PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions and the following specification sections apply to all Work herein:
1. Section 26 00 10 - General Requirements
2. Section 26 00 20 - Scope of Work
3. Section 26 05 19 - Electrical Conductors - 600 Volts
4. Section 26 05 26 - Grounding and Bonding
5. Section 26 08 13 - Testing
6. Section 26 24 13 - Switchboards - 600 Volts
7. Section 26 28 13 - Fuses
8. Section 26 41 13 - Lightning Protection Systems

1.2 SUMMARY

A. Provide all Surge Protective Device (SPD) systems as specified herein, as indicated on the Drawings, and as required for proper control of transient voltages throughout the building.

1.3 REFERENCE STANDARDS

A. Each SPD system and all components shall be designed, manufactured and tested in accordance with the latest edition of all applicable industry standards including the following:
1. NFPA 70 – National Electrical Code (NEC). Article 285 & 250
2. FIPS Pub 94 – Federal Information Processing Standards
3. IEEE C62.41 2002 – Guide on the Surge Environment in Low Voltage AC Power Circuits
4. UL 1449 3rd Edition – Surge Protection Device
5. UL 891 – Dead-Front Switchboards
6. UL 67 – Panelboards
7. NEMA LS-1 – 2009 – Low Voltage Surge Protective Devices

B. All equipment and material to be furnished and installed on this Project shall be UL listed and labeled, in accordance with the requirements of the authorities having jurisdiction, and suitable for its intended use on this Project.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the General Conditions and Section 16010 and shall include, but not be limited to:
1. Surge Protection Device*, complete with physical dimensions, materials, connector details, nameplate data, voltage, current and short circuit ratings, bus capacity data, circuit schedule, installation details, accessories, etc.
2. Certification of compliance with ANSI/UL 1449 3rd Edition.
3. Proposed test procedures, recording forms, test equipment, and list of personnel and qualifications for all tests proposed. Refer to Section 26 08 13 titled “Testing” for additional requirements.
4. Factory Test Schedule.
5. Factory Test Reports.
6. Field Test Reports.

B. All items or equipment listed above with asterisks (*) shall be certified by the manufacturer using Manufacturer Certification "MCA" as set forth in Section 16010. See Section 16010 for certification requirements.

C. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Intertek (ETL), Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratories (NRTL). NRTL verification must list model number, SPD Type, system voltage, phases , modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I-n)

1.5 WARRANTY

A. Comply with the requirements of the General Conditions and Section 16010.

B. The SPD Unit, including labor and materials, shall be free from defects in workmanship and materials, under normal use and service, for a period of ten (10) years on service entrance equipment and five (5) years on all other equipment from the date of acceptance or beneficial occupancy, whichever occurs first. Any equipment or workmanship shown to be defective shall be repaired, replaced or adjusted during normal working hours at no cost to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. If it complies with these Specifications, suppression filter devices manufactured by one of the following manufacturers, or equal, will be acceptable:
1. Cutler Hammer.
2. General Electric.
3. Siemens.
4. Square D.

2.2 UNIT OPERATING VOLTAGE

A. The nominal unit operating voltage and configuration shall be as indicated on the drawings.

2.3 MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV)

A. The maximum continuous operating voltage (MCOV) of all suppression components utilized in the unit shall not be less than 125% of the facility's nominal operating voltage.

B. The suppression system shall incorporate thermally protected metal oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cell, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.

2.4 DESCRIPTION

A. The specified unit shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit shall be connected in parallel with the facility's wiring system.

B. The unit shall be designed and manufactured in the USA by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacturer of such products for minimum of ten (10) years.

C. All products that are submitted according to these specification will be required to meet this specification in its entirety for both service and distribution TVSS systems. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

2.5 ENVIRONMENTAL REQUIREMENTS

A. Operating Temperature. Operating temperature range shall be -40ºC - +60ºC (-40°F to +140°F).

B. Relative Humidity. Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.

C. Audible Noise. The unit shall not generate any audible noise.

D. Magnetic Field. No appreciable magnetic fields shall be generated. Unit shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

E. Seismic. UBC seismic zone 4.

F. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

G. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

2.6 SURGE PROTECTION DEVICE

A. Nominal Discharge Current (I-n)
1. All SPDs applied to the distribution system with a Phase to Phase Peak Surge Current greater than 120KA shall have a 20kA I-n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having a Phase to Phase Peak Surge Current greater than 120KA and an I-n less than 20kA shall be rejected.
2. All SPDs applied to the distribution system with a Phase to Phase Peak Surge Current less than 80KA shall have a 10kA I-n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having a Phase to Phase Peak Surge Current less than 80KA and an I-n less than 10kA shall be rejected.

B. Electrical Noise Filter
1. Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electricl line noise shall be up to 50dB from 10kHz to 100MHz using MIL-STD-220A insertion loss test method.

C. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR). The maximum VPR for the device shall not exceed the following

Nominal Voltage	L-N	L-G	N-G	L-L
208Y/120	600V	600V	600V	900V
480Y/277	1000V	1000V	1000V	1800V

D. Pursuant to Phase Surge Current Capability
1. If the standard maximum surge rating of a manufacturer's device does not correspond to the ratings listed below, then a higher rated unit shall be provided:
   a. The surge current ratings for devices installed in lighting class branch circuit panels shall be rated a minimum of 80kA per phase and 40kA per mode.
   b. The surge current ratings for devices installed in distribution panelboards or distribution switchboards shall be rated a minimum of 160kA per phase and 80kA per mode.
   c. The surge current ratings for devices installed in service entrance switchboards shall be rated a minimum of 300kA per phase and 150kA per mode.

E. The unit shall be capable of withstanding sustained overvoltage events that may be encountered within the distribution system, without damaging the SPD. As a minimum, the unit shall provide 125% continuous overvoltage withstandability at nominal RMS voltage.

F. Each SPD unit shall be provided with the following monitoring features:
1. Operational status indicating lights including but not limited too green light for each phase to indicate fully operational suppression capability and a red light per phase indicating total loss of suppression capability.
2. Audible alarm with test switch and on/off switch.
3. Form C Dry contacts for remote alarm monitoring purposes.
4. Transient voltage surge counter.

G. Each SPD shall be labeled with a short circuit current rating appropriate for use within the electrical distribution as shown on the Drawings but shall not be less than 200kA SCCR. All labeling shall be in accordance with the NEC Article 285. The unit shall not be applied to a location where the available fault current exceeds the label on the unit.

2.7 CONSTRUCTION WITHIN SWITCHBOARDS AND PANELBOARDS

A. All Service Entrance Switchboards: A SPD meeting all of the requirements of these specifications shall be factory installed internal to the switchboard enclosure by the switchboard manufacturer. The SPD shall be installed in accordance with manufacturer instructions.

B. Panelboards: The SPD shall be installed internal to the panelboard enclosure where indicated on the drawings as a standard UL Listed panelboard accessory if it meets all of the requirements of the specifications. The SPD shall be installed in accordance with manufacturer instructions.

C. The SPD device(s) shall be installed and sized in accordance with the ratings as shown on the Drawings.

D. Disconnect Switch:
1. All units installed in switchboards or distribution panelboards shall include a disconnect switch located in the unit enclosure.
2. The switch shall be rated for 600 VAC and shall be surge rated.
3. If fuses are included with this switch, the fusing shall be (surge rated) capable of conducting a transient equal to the nameplate transient rating of the SPD without failure.
4. The SPD performance ratings shall include the disconnect switch (and fuses where required) within the surge current diversion path.
5. The disconnect switch shall meet or exceed the fault current rating of the board per NEC 285. The Disconnect must switch the phases and neutral.

E. Surge Current Diversion Conductors:
1. The surge current diversion conductor path between the SPD and the main bus within the switchboard and the SPD connection to ground shall be as short as possible and in no case shall they be installed longer than recommended by the SPD manufacturer. If shorter conductor lengths are achievable as determined by the owner, the switchboard manufacturer shall modify the switchboard in its final location to reduce the surge current diversion conductor lengths. Such modifications shall be done in accordance with UL 891 and not void the UL listing of the switchboard section. Required modifications will be considered covered under warranty and shall be done without cost to the owner.
2. Conductors shall be 600V insulated stranded copper or 98% conductive copper bus sized in accordance with the recommendations of the SPD manufacturer.
3. Where stranded copper conductors are used, twist all phase conductors together their full length separating leads only to make terminal connections.
4. Avoid sharp bends in connection leads.

PART 3 EXECUTION

3.1 FACTORY TESTING

A. Each unit shall be factory tested before shipment. Testing shall include, but not be limited to production-line tests, quality assurance checks, and MCOV. A copy of the benchmark clamping tests for each individual SPD shall be included with each unit.

B. A representative from the consulting engineer or the end user may witness specific testing of the system(s) at the time of manufacture. The Subcontractor shall notify the Engineer and Owner in writing at least three (3) weeks prior to the day of the factory test.

3.2 FIELD TESTING

A. A factory-authorized local service representative shall provide start-up inspection services. The surge suppression units shall be tested for proper connection to each phase ground and neutral point.

B. The field test results shall be submitted by the Subcontractor for review. Field test reports shall include, but not be limited to:
1. Equipment Name and Nameplate information
2. Test performed.
3. Test procedure.

4. Date(s) and time(s) of testing and verification.
5. Checksheet(s) indicating inspection items.
6. Final test values.
7. Additional pertinent data.
8. Instruments including documentation that such instruments were properly calibrated at the time of the testing.
9. Personnel printed name, title, company, and signature of persons who performed the test.

C. Refer to Section 26 08 13 for additional testing requirements for switchboards.

END OF SECTION