

SECTION 26 43 00
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI).
2. Department of Defense: MIL-STD-220C, Test Method Standard – Method of Insertion Loss Measurement.
3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits.
 - b. C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
 - c. C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits.
4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
5. UL:
 - a. 497A, Standard for Secondary Protectors for Communications Circuits.
 - b. 1283, Standard for Electromagnetic Interference Filters.
 - c. 1449, Standard for Surge Protective Devices.

1.02 SUBMITTALS

A. Action Submittals:

1. Product data on each suppressor type, indicating component values, part numbers, and conductor sizes. Include dimensional drawing for each, showing mounting arrangements.
2. Electrical single-line diagram showing location of each SPD.
3. Manufacturer's UL certified test data and nameplate data for each surge protective device (SPD).

1.03 QUALITY ASSURANCE

A. UL Compliance and Labeling:

1. SPDs for Power and Signal Circuits: Comply with UL 1449 and complimentary listed to UL 1283 as an electromagnetic interference filter. Provide units listed and labeled by UL.
2. SPDs for Telephone Circuit Protection: Comply with UL 497A.

B. ANSI Compliance: Use SPD devices in compliance with the recommendations of IEEE C62.41.1, IEEE C62.41.2, and IEEE C62.45.

PART 2 PRODUCTS

2.01 SERVICE ENTRANCE AND DISTRIBUTION SPD

A. Manufacturers: To be by the manufacturer of the equipment in which the SPD is installed.

B. Physical Characteristics:

1. Unless indicated otherwise, provide direct bus-connected and factory-installed SPDs inside distribution equipment.
2. Connect SPDs through a fused switch or circuit breaker as selected by manufacturer. Provide overcurrent to allow full surge handling capabilities and afford safety protection from thermal overloads and short circuits.

C. Functional Characteristics:

1. Design SPD devices to protect all modes (L-L, L-N, L-G, N-G) of electrical system being used.
2. Power Filter: Include a high frequency extended range power filter for each SPD complimentary listed to UL 1283 as an electromagnetic interference filter.
3. Provide SPDs with the following monitoring and diagnostics:
 - a. LED-type indication to show normal and failed status of each protected phase.
 - b. Surge event counter.
4. Form C dry contact which operates when unit fails.
5. Provide UL Type 2 SPDs.

D. Performance Characteristics:

1. SPD Operating Conditions: Capable of performing at ambient temperatures between minus 40 degrees C and 60 degrees C, at relative

humidity ranging from 0 percent to 95 percent, and at altitudes ranging from sea level to 12,000 feet.

2. Provide SPD meeting IEEE C62.41.1 and IEEE C62.41.2 Location in accordance with Category C.
3. Surge Current Capacity:
 - a. 200 kA per phase.
 - b. 100 kA per mode.
4. Maximum Continuous Operating Voltage (MCOV): Not less than 115 percent of nominal system voltage.
5. Nominal Discharge Current (I_N): 20 kA.
6. SPD Short Circuit Current Rating (SCCR): No less than the SCCR of distribution equipment.
7. EMI/RFI Noise Suppression: Minus 50 dB attenuation at 100 kHz, tested per MIL-STD 220C.
8. Voltage Protection Rating (VPR):

Voltage Rating	L-N	N-G	L-G	L-L
208Y/120	800	800	800	1,200
480Y/277	1,200	1,200	1,200	2,000
480 Δ	--	--	2,000	2,000

2.02 PANELBOARD SPDS

- A. Manufacturers: To be by the manufacturer of the equipment in which the SPD is installed.
- B. Physical Characteristics:
 1. Unless indicated otherwise, provide direct bus-connected and factory-installed SPDs inside distribution equipment.
 2. Connect SPDs through a fused switch or circuit breaker as selected by manufacturer. Provide overcurrent to allow full surge handling capabilities and afford safety protection from thermal overloads and short circuits.
- C. Functional Characteristics:
 1. Design SPD devices to protect all modes (L-L, L-N, L-G, N-G) of electrical system being used.
 2. Power Filter: Include a high frequency extended range power filter for each SPD complimentary listed to UL 1283 as an electromagnetic interference filter.

3. Provide SPDs with the following monitoring and diagnostics:
 - a. LED-type indication to show normal and failed status of each protected phase.
 - b. Surge event counter.
4. Form C dry contact which operates when unit fails.
5. Provide UL Type 2 SPDs.

D. Performance Characteristics:

1. SPD Operating Conditions: Capable of performing at ambient temperatures between minus 40 degrees C and 60 degrees C, at relative humidity ranging from 0 percent to 95 percent, and at altitudes ranging from sea level to 12,000 feet.
2. Provide SPD meeting IEEE C62.41.1 and IEEE C62.41.2 Location in accordance with Category C.
3. Surge Current Capacity:
 - a. 120 kA per phase.
 - b. 60 kA per mode.
4. Maximum Continuous Operating Voltage (MCOV): Not less than 115 percent of nominal system voltage.
5. Nominal Discharge Current (I_N): 10 kA.
6. SPD Short Circuit Current Rating (SCCR): No less than the SCCR of distribution equipment.
7. EMI/RFI Noise Suppression: Minus 50 dB attenuation at 100 kHz, tested per MIL-STD 220C.
8. Voltage Protection Rating (VPR):

Voltage Rating	L-N	N-G	L-G	L-L
208Y/120	800	800	800	1,200
480Y/277	1,200	1,200	1,200	2,000
480 Δ	--	--	2,000	2,000

2.03 PAIRED CABLE DATA LINE INTERIOR SUPPRESSORS

- A. Physical Characteristics: None.
- B. Functional Characteristics: Use bi-polar 1,500-watt silicon avalanche diodes between protected conductor and earth ground.
- C. Performance Characteristics:
 1. Provide units meeting IEEE C62.41, Location Category A.
 2. Provide units with a maximum single impulse current rating of 80 amperes (10 by 1,000 microsecond-waveform).
 3. Breakdown voltage shall not exceed 36 volts.

2.04 PAIRED CABLE DATA LINE EXTERIOR SUPPRESSORS

- A. Physical Characteristics: None.
- B. Functional Characteristics: Hybrid design with a minimum of three stages, using solid-state components and operating bi-directionally.
- C. Performance Characteristics:
 - 1. Provide units meeting IEEE C62.41, Location Category A.
 - 2. Meet or exceed the following criteria:
 - a. Maximum single impulse current rating of 10,000 amperes (8 by 20 microsecond-waveform).
 - b. Pulse Life Rating: 3,000 amperes (8 by 20 microsecond-waveform); 2,000 occurrences.

2.05 PAIRED CABLE DATA LINE INTERIOR SUPPRESSORS

- A. Maximum clamping voltage at 10,000 amperes (8 by 20 microsecond current waveform), shall not exceed the peak of normal applied signal voltage by 200 percent.

PART 3 EXECUTION

3.01 APPLICATION REQUIREMENTS

- A. Provide SPDs when indicated on the Drawings or in the equipment specifications.
- B. Provide factory-installed SPDs as integral components to new switchgear, switchboards, motor control centers, panelboards and transfer switches. Externally mounted SPDs are not acceptable for new distribution equipment.
- C. Externally mounted SPDs are acceptable for SPDs added to existing equipment as described below.
- D. Electronic Equipment Paired Cable Conductors: Install data line suppressors at the low voltage input and output of each piece of equipment, including telephone cable entrance.
 - 1. Use secondary protectors on lines that do not exit the structure.
 - 2. Use primary protectors on lines that exit and enter the structure.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Install suppressors according to manufacturer's recommendations.
- B. Install suppressors directly to the cabinet which houses the circuit to be protected so that the suppressor leads are straight and short, with conductors laced, running directly to the point of connection within the panel, without loops or bends. If bends are unavoidable, no bend may exceed 90 degrees and bending radius may not be less than 6 inches.
- C. Provide connecting wires as short as possible with gently twisted conductors, tied together, to prevent separation: Maximum Length: 24 inches.
- D. Field Installed Conductors: As specified for building wire, not smaller than 8 AWG and not larger than 4 AWG. Provide device leads not longer than the maximum length recommended by manufacturer, unless specifically reviewed and approved by manufacturer.
- E. Provide dedicated disconnecting means for SPD devices installed at main service entrance location, switchgear, and motor control centers. Provide dedicated circuit breakers (size by manufacturer) with number of poles as required, as disconnecting means for SPD devices. Provide circuit breakers with interrupting capacity equal to that specified for other breakers at that location.

END OF SECTION