

## SECTION 26 4300 - SURGE PROTECTIVE DEVICES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Surge protective devices for service entrance locations.
- B. Surge protective devices for distribution locations.
- C. Surge protective devices for branch panelboard locations.

#### 1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 262416 - Panelboards.
- C. Section 271000 - Structured Cabling: Protectors for communications service entrance.

#### 1.3 ABBREVIATIONS AND ACRONYMS

- A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
- B. SPD: Surge Protective Device.

#### 1.4 REFERENCE STANDARDS

- A. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2014).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.
- G. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

## 1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

## 1.6 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
  - 1. SPDs with EMI/RFI filter: Include noise attenuation performance.
- C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.
- D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
  - 1. UL 1449.
  - 2. UL 1283 (for Type 2 SPDs).
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.
- H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.
- I. Project Record Documents: Record actual connections and locations of surge protective devices.

## 1.7 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

## 1.8 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in accordance with manufacturer's written instructions.

## 1.9 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## 1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.
- C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Basis of Design: Schneider Electric Square d products.
- B. Field-installed, Externally Mounted Surge Protective Devices - Other Acceptable Manufacturers:
  - 1. Leviton
  - 2. Hubbel.
  - 3. SSI
- C. Factory-installed, Internally Mounted Surge Protective Devices:
  - 1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.
- D. Substitutions: See Section 016000 - Product Requirements.

## 2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
  - 1. Wye Systems: L-N, L-G, N-G, L-L.
- E. UL 1449 Voltage Protection Ratings (VPRs):
  - 1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
  - 2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 1. Indoor clean, dry locations: Type 1.
  - 2. Outdoor locations: Type 3R.
- H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
  - 1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.
  - 2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.
- I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
  - 1. Switchgear: See Section 262300.
  - 2. Switchboards: See Section 262413.

## 2.3 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Surge Protective Device:
  - 1. Protection Circuits: Field-replaceable modular or non-modular.
  - 2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
  - 3. UL 1449 Nominal Discharge Current (I-n): 20 kA.

4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
6. Diagnostics:
  - a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
  - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
  - c. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.
  - d. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.
7. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

## 2.4 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

- A. Distribution locations include SPDs connected to distribution panelboards, motor control centers, and busway.
- B. Surge Protective Device:
  1. Protection Circuits: Field-replaceable modular or non-modular.
  2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.
  3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
  4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
  5. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
    - a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
  6. Diagnostics:
    - a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
    - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
    - c. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.
    - d. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

7. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

## 2.5 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

### A. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular or non-modular.
2. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
  - a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
6. Diagnostics:
  - a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
  - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
  - c. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.
  - d. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.
7. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.
- D. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.
- D. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.
- E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.
- F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.
- G. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

### 3.3 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS Section 7.19.1.
- D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

### 3.4 CLEANING

- A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION