

SECTION 26 43 13

TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. These specifications describe the electrical and mechanical requirements for a high energy surge protective device (abbreviated TVSS in this specification and on all drawings). The specified system shall provide effective high energy surge current diversion, sine wave tracking for electrical line noise filtering and be suitable for application in ANSI/IEEE C62.41 Category A, B, and C environments, as tested by ANSI/IEEE C62.11, C62.45 and MIL-STD-220A. The system shall be connected in parallel with the MAIN CIRCUIT BREAKER; no series connected elements shall be used which limit load current or kVA capability.

1.2 STANDARDS

- A. The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:
 - 1. Canadian Underwriters Laboratory (CUL)
 - 2. American National Standards Institute and Institute of Electrical and electronic Engineers (ANSI/IEEE C62.11, C62.41, and C62.45)
 - 3. Federal Information Processing Standards Publication 94 (FIP PUB 94)
 - 4. National Electrical Manufacturer Association (NEMA LS-1 1992)
 - 5. National Fire Protection Association (NFPA 20, 70, 75, and 780)
 - 6. Underwriters Laboratories (UL 1449, UL 1283) (Second Edition)
 - 7. MIL-STD-220A
 - 8. International Standards Organization (ISO) Company certified ISO 9001 for manufacturing, design and service.
- B. The TVSS unit shall be UL-listed under UL 1449 Standard for Transient Voltage Surge Suppressions and the surge ratings shall be permanently affixed to the TVSS.

1.3 SYSTEM DESCRIPTION

- A. The TVSS shall be constructed using multiple surge current diversion arrays of metal oxide varistors (MOV). No gas tubes, silicon avalanche diodes or selenium plates/rectifiers shall be used. The status of each array shall be continuously monitored and a green LED shall be illuminated if the array is in full working order.

1.4 ELECTRICAL REQUIREMENTS

- A. Nominal system operating voltage shall be 277/480VAC, Split Configuration, Three Phase, 4-Wire plus ground.
- B. Maximum Continuous Operating Voltage (MCOV): The TVSS maximum continuous operating voltage shall be 115% of the nominal system operating voltage to ensure the ability of the system to withstand temporary RMS overvoltage (swell) conditions.

- C. Operating Frequency: The operating frequency range of the system shall be at least 47 to 63 Hertz.

1.5 SUBMITTALS

- A. Equipment Manual: The manufacturer shall furnish an installation manual with installation, start up, trouble-shooting guide and operating instructions for the specified system.
- B. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, component and connection locations, mounting provisions, connection details and wiring diagram.
- C. UL 1449 Ratings: Documentation of specified system's UL 1449 Listing and clamping voltage ratings of all protection modes shall be included as required product data submittal information.

1.6 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies and recommended maintenance procedures and intervals.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 ENCLOSURE

- A. The unit case shall be a NEMA 12 metal enclosure.

2.2 CONNECTIONS

- A. The unit shall be designed to be installed using wire leads cut as short as possible.

2.3 PERFORMANCE STANDARDS

- A. Transient Voltage Surge Suppression (TVSS)
 1. Manufacturer: *Cutler-Hammer/Eaton* Visor Series, or approved equal.
 2. Compliance: TVSS units and all components shall be designed, manufactured and tested in accordance with the latest applicable UL-listed standards (UL 1449, 2nd Edition), UL 1283 and CSA certified per CSA 22.2.
 3. Operating Voltage: 277/480Y.
 4. Maximum Continuous Operating Voltage: 115% nominal operating voltage

5. Description: The suppression system shall incorporate a hybrid designed MOV surge suppressor for the service entrance and other distribution level. The system shall not utilize silicon avalanche diodes, air gaps or other components that may crowbar the system voltage leading to system upset. The device shall have directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G).
6. Maximum UL 1449 SVR: 800V (L-N, L-G, N-G) and 1800V (L-L).
7. ANSI/IEEE Cat.C3 Let-Through Voltage: 960V or less (L-N).
8. ANSI/IEEE Cat B3 Let-Through Voltage: 165V or less (L-N).
9. TVSS Design:
 - a. Balanced Suppression Platform: The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating TVSS modules shall not be acceptable.
 - b. Electrical Noise Filter: Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be 50 dB at 100 kHz using the MIL-STD-220A insertion loss test method. The unit shall be complimentary listed to UL 1283. Products not able to demonstrate noise attenuation of 50 dB @ 100 kHz shall be rejected.
 - c. Extended Range Filter: The Surge Protective Device shall have a High Frequency Extended Range Tracking filter in each Line to Neutral mode with compliance w UL 1283. The filter shall have published high frequency attenuation rating in the attenuation frequencies.

1) Attenuation Frequency	50kHz	100kHz	150kHz	1MHz	10MHz	100MHz
2) Insertion Loss (ratio)	40	316	316	89	200	79
3) Insertion Loss (dB)	32	50	50	39	46	38
 - d. Internal Connections: No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be hardwired with connections utilizing low impedance conductors and compression fittings.
 - e. Minimum Repetitive Surge Current Capability as per ANSI/IEEE C62.41 and ANSI/IEEE 62.45: 1992 suppression filter system must be repetitive surge tested in every mode utilizing a 1.2 x 50µsec, 20kV open circuit voltage, 8 x 20µsec, 10kA short circuit current Category C3 bi-wave at one minute interval without suffering either performance degradation or more than 10% deviation of clamping voltage at a specified surge current.
 - 1) Service Entrance: 12000 impulses per mode.
10. Minimum Total Surge Current (compliant to ANSI/IEEE C62.41 and NEMA LS1):
 - a. 250 kA per phase
 - b. 125 kA per mode
 - c. Surge Withstand Capability ANSI/IEEE C3 Wave (10kA) -12,000.
11. Installation:
 - a. The TVSS shall be installed immediately beside the main service panelboard.
 - b. The suppressor shall be connected on load side of main disconnect device, as close as possible to the phase conductors and ground/neutral bar.
 - c. The Contractor shall provide a 30-amp circuit breaker disconnect. The disconnect shall be installed within the main service panel.
12. Accessories:
 - a. Push-to-test feature to verify operational integrity.
 - b. Transient counter to be incremented on every surge event.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The installing Contractor shall connect the TVSS in parallel to the power source main circuit breaker, keeping conductors as short and straight as practically possible. The Contractor shall twist the TVSS input conductors together to reduce input conductor impedance. The unit shall be close-nipped to the panel and be supplied by a 30-Amp circuit breaker. The Contractor shall follow the TVSS manufacturer's recommended installation practices and comply with all applicable codes.

END OF SECTION 26 43 13