

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the specifications for surge protective devices.

### 1.2 DESCRIPTION OF WORK

- A. Extent of surge protective device work is indicated by drawings, schedules and specification herein. Work includes complete installation, electrical testing and commissioning.

### 1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. SVR: Suppressed voltage rating.

### 1.4 QUALITY ASSURANCE

- A. Comply with the National Electrical Code (NEC), NEMA and IEEE Standards as applicable to wiring methods, construction, and installation of surge protective devices. Comply with applicable requirements of ANSI/IEEE C62.41, C62.45; NFPA 20, 70, 75 and 78, and UL 1449 3<sup>rd</sup> Edition. Provide complete packaged units, which have been UL listed and labeled by Underwriters Laboratory. UL surge ratings (UL 1449 3<sup>rd</sup> Edition) must be permanently affixed to the surge protective device.
- B. The short circuit rating shall be indicated on the device per the National Electrical Code and UL requirements.

### 1.5 SUBMITTALS

- A. 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 requirements, including breaker size, and wiring diagram.
- B. Equipment Manual: The manufacturer shall furnish an installation manual with installation, start-up, and operating instructions for the specified system.
- C. Installation instructions shall clearly state if the system requires an external overcurrent device to maintain the system's UL 1449 3<sup>RD</sup> Edition listing.
- D. A UL 1449 stipulation, signed by the manufacturer's authorized representative, is required for all submittals. The stipulation shall:
  - 1. Certify that the surge protective device system is UL 1449 3<sup>rd</sup> Edition listed.
  - 2. Indicate what internal or external fusing is incorporated in the surge protective device system and what impact the fusing has on the performance of the device. (I.e. surge capacity and clamping levels).
- E. Provide minimum single pulse surge current testing documentation on each model proposed for locations per specification.

- F. Documentation of filter performance for stand-alone and system requirements per the specification.
- G. Documentation showing operational test set which can verify the clamping voltage of unit. Factory trained representative shall include start-up and testing as part of the requirements of this specification. Copy of testing completed and operational integrity of units installed shall be forwarded to owner and Architect/Engineer for review.
- H. Breaker and wire size requirements shall be indicated.

## 1.6 COORDINATION

- A. Coordinate location of field-mounted surge protective devices to allow adequate clearances for maintenance.

## 1.7 WARRANTY

- A. Manufacturer shall provide a product warranty for a period of not less than five (5) years from date of installation. Warranty shall cover unlimited replacement of surge protective device modules during the warranty period. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of surge protective devices for not less than twenty (20) years.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Except as otherwise indicated, provide high-energy transient voltage surge suppression electronic filter devices, suitable for application in Category A, B and C environments as indicated. Provide types, sizes, ratings, and electrical characteristics indicated which comply with manufacturer's standard materials, design, and construction in accordance with published information and as required for a complete installation.
- B. SPD stands for "surge protective device" where used herein.

### 2.2 SURGE PROTECTIVE DEVICE SYSTEM DESCRIPTION

- A. Provide surge protective devices, which comply with the following:
  - 1. Have operating temperature of -40 to + 122 degrees F and operate reliably in environments with 0 to 95% humidity (non-condensing).
  - 2. Emit no audible noise and capable of operation of up to 12,000 feet above sea level and emit no appreciable magnetic field.
  - 3. Have a maximum continuous operating voltage not less than 125% of the nominal system operating voltage for 120/208 volt systems, 115% for 277/480 volt systems, and a frequency operating range of 47 to 63 Hertz.
  - 4. Provide protection modes for line-to-neutral, line-to-line, line to ground, and neutral-to-ground for three phase, 4-wire wye systems.

- B. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Silicon avalanche diodes and gas tubes are not to be used or other components, which may short or "crowbar" the AC line and lead to possible disruption of the normal AC power flow.
- C. All primary transient path wiring shall be of #6 minimum for service entrance units and #8 AWG copper minimum. No plug-in modules, components or printed circuit boards shall be used in surge carrying paths.
- D. Each protection module shall have a visual indicator that signifies the protection circuitry is on line. A redundant status indicator shall be mounted on the front of the panel.
- E. Each protection module shall have a capacitive filtering system connected in each Line to Neutral (L→N)(Wye) mode or Line to Line (L→L)(Delta) mode to provide sine wave tracking and better performance of the protection modules.
- F. The fusing elements must be capable of allowing the suppressor's minimum rated transient current to pass through suppressor, at a minimum 1,000 times, without fuse operation. No external current limiting devices shall be used.
- G. Manufacturers shall submit independent test data from a nationally recognized testing laboratory verifying that Surge protective device unit can withstand its rated single impulse surge current. Testing shall be done per NEMA LS-1 requirements. Failure to do so will result in non-compliance.
- H. Protection modes: surge protective device shall provide Line to Neutral (L→N)(Wye), Line to Ground (L→G) (Wye or Delta), Line to Line (L→L)(Delta) and Neutral to Ground (N→G)(Wye) protection, except that (N→G) is not required in units at service entrance switchboards.
- I. Each unit shall have a listed filter that reduces low level fast risetime electrical line noise per NEMA LS-1/MIL STD 220A guidelines.
- J. Provide each unit with status indicators. Only where specifically indicated on drawings, provide each unit with audible alarm, disturbance counters, and form C contacts as indicated on the drawings.
- K. The SPD shall be rated for the available fault current, and shall be labeled with its rating.

### 2.3 UNITS INSTALLED FOR DISTRIBUTION PANELS DOWNSTREAM OF THE SERVICE ENTRANCE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide manufacturer's name; product name or designation:
  - 1. Current Technology Inc.; Danaher Power Solutions.
  - 2. LEA International.
  - 3. Liebert Corporation; a division of Emerson Network Power.
  - 4. Innovative Technology
  - 5. Square D
  - 6. Eaton
- B. Device shall meet all specification requirements in Section 2.2, as well as the following:

Equipment shall be a multi-stage parallel protector rated for VAC, <\_\_\_\_\_>PHASE, <\_\_\_\_\_>WIRE, plus ground. The equipment's minimum surge current capacity shall be 200,000 per phase (L-N plus L-G).

- C. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Each protection module shall have a minimum surge current rating of 100,000 per mode. Each protection module shall be capable of withstanding over 1,000 sequential 10,000 Amp ANSI/IEEE C62.41 Category C3 impulses without degradation or failure.

## 2.4 UNITS INSTALLED FOR PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide manufacturer's name; product name or designation:

1. Current Technology Inc.; Danaher Power Solutions.
2. LEA International.
3. Liebert Corporation; a division of Emerson Network Power.
4. Innovative Technology
5. Square D
6. Eaton

- B. Device shall meet all specification requirements in Section 2, as well as the following:

Equipment shall be a multi-stage parallel protector rated for VAC, <\_\_\_\_\_>PHASE<\_\_\_\_\_>WIRE, plus ground. The equipment's minimum surge current capacity shall be 160,000 per phase (L-N plus L-G).

- C. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Each protection module shall have a minimum surge current rating of 80,000 per mode. Each protection module shall be capable of withstanding over 1,000 sequential 10,000 Amp ANSI/IEEE C62.41 Category C3 impulses without degradation or failure
- D. Surge protective device units shall be mounted external to the panelboard. Provide over current protection for surge protective device units in sizes and types as recommended by the manufacturer for a UL-listed assembly.

## 2.5 ENCLOSURES

- A. Indoor Enclosures: NEMA 250 [Type 1] [Type 12].

## PART 3 - INSTALLATION

### 3.1 GENERAL

- A. The specified surge protective device system shall be installed no further than eighteen (18) electrical inches from the power conductor(s) it is protecting, and must have a grounding of 25 ohms or less and shall avoid any unnecessary or sharp bends.
- B. Install devices in accordance with manufacturer's written installation and operation manuals.
- C. The installing contractor shall install service entrance SPD with short and straight conductors as practically possible. The contractor shall twist the SPD input conductors together to reduce

input conductor inductance. The contractor shall follow the SPD manufacturer's recommended installation practices and comply with all applicable codes.

- D. The contractor shall follow the SPD manufacturer's recommended installation practices and comply with all applicable codes.
- E. Factory trained ISO 9001 certified service division employees shall be required to perform a site inspection prior to the project being turned over to the owner. Site inspection shall include verification of proper SPD installation, correct SPD voltage application, and startup procedures. Documentation shall be submitted to the Engineer verifying site visit and findings of the above.
- F. Contractor to provide CB or molded case switch sized per manufacturer's recommendations for units not provided with internal disconnects.
- G. Contractor to provide conduit and wiring from panel to surge protective device manufacturers recommendations.

### 3.2 ACCEPTANCE

- A. Manufacturer's representative shall visit site, verify installation, and submit to Architect a letter stating equipment and installation meets intent of Contract Documents and manufacturer's warranties and guarantees are in effect.

**END OF SECTION**