

EXPECTED IMPLEMENTATION JANUARY 2016

620 GROUNDING AND LIGHTNING PROTECTION. **(REV 6-11-15) (FA 6-17-15) (1-16)**

SUBARTICLE 620-2.1 is deleted and the following substituted:

620-2.1 Ground Rods: Use ground rods meeting the requirements of UL 467 that are listed by an OSHA Nationally Recognized Testing Laboratory (NRTL). Ground rods must be made of copper-clad steel with a nominal diameter of 5/8 inches. Ground rod sections must be a minimum of eight feet in length and manufactured for the sole purpose of providing electrical grounding.

SUBARTICLE 620-2.6 is deleted and the following substituted:

620-2.6 Air Terminals: Use air terminals that comply with UL 96A and NFPA 780 standards and are listed by a NRTL.

SUBARTICLE 620-2.7 is deleted and the following substituted:

620-2.7 Surge Protective Devices (SPDs): Provide SPDs to protect electronics from lightning, transient voltage surges, and induced current.

Install SPDs on all power, data, video and any other conductive circuit. SPD requirements for lighting must meet the minimum requirements of Section 992 and the Design Standards. SPDs for traffic control devices, including intelligent transportation system (ITS) equipment, must be listed on the Department's Approved Product List (APL).

Provide primary and secondary surge protection on AC power at traffic control device field sites.

SUBARTICLE 620-2.7.1 is deleted and the following substituted:

620-2.7.1 SPD for 120 Volt or 120/240 Volt Power: Install a SPD at the utility disconnect to the cabinet. Ensure that the SPD at the utility disconnect includes L-N, L-G, and N-G protection and has a maximum surge current rating of 50 kA per phase or greater. The SPD must meet the requirements of UL 1449, Third Edition and be listed by a NRTL.

Ensure an SPD is provided where the supply circuit enters the cabinet. Locate the SPD on the load side of the main disconnect and ahead of any and all electronic devices and connected in parallel with the AC supply. Ensure that the SPD in the cabinet includes L-N, L-G, and N-G protection and has a maximum surge current rating of 50 kA per phase or greater. The SPD must meet the requirements of UL 1449, Third Edition and be listed by a NRTL.

Ensure that the SPD has a visual indication system that monitors the weakest link in each mode and shows normal operation or failure status and also provides one set of normally open (NO)/normally closed (NC) Form C contacts for remote alarm monitoring. The enclosure for a SPD shall have a NEMA 4 rating.

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SUBARTICLE 620-2.7.3 is deleted and the following substituted:

620-2.7.3 SPDs for Low-Voltage Power, Control, Data and Signal Systems:

Install a specialized SPD on all conductive circuits including, but not limited to, data communication cables, coaxial video cables, and low-voltage power cables. Ensure that these devices comply with the minimum functional requirements shown in Table 1 for all available modes (i.e. power L-N, N-G; L-G, data and signal center pin-to-shield, L-L, L-G, and shield-G where appropriate).

Table 1				
SPD Minimum Requirements				
Circuit Description	Clamping Voltage	Data Rate	Surge Capacity	Maximum Let-Through Voltage
12 V _{DC}	15-20 volts	N/A	5kA per mode (8x20 μs)	<150 Vpk
24 V _{AC}	30-55 volts	N/A	5kA per mode (8x20 μs)	<175 Vpk
48 V _{DC}	60-85 volts	N/A	5kA per mode (8x20 μs)	<200 Vpk
120 V _{AC} at POU	150-200 volts	N/A	20kA per mode (8x20 μs)	<550 Vpk
Coaxial Composite Video	4-8 volts	N/A	10kA per mode (8x20 μs)	<65 Vpk (8x20 μs/1.2x50μs; 6kV, 3kA)
RS422/RS485	8-15 volts	Up to 10 Mbps	10kA per mode (8x20 μs)	<30 Vpk
T1	13-30 volts	Up to 10 Mbps	10kA per mode (8x20 μs)	<30 Vpk
Ethernet Data	7-12 volts	Up to 1 Gbps	1kA per mode (10x1000 μs)	<30 Vpk
POE	60-70 volts	Up to 1 Gbps	5kA per mode (8x20 μs)	<200Vpk (100kHz 0.5μs; 6kV, 500A)

Ensure that SPDs meet the requirements of UL 497B or UL 497C, as applicable, and are listed by a NRTL.

SUBARTICLE 620-3.1 is deleted and the following substituted:

620-3.1 General: Construct a single-point grounding system. Install the primary ground rod assembly in an electrical pull box so that the top four inches are accessible for inspection,

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D resistance testing, and maintenance. The primary ground rod assembly and electrical pull box shall be installed between 12 inches to 36 inches from the element being grounded. The top of all other ground rod assemblies connected to the primary ground rod assembly in an array must be buried a minimum of 18 inches below grade. Direct bury grounding conductors used to connect ground rod assemblies a minimum of 18 inches below finished grade.

Bond all ground rod assemblies and ground rod arrays together with solid bare tinned copper wire unless otherwise shown on the Plans. Install grounding conductors in a straight path.

Make all bonds between ground wires and ground rod assemblies and ground rod arrays with an exothermic bond with the following exception: do not exothermically bond sections of ground rods to create the ground rod assembly and do not exothermically bond connections within a cabinet. Apply an anti-oxidant compound to all mechanical connections.

R Connect primary surge protection for power at the service entrance or main disconnect. Connect secondary surge protection at point of use, unless otherwise shown on the Plans.

Ensure that lightning protection systems conform to the requirements of the National Fire Protection Association (NFPA) Code NFPA 780, Standard for the Installation of Lightning Protection Systems. Install SPDs that have an operating voltage appropriate for the characteristics of the circuits they protect. The NFPA requirements do not apply to lightning systems.

A SUBARTICLE 620-3.2 is deleted and the following substituted:

620-3.2 Minimum Grounding Resistance: Obtain a resistance to ground of 5 ohms or less for the following elements. Install multiple ground rod assemblies totaling a maximum length of up to 80 feet, as required to achieve minimum grounding resistance.

1. Power service for traffic control devices
2. Signal and ITS cabinets
3. ITS Poles/Structures with electronic equipment
4. DMS and DMS structures

F Install a minimum of one primary ground rod assembly. If a grounding and lightning protection system using a single ground rod assembly does not achieve the required resistance to ground, extend the length of the ground rod assembly an additional 20 feet or install an additional ground rod assembly 40 feet away and connect it to the main ground rod assembly to create a ground rod array. Continue installing ground rod assemblies connected in an array until the required resistance is obtained or until the maximum required total length of ground rod is installed.

T Grounding systems formed from horizontally constructed conductive radials are permitted if site conditions prohibit the use of vertically driven rods as permitted by the NEC Article 250.53(G). A grounding system consisting of the maximum total length of ground rod required is acceptable in cases where soil conditions prevent the grounding system from achieving the required resistance to ground. Submit the site resistance measurement to the Engineer.

Install a single ground rod assembly for these elements.

1. Conventional lighting

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2. External lighting for signs
3. Signal cable & span wire
4. Aerial interconnect messenger wire
5. Pedestals for pedestrian signals
6. Pull boxes with metal covers when 120 volts (or greater) AC power is present
7. Splice vaults with wire grounding units.

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