

DIVISION 16 SECTION 16289

Surge Protective Device Submittal (SPD)

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

- A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1 Specification sections apply to this section.

1.2 DESCRIPTION

- A. General: a Surge Protective Device (SPD) is the description and equipment required for the protection of all AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients

1.3 REFERENCE STANDARDS AND PUBLICATIONS

- A. A. General: The latest edition of the following standards and publications shall comply to the work of this section:
 1. ANSI/IEEE C84.1-1989, American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz)
 2. ANSI/IEEE C62.41-1991, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
 3. ANSI/IEEE C62.45-1992, IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits
 4. The SPD units and all components shall be designed, manufactured and tested in accordance with the latest applicable UL standard UL 1449, 3rd Edition, compliance required September 30, 2009, UL 1283 and CSA certified per CSA 22.2.
 5. TVSS units shall be listed by a Nationally Recognized Listing agency such as UL or ETL.
 6. The UL 1449 3rd edition Voltage Protection Ratings (VPR) label shall be permanently affixed to the Series Surge Protective Device (SPD).
 7. The SPD units must be co listed to Underwriters Laboratories UL 1283 Standard for Safety - Electromagnetic Interference Filters.
 8. National Fire Protection Association, NFPA 780 - National Electrical Code
 9. IEEE Standard 142-1991, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)
 10. ANSI/IEEE Standard 141-1999, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)
 11. IEEE Standard 1100-2005, IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)
 12. FIPS Pub 94, Federal Information Processing Standards Publication - Guideline on Electrical Power for ADP Installations.
 13. MIL Standard 220A Method of Insertion-loss Measurement
 14. ISO 9001:1994, Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation and Servicing

1.4 MANUFACTURER QUALIFICATIONS

- A. Eaton's Innovative Technology surge protective devices shall be the basis of design. All products submitted shall comply with the specifications of the Innovative Technology model type specified herein. Manufacturers requesting product approval must meet or exceed the written specification contained herein. Product information may be obtained by contacting Power Protection Products (P3) attention Dan Maxcy at dan@p3-inc.com. Manufacturers requesting approval must receive written verification of product acceptance by the specifying engineer 10 days prior to the bid date.
- B. The manufacturer shall submit a written statement indicating that a factory authorized representative inspected the installation. The installing contractor shall submit a checkout memorandum to the manufacturer. The memorandum shall indicate the date the equipment is placed into service and the actual method of installation. Submit three copies to the specifying engineer.
- C. All surge protective devices for service entrance, distribution, and branch circuit protection within a facility shall be provided by a single manufacturer.
- D. The manufacturer must be regularly engaged in the manufacture of surge suppression products for the specified categories for no less than ten (10) years.

1.5 WARRANTY

- A. The SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of twenty (20) years from the date of substantial completion of service and activation of the system to which the suppressor is attached.
- B. An SPD that shows evidence of failure or incorrect operation during the warranty period shall be replaced free of charge. Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPDs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this section. The warranty is to cover the effects of lightning, single phasing, and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.
- C. The installation of SPDs in or on electrical distribution equipment shall in no way compromise or violate equipment listing, labeling, or warranty of the distribution equipment.

1.6 SUBMITTALS

- A. The SPD submittals shall include, but shall not be limited to, the following information:
 - 1. Data for each suppressor type indicating conductor sizes, conductor types, and connection configuration and lead lengths.
 - 2. Manufacturer's certified test data indicating the ability of the product to meet or exceed requirements of this specification.
 - 3. Drawings, with dimensions, indicating SPD mounting arrangement and lead length configuration, and mounting arrangement of any optional remote diagnostic equipment and assemblies.
 - 4. List and detail all protection systems such as circuit breakers, disconnecting means and protective materials.
 - 5. SPD wiring, bonding, and grounding connections shall be indicated on the wiring diagrams for each system. Include installation details demonstrating mechanical and electrical connections to equipment to be protected.

6. If requested, a sample of each suppressor type shall be submitted for use in testing and evaluation.
7. Provide verification the SPD device complies with the required UL 1449 3rd edition. At a minimum, the complete Listing File Number covering the submitted SPD devices shall be provided.
8. Provide a copy of the listing agencies ratings to UL1449 3rd edition, which must include the SPD type, the Voltage Protection Ratings (VPR), the modes protected, the Nominal Discharge rating (I_n), and the Maximum continuous operating voltage (MCOV).

Part 2 - Products

2.1 PERFORMANCE

A. GENERAL

1. SPDs shall be listed in accordance with UL 1449 Third Edition, Standard for Safety, Surge Protective Devices and UL 1283, Standard for Safety, Electromagnetic Interference Filters.
2. The SPD shall protect all modes and there shall be seven discrete suppression circuits: 3 modes connected Line to Ground, 3 modes connected Line to Neutral, and 1 mode connected Neutral to Ground for a 3-phase, 4-wire, plus ground voltage system. Line to Neutral to Ground is not an acceptable substitute for Line to Ground protection. Line to Neutral to Line and Line to Ground to Line (in combination) will be acceptable for Line to Line protection.
3. All SPDs must have a minimum Short Circuit Current Rating (SCCR) of 200kA. Documentation substantiating this claim must be provided.
4. SPDs shall use a separate path to building ground; the equipment safety ground is not to be used as a transient ground path.
5. All SPDs are to be an MOV-based design and are not to include SAD technology as a means of suppression. The SPDs shall not employ the use of hazardous materials such as Selenium as a surge suppression means.
6. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 115% for 220, 240, 277, and 480V systems.
7. Standard diagnostic features are to include green LEDs (one per phase - normally on) indicating power and suppression status and a set of normally open/normally closed Form C dry-relay contacts.
8. Extended diagnostics must include an audible alarm and surge counter to be displayed on an LCD display on the front of the suppressor. The surge counter must include a reset option. The audible alarm must include a mute option. Products requiring an optional diagnostic test kit to verify operation will not be allowed.

B. SERVICE ENTRANCE PROTECTION

1. The SPD for this location shall be indicated as [SPD TYPE 1 OR 2] on project drawings
2. The service entrance SPD equipment shall meet or exceed the minimum performance criteria as follows:
 - a. The SPDs shall be Innovative Technology model "PTX300-xxxxxCD-SD" or "Approved Equal" as described in Section 1.4 (where xxxxx represents the appropriate voltage code for the system being protected).
 - b. The single-impulse surge-current rating shall be a minimum of 300,000 Amperes per phase (150,000 Amperes per mode)
 - c. The UL 1449 Third Edition Nominal Discharge Rating (I_n) shall be 20kA to be compliant with NFPA 780

requirements. Lower Nominal Discharge ratings will not be accepted.

d. The UL 1449 Third Edition Voltage Protection Rating for the following configurations shall not exceed the following:

Voltage Configuration	L-G	L-N	N-G
120/208V (3Y101)	600V	600V	600V
277/480V (3Y201)	1000V	1000V	1000V

e. SPDs shall be of compact design. The mounting position of the SPD shall allow a straight and short lead-length connection between the SPD and the point of connection in the panelboard. SPD's mounted internal to the switchboard or panelboard will not be permitted.

f. Visual indication of proper SPD connection and operation shall be easily viewed on the front panel of the enclosure. The indicator lights shall indicate suppression circuit status.

g. A set of normally open/normally closed Form "C" dry contacts shall be provided for remote monitoring.

h. The enclosure type shall have a minimum of a NEMA 4 rating.

i. SPDs shall have a diagnostics LCD panel display providing information on phase loss (specific to each phase), surge/transient event count, stored cumulative surge/transient event history, and technical support information.

j. SPDs shall be equipped with an audible alarm with mute, reset and acknowledge features.

k. The device must be certified to withstand a minimum of 20,000 Category C3 (Combination wave - 20,000 Volts - 1.2x50us OCV and 10,000 Amps - 8x20us SCC as defined by ANSI/IEEE C62.41-1991) impulses with less than 10% change in the baseline to final let-through voltage. This data must be submitted as an independently verified and certified test report.

L. The maximum value for the attenuation for the suppressor must exceed a minimum of 33 dB. All measurements for this requirement must be taken using the MIL STD 220A method and with only six (6) inches of lead length extending outside of the normal exit location of leads for the enclosure. Test results taken with leads extending past six (6) inches are not acceptable or compliant. Additional or excessive lead length used in the test setup is not acceptable.

C. DISTRIBUTION PANEL PROTECTION

1. SPD(s) for this location shall be indicated as [SPD TYPE 2] on project drawings.

2. The distribution panel SPD equipment shall meet or exceed the minimum performance criteria as follows:

a. The SPDs shall be Innovative Technology model "PTE120-xxxxxCD-SD" or "Approved Equal" as described in Section 1.4 (where xxxxx represents the appropriate voltage code for the system being protected).

b. The single-impulse surge-current rating shall be a minimum of 120,000 Amperes per phase (60,000 Amperes per mode).

c. The UL 1449 Third Edition Nominal Discharge Rating (In) shall be 20kA. SPDs with less than 20kA Nominal Discharge Ratings will not be accepted.

d. The UL 1449 Third Edition Voltage Protection Rating for the following configurations shall not exceed the following:

Voltage Configuration	L-G	L-N	N-G
120/208V (3Y101)	600V	600V	600V
277/480V (3Y201)	1000V	1000V	1000V

e. SPDs shall be of compact design. The mounting position of the SPD shall allow a straight and short lead-length connection between the SPD and the point of connection in the panelboard. SPD's mounted internal to the switchboard or panelboard will not be permitted.

f. Visual indication of proper SPD connection and operation shall be easily viewed on the front panel of the enclosure. The indicator lights shall indicate suppression circuit status, phase status, phase loss, reduced protection level and suppression fault.

g. The SPD shall be equipped with an integral disconnect switch or be available as an option.

h. A set of normally open/normally closed Form "C" dry contacts shall be provided for remote monitoring.

i. The enclosure type shall have a minimum of a NEMA 4 rating.

j. SPDs shall have a diagnostics LCD panel display providing information on phase loss (specific to each phase), surge/transient event count, stored cumulative surge/transient event history, and technical support information.

k. SPDs shall be equipped with an audible alarm with mute, reset and acknowledge features.

l. The device must be certified to withstand a minimum of 15,500 Category C3 (Combination wave - 20,000 Volts - 1.2x50us OCV and 10,000 Amps - 8x20us SCC as defined by ANSI/IEEE C62.41-1991) impulses with less than 10% change in the baseline to final let-through voltage. This data must be submitted as an independently verified and certified test report.

m. The maximum value for the attenuation for the suppressor must exceed a minimum of 33 dB. All measurements for this requirement must be taken using the MIL STD 220A method and with only six (6) inches of lead length extending outside of the normal exit location of leads for the enclosure. Test results taken with leads extending past six (6) inches are not acceptable or compliant. Additional or excessive lead length used in the test setup is not acceptable

D. SUBPANEL PROTECTION

1. SPD(s) for this location shall be indicated as [SPD TYPE 2] on project drawings.

2. The distribution panel TVSS equipment shall meet or exceed the minimum performance criteria as follows:

a. The SPDs shall be Innovative Technology model "PTE080-xxxxx-D-SD" or "Approved Equal" as described in Section 1.4 (where xxxxx represents the appropriate voltage code for the system being protected).

b. The single-impulse surge-current rating shall be a minimum 80,000 Amperes per phase (40,000 Amperes per mode).

c. The UL 1449 Third Edition Nominal Discharge Rating (In) shall be a minimum of 10kA. SPDs with less than 10kA Nominal Discharge Ratings will not be accepted.

d. The UL 1449 Second Edition Suppressed Voltage Rating for the following configurations shall not exceed the following:

Voltage Configuration	L-G	L-N	N-G
120/208V (3Y101)	600V	600V	600V
277/480V (3Y201)	1000V	1000V	1000V

e. SPDs shall be of compact design. The mounting position of the SPD shall allow a straight and short lead-length connection between the SPD and the point of connection in the panelboard. SPD's mounted internal to the switchboard or panelboard will not be permitted.

f. Visual indication of proper SPD connection and operation shall be easily viewed on the front panel of the enclosure. The indicator lights shall indicate suppression circuit status, phase status, phase loss, reduced protection level and suppression fault.

g. The SPD shall be equipped with an integral disconnect switch or be available as an option.

h. A set of normally open/normally closed Form "C" dry contacts shall be provided for remote monitoring.

i. The enclosure type shall have a minimum of a NEMA 4 rating.

j. SPDs shall have a diagnostics LCD panel display providing information on phase loss (specific to each phase), surge/transient event count, stored cumulative surge/transient event history, and technical support information.

k. SPDs shall be equipped with an audible alarm with mute, reset and acknowledge features.

l. The device must be certified to withstand a minimum of 15,000 Category C3 (Combination wave - 20,000 Volts - 1.2x50us OCV and 10,000 Amps - 8x20us SCC as defined by ANSI/IEEE C62.41-1991) impulses with less than 10% change in the baseline to final let-through voltage. This data must be submitted as an independently verified and certified test report.

m. The maximum value for the attenuation for the suppressor must exceed a minimum of 33 dB. All measurements for this requirement must be taken using the MIL STD 220A method using and with six (6) inches of lead length extending outside of the normal exit location of leads for the enclosure. Test results taken with leads extending past six (6) inches are not acceptable or compliant. Additional or excessive lead length used in the test setup is not acceptable.

E. INSTALLATION

1 The installing contractor shall install the parallel SPD with short and straight conductors as practically possible. SPD's mounted internal to the switchboard or panelboard will not be permitted.

2 The contractor shall follow the SPD manufacturer's recommended installation practice as found in the equipment installation instructions.

3 The installation shall apply to all applicable codes.

END OF SECTION