

## SECTION 40 95 13.19 – PROCESS CONTROL HARDWARE FOR ELECTRICAL DISTRIBUTION CONTROL SYSTEMS (EDCSs)

### 1.01 SUMMARY:

- A. <sup>A17</sup>**General:** This Section covers the performance requirements, design, installation, and commissioning of industrial process control systems for the electrical distribution systems as part of the Works.<sup>A17</sup> The power distribution networks included in the scope of this Section operate at medium voltage, including 12,000 and 480 VAC. This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 40 95 13.19-1.

B. **Related Sections:**

Table 40 95 13.19 – 1: Related Sections		
1.	Section 01 81 26	- Communications, Control, Safety, and Security Systems.
2.	Section 01 81 29	- Electrical and Lighting Systems.
3.	Section 26 13 00	- Medium Voltage Switchgear.
4.	Section 26 24 19	- Motor Control Centers.
5.	<a href="#">Section 26 29 23</a>	- <a href="#">Variable Frequency Drives.</a>
6.	Section 26 32 13.13	- Diesel-Engine Driven Generator Sets.
7.	Section 26 33 00	- Direct Current Equipment.
8.	Section 26 60 00	- Dynamic VAR Compensators.
9.	Section 40 00 00	- Process Systems Integration.
10.	Section 40 91 00	- Primary Process Measurement Devices.
11.	Section 40 95 13	- Process Control Hardware.
12.	<a href="#">Section 40 96 45.19</a>	- <a href="#">Process Control Software for Electrical Distribution Control Systems.</a>
13.	Section 48 19 16	- Inverters.

### 1.02 REFERENCES:

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

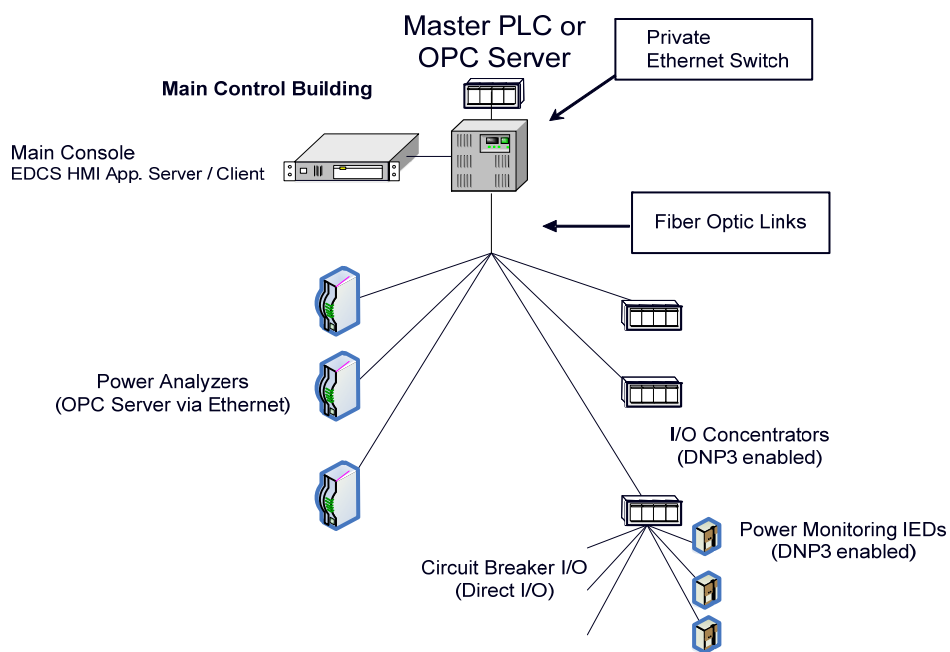
### 1.03 REQUIREMENTS:

A. **General:**

1. The Contractor shall meet all applicable requirements of Section 40 00 00 (*Process Systems Integration*), Paragraph 1.03, and Section 40 95 13 (*Process Control Hardware*), Paragraph 1.03.
2. EDCSs shall monitor AC power distribution, including medium voltage switchgear, motor control centers (MCCs), dynamic VAR compensators, diesel-engine driven generator sets, and the power to the Locks foam concentrate/water systems.
3. EDCSs shall monitor DC power distribution, including batteries, chargers, and DC/DC converters.

**B. Control Architecture:**

1. Architecture shall be a star configuration as shown in Figure 40 95 13.19–1, conceptual control architecture.
2. A redundant master programmable logic controller (PLC) may be used but is not required. The Employer envisions that all input / output (I/O) will be provided to the EDCS human-machine interface (HMI) by means of an open process control (OPC) server with a direct EtherNet/IP link to the measurement and protection devices in accordance with Section 40 91 00 (*Primary Process Measurement Devices*).
3. Other discrete I/O may be handled by using I/O sometimes available in measurement and protection devices. If needed, a slave PLC shall be used to gather direct I/O or obtain I/O through fieldbuses in accordance to Section 40 91 00 (*Primary Process Measurement Devices*).
4. A single EtherNet/IP link via fiber optics shall be used to communicate between the HMI application and the OPC server, and the following:
  - a. Measurement and protection devices.
  - b. Slave PLCs.
5. The fiber optic modems in the equipment room of the main control building shall be installed together in a chassis rack and rack mounted.



**Figure 40 95 13.19-1: Conceptual EDCS Architecture**

- C. **Emergency Generation:** Emergency generators in the new Locks Complexes shall be in accordance with Section 26 32 13.13 (*Diesel Engine Driven Generator Sets*). Such units shall be controlled in accordance with the requirements of Section 26 13 00 (*Medium Voltage Switchgear*), Subparagraph 1.04 H.
- D. **Sequence of Events (SOE):** EDCSs shall support time stamping and SOE for all electrical analog and status input points. Timestamp resolution shall be 1 mS or better.

#### 1.04 DESIGN CRITERIA/ SYSTEM PERFORMANCE:

##### A. General:

- 1. **Problem to be Solved:** The systems shall solve the following business needs:
  - a. To acquire reliable hardware capable of protecting equipment from power events, improving power quality, and minimizing downtime.
  - b. Meet the operational requirements of Sections 26 13 00 (*Medium Voltage Switchgear*), 26 24 19 (*Motor Control Centers*), 26 32 13.13 (*Diesel-Engine Driven Generator Sets*), and 26 60 00 (*Dynamic VAR Compensators*).
  - c. To capture data of machinery or equipment conditions, process the data, evaluate the data, report alarms, suggest course of action, correlate events and present various statistical and trending charts for decision making as applicable for both operation and maintenance tasks at the designated authority workstations.
  - d. To facilitate operation and maintenance tasks by showing in real time the status of the power distribution, and thus simplifying, making easy and expediting the operation, the testing and the maintenance tasks.
  - e. To ensure, control and report of safety issues, both physically as well as electronically.
- 2. **Restrictions to be Considered:** (Reserved)

##### B. System Performance: The EDCS shall have the following measurement, protection, and control areas:

##### 1. General:

##### a. Protection:

- 1) In addition to the breaker protection, each distribution feeder shall be protected by the tripping functions of electrical systems specified in Section 01 81 29 (*Electrical and Lighting Systems*). EDCSs shall not cause nuisance tripping.
- 2) However, EDCSs shall use information from power quality analyzers and power monitors specified on Section 40 91 00 (*Primary Process Measurement Devices*) for reporting purposes.

<sup>A8</sup>b. **Step Loading:** Upon emergency generator startup, EDCSs shall switch loads sequentially to prevent all loads to enter at once.<sup>A8 A10</sup> The number of steps shall be as required to avoid exceeding the capacity of the corresponding electrical distribution system.<sup>A10</sup>

2. **12,000 VAC Power Distribution at Incoming Switchboards:**

a. <sup>A16</sup>**Measurement:** Shall be in accordance with Section 26 13 00 (*Medium Voltage Switchgear*) and Section 40 91 00 (*Primary Process Measurement Devices*).<sup>A16</sup>

b. **Control:** All breakers shall be remotely opened and closed by an EDCS signal, except for the two (2) "incoming feeder" breakers of each lock complex. The EDCS shall control the distribution breakers in accordance with Section 40 96 45.19 (*Process Control Software for EDCSs*).

3. **480 VAC Motor Control Centers:**

a. <sup>A16</sup>**Measurement:** Shall be in accordance with Section 26 24 19 (*Motor Control Centers*) and Section 40 91 00 (*Primary Process Measurement Devices*).<sup>A16</sup>

b. **Control:** Incoming breakers to the busbar and tie breakers shall be remotely opened and closed by an EDCS signal. The EDCS shall monitor and control the distribution breakers in accordance with Section 40 96 45.19 (*Process Control Software for EDCSs*).

4. **Direct Current Systems:** EDCSs shall monitor DC current systems of Section 26 33 00 (*Direct Current Equipment*) and 48 19 16 (*Inverters*).

5. **Dynamic VAR Compensators:** All dynamic VAR compensators shall be monitored and protected in accordance with Sections 26 29 23 (*Variable Frequency Drives*) and 40 91 00 (*Primary Process Measurement Devices*).

6. <sup>A16</sup>**Main Breakers:** All switchboard/switchgear, MCC, diesel-engine generators and Locks foam concentrate/water systems' main breakers shall be monitored, protected using a power monitoring protection device in accordance with Section 40 91 00 (*Primary Process Measurement Devices*).<sup>A16</sup>

7. **Other Control and Indication:** The Contractor shall provide, configure, develop, install, and commission all process control system (PCS) indicated hardware below.

- a. High mast lighting
- b. Diesel-engine power generators
- c. Motor control centers
- d. Transient voltage surge suppressor (TVSS) alarms.

**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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