

**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

- A. NFPA 780 - Standard for the Installation of Lightning Protection Systems 2014.
- 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 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 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 Lightning Protection Inc. Base Bid.

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.

2.03 COMPONENTS

- A. All Components: Complying with applicable requirements of UL 96.
- B. Strike (Air) Terminals: Copper, solid, with adhesive bases for single-ply roof installations.
- C. Grounding Rods: Solid copper.
- D. Ground Plate: Copper.
- E. Conductors: Copper cable.
- F. Connectors and Splicers: Bronze.

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.
- C. Coordinate installation with the Electrical Contractor

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

**SECTION 26 4300
SURGE PROTECTIVE DEVICES**

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

- A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
- B. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2010.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2014.
- C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2013.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1449 - Standard for Surge Protective Devices 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 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. Comply with 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 ten 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

- A. Basis of Design: Base bid: RayCap ,Contact: Factory Rep - Hedrick Associates 616-288-0824

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. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.
- C. 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.
- D. Protected Modes:
 - 1. Wye Systems: L-N, L-G, N-G, L-L.
 - 2. Delta Systems: L-G, L-L.
- E. UL 1449 Voltage Protection Ratings (VPRs):
 - 1. Equivalent to basis of design.
 - 2. Main Service Panel SPD
 - a. Modular-type with the following features and accessories:
 - 1) Hybrid technology, utilizing SAD and MOV components with active disconnect circuit to ensure proper current sharing between SAD and MOV components
 - (a) LED light for power and protection status.
 - (b) Audible alarm with silencing switch to indicate when protection has failed.
 - (c) One set of dry contacts rated at 5A 250V-AC for remote monitoring of protection status.
 - (d) Surge event operations counter.
 - (e) Fused devices shall allow rated surge current to flow through device.
 - (f) Integral disconnect (if required on plans)
 - b. Protection modes and UL 1449 4th Edition Type 1 VPR for 120/208V, 3 phase, 4 wire circuits:
 - 1) Line to Neutral: 700 volts
 - 2) Line to Ground: 700 volts

- 3) Neutral to Ground: 700 volts
 - 4) Line to Line: 1000 volts.
 - c. Protection modes and UL 1449 4th Edition Type 1 VPR for 277/480V, 3 phase, 4 wire circuits:
 - 1) Line to Neutral: 1000 volts
 - 2) Line to Ground: 1200 volts
 - 3) Neutral to Ground: 1000 volts
 - 4) Line to Line: 1800 volts
- 3. 2. Distribution Panel SPD (Main Larger than 400A)
 - a. Modular-type with the following features and accessories:
 - 1) LED light for power and protection status.
 - 2) Audible alarm with silencing switch to indicate when protection has failed.
 - 3) One set of dry contacts rated at 5A 250V-AC for remote monitoring of protection status.
 - 4) Surge event operations counter.
 - 5) Fused devices shall allow rated surge current to flow through device.
 - 6) Integral disconnect (if required on plans)
 - b. Protection modes and UL 1449 4th Edition Type 1 VPR for 120/208V, 3 phase, 4 wire circuits:
 - 1) Line to Neutral: 700 volts
 - 2) Line to Ground: 700 volts
 - 3) Neutral to Ground: 700 volts
 - 4) Line to Line: 1000 volts.
 - c. Protection modes and UL 1449 4th Edition Type 1 VPR for 277/480V, 3 phase, 4 wire circuits:
 - 1) Line to Neutral: 1000 volts
 - 2) Line to Ground: 1200 volts
 - 3) Neutral to Ground: 1000 volts
 - 4) Line to Line: 1800 volts
- 4.
 - F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
 - G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 1. Indoor clean, dry locations: Type 1.
 - 2. Outdoor locations: Type 3R.
 - H. 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. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Unless otherwise indicated, provide field-installed, externally mounted SPDs.
- B. Basis of Design: Raycap. Unit shall incorporate Hybrid Technology, using both SAD and MOV components Plus Active Surge Monitor.

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

- A. Basis of Design: 1. Raycap: Rayvoss Series .

2.05 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

- A. Unless otherwise indicated, provide field-installed, externally mounted SPDs.
- B. Basis of Design: 1. Raycap: RSE Series.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- 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 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 accordance with NECA 1 (general workmanship).
- B. Install products 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 required by NFPA 70, as required by NFPA 70, and as required by NFPA 70.
- 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. Install remote devices with conductors between surge protection device and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length or 24 inches total, whichever is less. Do not bond neutral and ground
- I. 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