

Lightning and Static Protection System (LSPS)

Inspection and Maintenance

Frequency of Inspections

Lightning and static protection systems should be inspected and repaired as necessary:

1. upon completion of installation
2. after work on, expansion, modification, addition or other changes to the underlying protected structure(s) that requires disturbing the system (NFPA 780, B.5)
3. after relocation of components supporting the system
4. upon finding damaged system components
5. after major electrical storms, high wind events, earthquakes, known lightning discharges to the system or other occurrences that may affect the system
6. after expansion of the underlying protected structures that may require reconfiguring or expanding the LPS to provide adequate coverage
7. periodically

It is recommended that lightning and static protection systems be visually inspected at least annually. Electing longer or shorter inspection intervals should be determined at the discretion of the owner. Shorter intervals should be utilized in the event of significant storm events, severe climatic changes, or any time maintenance is performed on, or changes are made to, the structures or facilities being protected. It is also advisable to inspect systems following any known lightning discharge to the system or following extreme changes in ambient temperatures.

Inspection criteria

Inspections should be made to ascertain the following:

1. the system is in good repair and all components are in good condition and securely attached and connected as designed and originally installed

2. there have been no changes or modifications to the system
3. there are no loose connections that might result in high-resistance joints
4. no part of the system has been weakened by corrosion or vibration
5. all down conductors and grounding electrodes are intact (non-severed)
6. all conductors and system components are fastened securely to their mounting surfaces and are protected against accidental mechanical displacement as required
7. there have not been additions or alterations to the protected structure that would require additional or modified protection
8. there is no visual indication of damage to surge suppression devices
9. the system complies with the applicable standards

Inspection Guides and Records

Inspection guides or forms should be prepared and made available by the owner to the individuals conducting inspections of lightning protection systems. These forms should contain sufficient information, including that detailed above, to guide the inspector through the inspection process so that he or she can document all areas of importance relating to the methods of installation, the type and condition of system components, test methods, and the proper recording of the test data obtained.

These records should include photographs and should be retained by the owner and made available for use in subsequent inspections to monitor trends and flag problems.

Maintenance of Lightning and Static Protection Systems

A maintenance program should be established to immediately repair any discrepancies identified by the inspection program. This program should mirror the criteria contained in the inspection program.

Maintenance Records. Complete records of all maintenance procedures and routines and of corrective actions that have been or will be taken should be kept with the inspection records. Such records can provide a means of evaluating system components and their installation. They may also serve as a basis for reviewing maintenance procedures and updating any preventive maintenance programs.

Considerations for specific types of structures

Buildings. Problems with the structural lightning protection system often arise due to the actions of window washers. Window washer personnel should be advised of the possibility that their equipment can damage the lightning protection system, and directed to notify the owner in the event of any such damage.

Additionally, any time installation or maintenance of appurtenances such as antennas, security cameras, and other items is performed, such work should be inspected and appraised for its impact of the LPS. At a minimum, antennas and cameras often require bonding to the LPS.

Water/wastewater treatment plants. One of the biggest enemies of structural lightning protection at these facilities appears to be hoses used by operating personnel. These hoses tend to be dragged along handrails, dislodging air terminals and other components. Personnel should be made aware of this potential problem, and systems inspected after any such work.

Petroleum production, disposal and flowback facilities. Because of the nature of these sites, they are often modified, expanded, reconfigured or otherwise changed. Additionally, bonding conductors and other system components are often disconnected or moved to allow maintenance of other systems. This is particularly true of tank level sensors. Personnel performing such work should be advised to reconnect any disconnected bonding exactly as they found it, and to advise the owner if that is not possible. Each site shall be inspected after any changes are made. Specific problem-creating changes we have seen over the years include adding slurry stations, adding or relocating site lights, reconfiguring piping, adding tanks, installing fire extinguishers on handrails above air terminal zones of protection and disconnecting bonding. Since these sites tend to be corrosive

environments, we have also seen corrosion on and under components, particularly those exposed to gases or liquids.

Movable Arm Grounding Systems (MAGS). Additional items to check:

1. check mast tubes for deformities and cracks
2. check articulating conduit for deformities and cracks, check conduit strap for fraying or tears
3. check articulating conduit orientation (i.e. that conduit still curves in vertical, not horizontal, plane)
4. check bypass conductor insulation for wear and cracks (exposed portions only, no need to remove conductor from masts)
5. check bypass conductor wire for corrosion at connections to both rim bracket and at base
6. check hardware connections for corrosion on all parts
7. check base plate for warping and adhesive peeling

Notes:

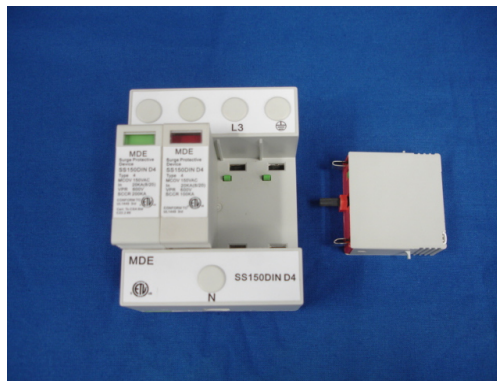
Grounding. There are no grounding resistance requirements contained in the applicable standards. However, if the owner wishes, such testing could be included in this program. If desired, testing should be conducted of the grounding electrode termination system and its individual grounding electrodes, if adequate disconnecting means have been provided. These test results should be compared with previous or original (if conducted) results. If it is found that the test values differ substantially from previous values obtained under the same test procedures, additional investigations should be made to determine the reason for the difference. If ground testing is conducted, it is advisable to stagger inspections throughout the year so that earth resistance measurements are made in the hot and cold, and wet and dry months.

Electrical Continuity. There is very little guidance contained in the applicable standards regarding continuity testing. However, if the owner wishes, such testing could be included during inspections at greater intervals, perhaps three to five years. Such testing could include the visual inspections described above, plus the following:

1. tests to verify continuity of those parts of the system that were concealed (built in) during the initial installation and that are

- not available for visual inspection
2. continuity tests to determine if suitable equipotential bonding has been established for any new services or constructions that have been added to the interior of the structure since the last inspection

Surge Suppression. Each module comprising a Lightning Master low voltage (120V – 480V) AC power surge suppressor is equipped with a status indicator.



In this photograph, the status indicator in the module on the left indicates that the module is good. The one in the module on the right indicates that the module has failed. In this case, only the plug-in module (shown to the right) requires replacement. No rewiring is required. Always de-energize the surge suppressor before removing or replacing modules.

Execution

The owner may contract for these services with any engineering or lightning protection company, preferably one that is a UL Certified Lightning Protection System Installer. Or, owner personnel may conduct these inspections and maintenance. Lightning Master Corporation is a UL Certified Lightning Protection System Installer and offers a QA/QC program to satisfy the above requirements.