SECTION 26 4113
LIGHTNING PROTECTION FOR STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Strike (air) terminals and interconnecting conductors.
B. Grounding and bonding for lightning protection.

1.02 RELATED REQUIREMENTS
A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Electrical system grounds.
B. Surge Protection for Wiring Systems: Specified in individual system requirements.

1.03 REFERENCE STANDARDS
B. UL 96 - Lightning Protection Components; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination with Concrete Work: Coordinate the embedding of lightning protection components in concrete.
B. Coordination with Roofing Work: Ensure adequate attachment of strike terminals and conductors without damage to roofing.
C. Preinstallation Meeting: Convene a meeting at least two weeks prior to commencement of any work affected by lightning protection system requirements to discuss prerequisites and coordination required by other installers; require attendance by representatives of installers whose work will be affected.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate location and layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.
   1. Where conductors or grounds are to be embedded or concealed in other construction, submit shop drawings at least 30 days prior to start of construction.
   2. If concrete-encased grounds are to be used and are not shown in the contract documents, provide sufficient data to determine concrete encasement dimensions and location.
   3. Include data on actual ground resistance determined by field measurement in accordance with NFPA 780.
   4. Include engineering analysis of equalization of potential to metal bodies within the structure.
   5. Include access panels, test holes, and disconnecting means for maintenance.
C. Product Data: Provide dimensions and materials of each component, indication of testing agency listing, and installation instructions.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
E. Installation Certification: Submit copy of certification agency's approval.

1.06 QUALITY ASSURANCE
A. Maintain one copy of each referenced system design standard on site.
B. Manufacturer Qualifications: Company specializing in lightning protection equipment with minimum three years documented experience.
C. Designer Qualifications: Person or entity, employed by installer, who specializes in lightning protection system design with minimum three years documented experience.
D. Installer Qualifications: Capable of providing the specified certification of the installed system.
E. Products: Listed, classified, and labeled as suitable for the purpose intended.
F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2  PRODUCTS

2.01 MANUFACTURERS
A. Lightning Protection Components:
   1. Michigan Lighting Protection Systems

2.02 LIGHTNING PROTECTION SYSTEM
A. Lightning Protection System: Provide complete system complying with NFPA 780, including air terminals, bonding, interconnecting conductors and grounding electrodes.
   1. Provide system that protects:
      a. The entire structure.
      b. Open air areas within 100 feet of exterior walls at grade level.
      c. Open air areas within building footprint.
   2. Coordinate with other grounding and bonding systems specified.
   3. Treat isolated non-grounded protruding metal items as specified by NFPA 780 for heavy-duty stacks.
   4. Provide copper, bronze, or stainless steel components, except where aluminum is allowed by NFPA 780.
   5. Provide system certified by Underwriters Laboratories or the Lightning Protection Institute.
B. Strike Terminals: Provide strike (air) terminals on the following:
   1. Roofs.
   2. Penthouse roofs.
   3. Parapets.
   4. Roof mounted equipment.
   5. Stacks.
   6. Chimneys.

PART 3  EXECUTION

3.01 EXAMINATION
A. Verify that field measurements are as indicated on shop drawings.
B. Coordinate work with installation of roofing and exterior and interior finishes.

3.02 INSTALLATION
A. Install in accordance with referenced system standards and as required for specified certification.
B. Connect conductors using mechanical connectors or exothermic welding process; protect adjacent construction elements and finishes from damage.

3.03 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Perform visual inspection as specified in NFPA 780 as if this were a periodic follow-up inspection.
C. Perform continuity testing as specified in NFPA 780 as if this were testing for periodic maintenance.
D. Obtain the services of the specified certification agency to provide inspection and certification of the lightning protection system, including performance of any other testing required by that agency.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Surge protective devices for service entrance locations.
   B. Surge protective devices for distribution locations.
   C. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS
   A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   B. Section 26 2300 - Low-Voltage Switchgear.
   C. Section 26 2413 - Switchboards.
   D. Section 26 2416 - Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS
   B. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS
   B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
   C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
   E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   F. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS
   A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to ordering equipment.

1.06 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
      1. SPDs with EMI/RFI filter: Include noise attenuation performance.
   C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.
   D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
      1. UL 1449.
      2. UL 1283 (for Type 2 SPDs).
E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual connections and locations of surge protective devices.

1.07 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION
A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS
2.01 MANUFACTURERS
2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS
A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
B. Protected Modes:
   2. Delta Systems: L-G, L-L.
C. UL 1449 Voltage Protection Ratings (VPRs):
   1. Equivalent to basis of design.
D. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
E. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type I.
   2. Outdoor locations: Type 3R.
F. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
   1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS
A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.
B. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

D. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.

E. UL 1449 Nominal Discharge Current (I-n): 20 kA.

F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

G. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
   3. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

H. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 or Type 2.

C. Distribution locations include SPDs connected to distribution panelboards, motor control centers, and busway.

D. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

E. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.

F. Repetitive Surge Current Capacity: Not less than 3,500 impulses.

G. UL 1449 Nominal Discharge Current (I-n): 20 kA.

H. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

I. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
   1. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

J. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
   3. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.
   4. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

K. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

2.05 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 or Type 2.
C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
D. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
G. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
   1. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
H. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection status.
   3. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.
   4. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.
B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of the drawings and manufacturer's instructions.
D. Verify system grounding and bonding is in accordance with Section 26 0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
B. Install SPD in accordance with manufacturer's instructions.
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.
E. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.
F. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.
G. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.
H. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.
3.03 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for additional requirements.
   B. Inspect and test in accordance with NETA ATS, except Section 4.
   C. Perform inspections and tests listed in NETA ATS Section 7.19.1.
   D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

3.04 CLEANING
   A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION