

## SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes commissioning process requirements for electrical systems, assemblies, and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.
- C. Start up of equipment and systems such as medium voltage switches, transformers, unit substations, emergency power and lighting systems, etc. shall be done by or with a trained manufacturer's representative who can check and report on all items such as installation, operation, and see that the equipment or system starts and operates properly.
- D. Testing shall be performed at the convenience of the Owner and with the Owner's representatives present and the manufacturer's representative of the equipment and/or system present.

#### 1.3 DEFINITIONS

- A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxA: Commissioning Authority.
- C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 ALLOWANCES

- A. Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the "Schedule of Allowances" Article in Division 01 Section "Allowances."

## 1.5 UNIT PRICES

- A. Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 01 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing.

## 1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Perform commissioning tests at the direction of the CxA.
- B. Attend construction phase controls coordination meeting.
- C. Attend testing, adjusting, and balancing review and coordination meeting.
- D. Participate in electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- E. Provide information requested by the CxA for final commissioning documentation.
- F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

## 1.7 CxA'S RESPONSIBILITIES

- A. Provide Project-specific construction checklists and commissioning process test procedures for actual electrical systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.
- B. Direct commissioning testing.
- C. Verify testing and adjusting of Work are complete.
- D. Provide test data, inspection reports, and certificates in Systems Manual.

## 1.8 COMMISSIONING DOCUMENTATION

- A. Provide the following information to the CxA for inclusion in the commissioning plan:
  - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
  - 2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
  - 3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for electrical systems, assemblies, equipment, and components to be verified and tested.

4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that electrical systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing and adjusting reports.

#### 1.9 SUBMITTALS

- A. Certificates of readiness.
- B. Certificates of completion of installation, prestart, and startup activities.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 TESTING PREPARATION

- A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify that electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify that testing and adjusting procedures have been completed and that testing and adjusting reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

### 3.2 TESTING VERIFICATION

- A. Prior to performance of testing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.
- B. Notify the CxA at least 10 days in advance of testing Work, and provide access for the CxA to witness testing Work.
- C. Provide technicians, instrumentation, and tools to verify testing of electrical systems at the direction of the CxA.
  - 1. The CxA will notify testing Contractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
  - 2. The testing Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
  - 3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing and adjusting report.
  - 4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

### 3.3 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of electrical testing shall include all components, equipment, and systems as outlined in outlined later in this section.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response to input signals.
- D. The CxA along with the Electrical Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

- I. If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

### 3.4 MEDIUM-VOLTAGE CABLE

- A. High potential and megger tests shall be made of the completed circuit and the high potential test results plotted.
- B. The high potential tests shall be made in accordance with current industry standards. The test voltages, voltage increments, and time intervals shall be as follows:
  1. Installation test
    - 30 kV test voltage
    - 3 kV step increase from 0 to 30 kV
    - 15 minutes 1t 22.5 kV
  2. Maintenance proof test
    - 22.5 kV test voltage
    - 3 kV step increase from 0 to 22.5 kV
    - 5 minutes at 22.5 kV

### 3.5 PRIMARY SWITCH UNITS

- A. Primary switch units and automatic throwover devices shall be operated in all modes to ensure proper operation.

### 3.6 TRANSFORMERS

- A. Transformers shall be tested in accordance with the latest ANSI C57.12.90 Standard.

### 3.7 DRAW-OUT CIRCUIT BREAKERS

- A. All draw-out circuit breakers shall be tested and set using the proper instruments for this operation.

### 3.8 AUTOMATIC TRANSFER SWITCHES

- A. All automatic transfer switches shall be tested by deenergizing and energizing the power feeders in proper sequence to ensure correct operation.

3.9 EMERGENCY POWER SYSTEMS

- A. Emergency power systems shall be tested under load by deenergizing the normal power feeders to verify proper transfer. All of the alarm systems will be tested to verify proper operation. The starting battery will be tested to ensure compliance with the manufacturer's specifications.

3.10 VARIABLE FREQUENCY DRIVES

- A. All variable frequency drives shall be tested, connected in its final location to the building power system, under 100% motor load for compliance with the frequency and notch requirements specified under the Variable Frequency Drive section of the specification. The Contractor shall add any necessary filtering to the drive(s) to meet the specification.

3.11 LIGHTING DIMMING AND CONTROL SYSTEMS

- A. All dimming systems shall be operated throughout its entire range with all functions operated to verify proper operation.
- B. All occupancy sensors shall be tested for proper operation over the entire intended zone of coverage.

END OF SECTION 260800