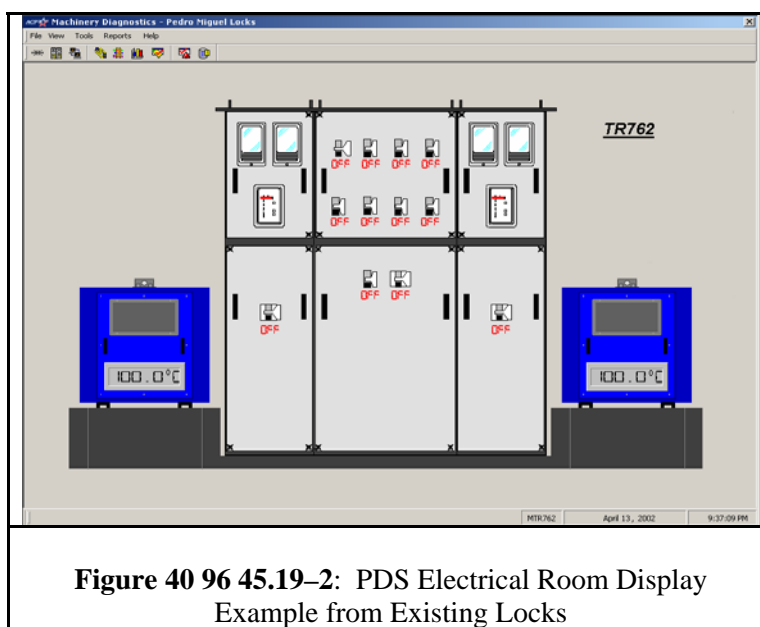
Figure 40 96 45.19-1: PDS Main Display Example from Existing Locks

2. <sup>A16</sup>**Main Display Title Bar:** See requirements for Machinery Control Station (MCS) in Section 40 96 45.13 (*Process Control Software for Locks Machinery Control Systems*).<sup>A16</sup>
3. **Main Display Menu Bar:** Shall at least include a) File, b) View, c) Tools, d) Reports and e) Help. Sub-menus shall include a menu icon to the left of the option text.

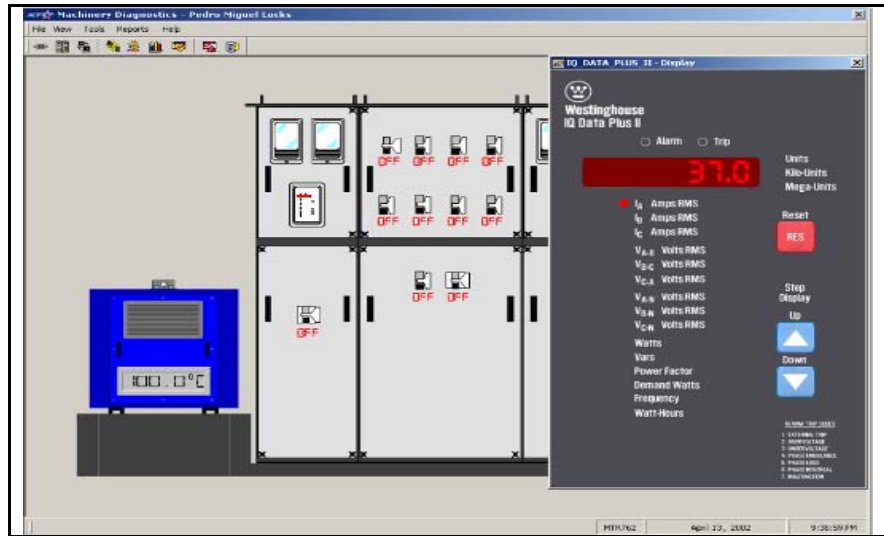
- a. **File:** Shall at least include a) Expert Help Input, b) User Management and Security, c) HMI Preferences (a dialog to configure auto and manual selection of which HMI application server to use, and configure file locations), and d) Exit.
  - b. **View:** Shall at least include a) Power Distribution Overview Display, b) DC Power System Display, and c) Electrical Rooms.
  - c. **Tools:** Shall at least include a) Lockout / Tagout Display, b) RSBizware, c) RSTrend, d) Tag Monitor, and e) Alarms.
  - d. **Reports:** Shall at least include a) Print Screen(s), and <sup>A9</sup>b) Factory Floor Data. Factory Floor Data <sup>A9</sup> shall handle all reporting requirements such as expert help database inputs (raw and approved) and statistics, the condition monitoring reports, and process variable monthly trends.
  - e. **Help:** Shall at least include a) Help (running the Windows HELP.EXE application with the HMI help document in HLP format), b) System Statistics (to include hard drive space, memory available, number of tags, number of displays, and other statistics), and d) About (containing [Employer](#) and Contractor credits).
4. **Main Display Tool Bar:** Shall include an access button for all frequently used functions such as example in Figure 40 96 45.19–2. Tool bar shall be divided in at least 3 sections – a) Display navigation, b) Diagnostics and analysis, and c) navigation to other diagnostic displays of equipment
- a. **Display Navigation:** At least tool buttons related to each viewing displays, such as 460 power distribution, DC power system, electrical room view, foam fire fighting, and others.
  - b. **Diagnostics and Analysis:** At least the buttons for calling Active-X objects pertaining to different device specific configuration, alarms, data logging and trending software where available.
  - c. <sup>A17</sup>**Navigation to Other Diagnostic Displays:** At least the buttons for displaying diagnostic information of equipment such as fire-fighting equipment, Crossunder elevators, compressed air systems, and UPS status. <sup>A17</sup>
5. **Main Display Graphics:** The main display graphics shall be the electric one-line diagram for the Locks, all levels, segregated into four quadrants, where all screen transitions are managed to avoid mismatched lines, or split buttons or text into different screens.
- a. All components shall have tool tip captions that appear when the mouse pointer moves over the item. Captions shall include ID name and status of device or voltage line.

6. **Main Display Status Bar:** The left side of the status bar shall always be reserved for the color code legend. The middle of the status bar shall get updated with machinery specific information, every time it gets focus. The status bar shall have three sections, a) Color code legend, b) Selected Machinery Status, and c) Official Date and Time.
  - a. **Color Legend Volts – Alternating Current (VAC) Distribution:**
    - 1) 12,000 VAC lines – Blue
    - 2) 460 VAC lines – Green
    - 3) Open lines – White
    - 4) Communication Error – Orange
  - b. **Color Legend Volts – Direct Current (VDC) Distribution:**
    - 1) 125 VDC lines – Blue
    - 2) -48 VDC lines – Green
    - 3) 24 VDC lines – Yellow
    - 4) Open lines – White
    - 5) Communication Error – Orange
  - c. **Device Status:**
    - 1) Last manually selected or the last macro selected machinery identification (ID)
    - 2) Status – normal (N), faulted (F), out of service (O).
  - d. **Official Date and Time:** Standard time display whose source shall be the workstation's system time. System time shall be updated via Network Time Protocol (NTP).
7. **Navigating the Main Display:**
  - a. Right clicking on a device shall bring a selection menu similar to Figure 40 96 45.13–15. The selection menu shall include three sections, a lock out / tag out item that calls a dialog display, an alarms display item that calls that display, and a command operation section containing open, close commands and a reset command or submenu, which shall be usable to remotely reset breakers, motor starters, Variable Frequency Drives (VFDs), or other devices, whichever the case, with the intention to normalize machine operation.

- b. The last machinery to have focus, as indicated in the status bar, shall be the target machinery when the selection menu items are used.
  - c. If the Employer's Personnel select a machinery and next click on the alarm button on the toolbar, the Employer's Personnel shall get specific alarms related to the selected machinery. If the Employer's Personnel use the menu bar selection, the Employer's Personnel shall get the full range of alarm reporting.
8. **The Electrical Room Display:** This display shall appear by selecting from the menu bar, "View", "Electrical Room", or by right-clicking an electrical room on the main display, thus giving the Employer's Personnel a virtual view of the room, see Figure 40 96 45.19–4. The display shall show all key process values of the machinery and a real-time animation of the machinery based on engineering rendered drawings. Further information shall be available by clicking a device and bringing forth a view of the device's faceplate, where the Employer's Personnel can navigate through the device's functions, see Figure 40 96 45.19–2.



- a. Electrical room display shall at least include a) Transformer Winding Temperature(s), b) Breaker Lever Position and color animation based on operational status, and c) Electronic Power Monitoring Device Active-X pop-up.
- b. Faceplate pop-up displays, where possible, shall be the electronic power monitoring device's Active-X. If not available, the developed pop-up window shall have at least the same functionality as the device's actual faceplate; see Figure 40 96 45.19–3.



**Figure 40 96 45.19–3: PDS Device Faceplate Display Example from Existing Locks**

9. **The Lockout / Tagout Display:** This display shall be the data capture screen and the reporting screen for the lock out / tag out database. This database shall maintain a record for all devices:
- Status of device, “In” or “Out Of Service”
  - Requested “In Service” by the Employer’s Personnel complete name
  - Requested “Out of Service” by the Employer’s Personnel complete name
  - Date and time of request.
  - A red textbox shall show filtered expert help information related to the power unit indicating a) active fault codes and brief description for each, b) if selected a fault code, display a brief narrative describing the alarm logic and its triggers, and c) a list of possible solutions, each rated statistically to show problem solving success in the past instances of the selected fault.

**1.05 SUBMITTALS:** Shall be in accordance with Section 40 00 00 (*Process Systems Integration*), Paragraph 1.05.

**1.06 QUALITY ASSURANCE:** Shall be in accordance with Section 40 00 00 (*Process Systems Integration*), Paragraph 1.06.

## END OF SECTION

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