

## **SECTION 26 43 13**

### **TRANSIENT VOLTAGE SURGE PROTECTION DEVICES**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS:**

- A. The Conditions of the Contract and applicable requirements of Divisions 0 and 1 and Section 26 00 01, "Electrical General Provisions", govern this Section.

##### **1.2 DESCRIPTION OF WORK:**

- A. Work Included: The extent of transient voltage surge protection device (SPD) work is as shown, scheduled, and as indicated by the requirements of this Section, and as specified elsewhere in these Specifications.
- B. Types: The types of SPD devices required for the project include, but are not limited to:
  - 1. Service Entrance Protectors.
  - 2. Panelboard Protectors.
- C. Surge Protection Receptacles: Refer to Section 26 27 26, "Wiring Devices".

##### **1.3 QUALITY ASSURANCE:**

- A. Manufacturers: Provide products complying with these specifications and produced by one of the following:
  - 1. Advanced Protection Technologies.
  - 2. Control Concepts.
  - 3. L.E.A. Dynatech.
  - 4. Leviton Manufacturing Co.
  - 5. Liebert Corporation.
- B. UL Label: All SPDs shall be UL labeled.

##### **1.4 SUBMITTALS:**

- A. Show Drawing submittals shall include, but not be limited to, the following:
  - 1. Cut sheets marked to clearly indicate SPD types, sizes, construction, features, accessories, dimensions and other information required to review the proposed SPDs.
  - 2. Additional information as required in Section 26 00 01, "Electrical General Provisions".

##### **1.5 DELIVERY, STORAGE AND HANDLING:**

- A. Store SPD devices in a clean, dry space. Maintain factory-wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle SPD devices carefully to avoid damage to material components, enclosure and finish.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND COMPONENTS:

- A. General: Except as otherwise indicated, provide SPD manufacturer's standard materials and components as indicated by his published product information, designed and constructed as recommended by the manufacturer, and as required for a complete installation.

### 2.2 SURGE PROTECTORS:

- A. General: Provide L.E.A. Dynatech [**PHT Plus**] Series or approved equal transient voltage surge suppressors (SPD) on the secondary side of each substation transformer. The SPD shall be of a parallel, multi-staged, hybrid design. The SPD shall use fast-acting, high-energy dissipators and transient-energy protectors that will divert and dissipate the surge energy. The SPD shall be self-restoring and fully automatic, with a total system response time not to exceed 5 nanoseconds. The SPD shall include an integrated status alarm monitor circuit, surge counter, and audible alarm to facilitate a positive diagnosis of continuous operation.
- B. High-energy Dissipator (HED): The primary protection shall be a high-energy shunt network, capable of dissipating the energy associated with a lightning strike. The HED shall be connected phase to ground, providing maximum lightning protection with a surge current capacity of 50,000 amperes/module with an 8x20 microsecond test waveform. The HED shall incorporate fuse links which, if the surge capacity of the module is exceeded, will disconnect the HED from the ac source without interrupting power to the load.
- C. Transient-energy Protector (TEP): The secondary protection shall be a solid-state clamping network capable of clamping impulse voltages, regardless of their origin, to the specified safe level. The TEP shall be installed phase to neutral (single-phase, split-phase, and wye) or phase to phase (delta), providing maximum protection against surges and spikes with a surge current capacity of 25,000 amperes/module with an 8x20 microsecond test waveform. Component response time shall be one picosecond. Total module response time not to exceed 5 nanoseconds.
- D. Status Indicators: The SPD shall include redundant status indicators, providing a continuous positive indication of SPD protection module status.
- E. Status Alarm Monitor (SAM): The SPD shall include a status alarm monitor system, which will continuously monitor each phase of the incoming power as well as the status of the TEP and HED modules. The SAM shall include a normally open (N.O.) dry output contact which shall close upon failure of any protection module. The SAM shall incorporate its own transient voltage suppression network to protect itself from damage due to surge and transient energy.
- F. [**Surge Counter Option (SCO)**]: The SPD shall include a surge counter, on the face of the enclosure, which will count all transients occurring above the system clamping voltage threshold. The SCO shall interface with the SAM system and be independently powered without using an external power supply. The SCO shall maintain data in the event of a power failure or disconnection from the ac power source. The SCO system shall provide a visual count of all surges and transients through an LCD readout. The SCO circuitry shall prevent incorrect counting of ringing transients by registering all surges and transients occurring within 20 milliseconds as a single event. The SCO shall be capable of being reset by a push button switch on the surge counter meter faceplate.]

- G. Testing Standards: The SPD shall be tested to and comply with ANSI/IEEE C62.41-1991 categories A, B, and C. The SPD modules shall be UL recognized and comply with UL 1449. Total system shall be tested to MIL STD 220A. The SPD system shall be UL listed.
- H. Requirements: The SPD shall meet or exceed the following specifications.
1. Voltage Configuration: 120 volts ac, single phase, 2 wire plus ground.
  2. Protection Configuration: Phase to neutral, neutral to ground [phase to phase (delta only)] and phase to ground.
  3. Maximum Surge Current/Phase: 75,000 amps.
  4. Response Time: Total system response time not to exceed 5 nanoseconds.
  5. EMI/RFI Noise Rejection: 50 dB (50 Ohm insertion loss measurement method).
  6. Clamping Voltage Ratio: Maximum clamping voltage ratio shall be 2.7:1 under test procedures outlined in ANSI/IEEE C62.41-1980, Category C, 8x20 micros at 10,000 amperes.
  7. Performance: The SPD shall be tested in accordance with procedures outlined in ANSI/IEEE C62.41-1980. Surges will be applied in all possible combinations; common mode to common mode, normal mode to common mode, normal mode to normal mode, and common mode to normal mode. The manufacturer shall provide test data consisting of specified clamp voltages and surge current capacity for Category C. Test shall be conducted as follows:
    - a. Category A 100 kHz ring wave - 6,000 volts at 200 amperes.
    - b. Category B 100 kHz ring wave - 6,000 volts at 500 amperes.
    - c. Category B Bi-wave - 8 x 20 micros at 3,000 amperes and 1.2 x 50 micros at 6,000 volts.
    - d. Category C Bi-wave - 8 x 20 micros at 10,000 amperes and 1.2 x 50 micros at 6,000 volts.

In addition, the system design shall be life tested to withstand 1,000 sequential Category C surges without internal failure. The SPD shall also be tested to MIL STD 220A for noise insertion loss in a 50 Ohm system for RF frequencies up to 400 MHz.]
- I. Factory Testing: The SPD shall be completely factory-tested before shipment. Testing shall include, but not be restricted to, the following:
1. Quality control checks.
  2. MIL STD-220A.
  3. ANSI/IEEE C62.41-1980.
    - a. Category A.
    - b. Category B.
    - c. Category C.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF SURGE SUPPRESSORS:**

- A. General: Install SPD devices where shown, in accordance with the manufacturer's written instructions and recognized industry practices to ensure that the SPD devices comply with the requirements and serve the intended purposes. Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's "Standard of Installation", for installation of electrical devices.

**[EDIT TO SUIT PROJECT]**

- B. SPD Installation: Install the surge protector in or adjacent to the equipment which it protects. Maximum cable length from the protector to the protected device shall not exceed [3'] [\_\_\_\_\_]. The protector status alarm monitor shall be located in the face of the [protector]. Provide power wiring connections and disconnect/overcurrent device as required for connection to the protected equipment bus. [Extend alarm monitoring wiring from the surge suppressor alarm contact to [\_\_\_\_\_]].

3.2 TESTING:

- A. Checks: Prior to energization, check SPD devices for continuity of circuits and for short circuits.
- B. Demonstration: Subsequent to wire and cable hook-up, energize SPD devices and demonstrate proper functioning.

3.3 WARRANTY:

- A. General: The SPD device shall be warranted against defect or failure for one year after substantial completion of the project.

**END OF SECTION 26 43 13**