

PART 1 - GENERAL

1.1 CANADIAN STANDARDS ASSOCIATION (CSA).

- .1 CAN/CSA-C222.2#144-M91 (R2015) Ground Fault Circuit-interrupters
- .2 CAN/CSA-C222.2#144.1-16 Ground Fault Circuit-interrupters
(TriNational Standard with UL 943 and NMX-J-520-ANCE)

1.2 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 24 16.01 - Panelboards Breaker Type.
- .3 Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .4 Section 26 05 05 - Short Circuit, System Coordination, Arc Flash Hazard Studies.

1.3 REFERENCES

- .1 The specified transient surge protective equipment shall be designed, manufactured, tested and installed in compliance with the following codes and standards:
- .2 Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41, C62.45).
- .3 American National Standards Institute.
- .4 Federal Information Processing Standards Publication 94 (FIPS PUB 94).
- .5 Underwriters Laboratories UL 1283 5th Edition and UL 1449 - **4TH** Edition.
- .6 Underwriters Laboratories Canada (ULC).
- .7 Ontario Hydro Electrical Safety Code 2018

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittals.
- .2 Provide verification that the SPD device(s) meets the requirements of:
 - .1 UL 1449 - as well as;
 - .2 CSA Approval;
 - .3 Ontario Electrical Safety Code;
 - .4 Provide the following supporting Product Data:
 - .1 For each type of SPD product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- .2 Provide verification the SPD is listed or recognized through Underwriters Laboratories to UL 1449.
- .3 Operations and Maintenance Data: SPDs to be included in the operation and maintenance manuals.
- .4 Warranties: SPD warranties to be included in the O&M manuals.
- .3 Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up of the product(s). Indicate maximum size of circuit breaker or fuse to be connected for each unit.
- .4 List and detail all protection systems such as fuses, disconnecting means and protective features.
- .5 Provide actual let through voltage test data in the form of oscillograph results for the IEEE C62.41 Category "C" & "B" impulse and ringwave tested in accordance with IEEE C62.45.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance Submittals: submit following in accordance with Section 01 05 03 - Quality Control.
- .2 Certificates: submit production certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Submit three (3) copies of certified factory test results.
- .4 Instructions: submit manufacturer's installation instructions.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual in accordance with Section 01 78 00.
- .2 3 copies maintenance data for complete assembly including components.
- .3 Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

1.7 SYSTEM

- .1 This section describes the electrical and mechanical requirements for a transient surge protection system.
- .2 The specified system shall provide effective, surge energy (voltage and current) diversion and be suitable for application in ANSI/IEEE C62.41 Category "B" and "C" environments (as described by ANSI/IEEE C62.41.1).
- .3 Surge Protective Devices (SPDs) shall be compatible with non-linear loads and consist of high performance metal-oxide varistors designed

to provide impulse transient voltage surge suppression and ring wave surge noise filtering.

- .4 SPDs shall be connected in parallel with the electrical distribution system unless otherwise noted or indicated.
- .5 The operation of an SPD shall not be affected by or interact with any other filter or power factor correction or harmonic reduction equipment installed on the electrical distribution system.
- .6 SPDs shall be mounted within the panelboards and distribution equipment and be manufactured by the same manufacturer of the equipment. The SPD unit shall be connected to the distribution equipment via a 30 amp **2 pole** circuit breaker from within the distribution equipment in order that the SPD unit can be serviced. The SPD unit shall be of modular design.

1.8 DEFINITIONS

- .1 $I_{(n)}$: Nominal discharge current rating.
- .2 MCOV: Maximum continuous operating voltage.
- .3 Protection Modes: The pair of electrical connections where the VPR applies.
- .4 MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- .5 OCPD: Overcurrent protective device.
- .6 SCCR: Short-circuit current rating.
- .7 SPD: Surge protective device.
- .8 VPR: Voltage protection rating.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 SPDs shall not generate any appreciable magnetic fields.
- .2 SPDs shall be capable of use in computer rooms without danger to data storage systems or devices.
- .3 SPD operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.
- .4 SPDs shall not generate any audible noise during normal operation.

1.10 WARRANTY

- .1 The manufacturer shall provide a full 10-year parts and labour warranty from date of substantial completion against failure when installed in compliance with manufacturer's written instructions, ULC listing requirements, and any applicable national and local electrical codes. Manufacturer shall make available for consultation, (local, national) engineering service support. Where direct factory employed service engineers are not locally available, travel time from the factory or the nearest dispatch centre shall be stated in the Project Bid Form.

- .2 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 SPD's shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this section. That is, the warranty must specifically provide for unlimited free replacements in the event of failure caused by the effects of lightning and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.
- .3 The installation of SPDs in or on electrical distribution equipment shall in no way compromise or violate equipment listing, labelling, or warranty of the distribution equipment or its components.

1.11 MANUFACTURER

- .1 The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- .2 For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- .3 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Department Representative, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.12 DELIVERY, STORAGE AND HANDLING

- .1 Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

- .1 SPD with Accessories: Listed and labeled as defined in NFPA 70.12, by Underwriters Laboratories, and marked for intended location and application.
- .2 Comply with Underwriters Laboratories UL 1449 - Surge.
- .3 Comply with Underwriters Laboratories UL 1283 (Applies to all Type 2 SPDs).
- .4 Designed in accordance with IEEE C62.41.1, C62.41.2 and C62.45.
- .5 SPDs manufacturer shall be ISO-9001 1.2 certified.
- .6 MCOV of the SPDs shall not be less than 115% for 480Y/277V and 125% for 240Y/120V nominal RMS system voltages.
- .7 SPDs installed internal to the distribution equipment shall be of the same manufacturer as the equipment. The equipment shall be fully tested and certified to the following UL standards:

.1 UL 67 1.2 = Panelboards. **Add E-02**

.8 Surge Current Rating: The surge current rating of the SPD shall be dependent of its Category/Location,

Category/Location	Application	Per Phase	Per Mode
C	Service Entrance	160 kA	80 kA
B	Distribution	160 kA	80 kA

.9 Protection modes: UL 1449 - **4TH**. Edition, VPR for Delta configured circuits shall not exceed the following:

Modes	240D	600D
L-G; N-G	1200 V	2500 V

.10 SCCR: As per the Ontario Electrical Safety Code the short circuit current rating of the SPD shall be equal to or greater than the available short circuit current at the point on the system where installed.

.1 Nominal Discharge Current Rating: **200 kAIC. Add E-02**

.2 Facilities that have a Lightning Protection System installed or scheduled to be installed shall be provided with a Surge Protective Device that carries a minimum Nominal Discharge Current Rating of 20kA.

2.2 PANELBOARD SUPPRESSORS **ADD E-02**

.1 SPDs: Shall comply with UL 1449 **4TH**. Edition.

.1 Type 1 or Type 2 SPD.

.2 Type 2 SPDs shall also comply with UL 1283.

.2 Provide SPDs with the following:

.1 Indicator light(s) for power and protection status.

.2 Internal fusing design capable of disconnecting the SPD before any damaging external effects to the suppressor or surroundings occur.

.3 Audible Alarm with complete with a silencing switch.

.4 Form-C contacts - One normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building management system.

.5 Surge counter complete with a reset switch.

.3 Surge Current Rating: The surge current rating of the SPD shall be dependent of its Category/Location.

Category/Location	Application	Per Phase	Per Mode
B	Distribution	160 kA	80 kA
B	Branch	120 kA	60 kA

.1 Protection modes: UL 1449 - **4TH**. Edition, VPR for grounded WYE configured circuits shall not exceed the following: **Add E-0**

Modes	208Y/120	600Y/347
L-N; L-G; N-G	800 V	1500 V
L-L	1200 V	2500 V

- .4 Protection modes: UL 1449 -, VPR for Delta configured circuits shall not exceed the following:

Modes	240D	600D
L-G; N-G	1200 V	2500 V

- .5 SCCR: As per the Canadian Electrical Code the short circuit current rating of the SPD shall be equal to or greater than the available short circuit current at the point on the system where installed.
- .6 Nominal Discharge Current Rating: Minimum of 10 kA $I_{(n)}$.

2.3 ENCLOSURES

- .1 Enclosures shall meet or exceed the ratings for the environment to be installed as indicated on the drawings.
- .2 Indoor Enclosures: NEMA 250, Type 3R.
- .3 Outdoor Enclosures: NEMA 250, Type 3R, 4X.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Refer to the project power distribution diagrams for additional SPDs requirements to be met and or provided.
- .2 Install SPD devices at the service entrance in accordance with the CSA C22.1 Canadian Electrical Code.
- .3 All SPDs installed on the line side of the service entrance distribution equipment OCPD shall be Type 1 SPDs.
- .4 All SPDs installed on the load side of the OCPD shall be Type 2 SPDs and be provided with an over current protective device.
- .5 All SPDs must be rated for the distribution system short circuit level based upon the approved Short Circuit and System Coordination Studies.
- .6 Follow manufacturer's installation practice recommendations.
- .7 Provide a minimum 30 Amp **2-pole** circuit breaker as a dedicated disconnecting means for the SPD unit unless otherwise indicated.
- .8 Install SPDs with properly rated conductors (minimum wire size shall be No.10 copper twisted AWG) between the suppressor and points of attachment as short and straight as possible; adjust circuit-breaker positions to achieve shortest and straightest leads lengths.
- .9 Twist input conductors together to reduce the input inductance.
- .10 Do not splice and extend SPD leads unless specifically permitted by manufacturer and written direction have been issued by the departmental representative to this effect.
- .11 Connect into building automation system for remote monitoring of the SPD device.

3.2 FIELD QUALITY CONTROL

- .1 Perform the following tests and inspections in accordance with section 26 05 05.
- .2 Compare equipment nameplate data for compliance with Drawings and Specifications.
- .3 Inspect anchorage, alignment, grounding, and clearances.
- .4 Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- .5 An SPD will be considered defective if it does not pass inspections.
- .6 Prepare inspection reports.

3.3 START-UP SERVICE

- .1 Complete start-up checks in accordance with the manufacturer's written instructions.
- .2 Verify that SPDs within electrical Switchboards etc. have been energized as many vendors ship this equipment to the site in the off position.
- .3 Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect all wires, including neutral of the SPD before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- .4 Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION