SIX ESSENTIAL GROUNDING AND BONDING PRACTICES FOR RADIO TOWERS- APPLICATION NOTE 22

Grounding systems are a vital component of radio tower lightning protection because they provide a safe and controlled path for electrical energy to dissipate into the earth. When lightning strikes a tower, the surge of electricity must be directed away from sensitive equipment and structural components to prevent damage, fire, or service disruption. A well-designed grounding system minimizes resistance and ensures that the high-voltage energy flows efficiently into the ground, reducing the risk of side flashes, step potential hazards, and electromagnetic interference. Without proper grounding, even the best lightning protection system can fail, making grounding essential for both safety and operational reliability. We have assembled some of the most prominent practices commonly used on radio tower grounding systems to ensure the effective operation of installed lightning protection systems.

1. **Air Terminal grounding and bonding:**
    a. Conventional air terminals and dissipators should be clamped directly to the tower, making a good electrical connection.
    b. #2 AWG minimum bare tinned solid copper ground wire may be used to bond air terminals to the tower.
    c. 1/0 AWG minimum insulated copper wire may be used as an independent ground wire to the tower ground, but is not generally a recommended practice, especially on tall towers.
2. **Cable and antenna grounding and bonding:**
    a. All coaxial cables, waveguides, and antennas should be bonded to the tower near the antenna base.
    b. Coaxial cables and waveguides should be bonded to the tower near the tower base before making the bend towards an equipment shelter or an ice bridge.
    c. For towers over 100', ensure cable is bonded to tower at intervals not exceeding 75'.
    d. Use #6 AWG minimum tinned copper ground wire ó a common wire size used in coaxial cable grounding kits.
3. **Grounding and bonding cable at tower transition:**
    a. Install a grounding bus bar near the tower base and above the cable bends.
    b. Cable grounds should be bonded to the grounding bus bar.
    c. Grounding bus bar should be bonded to tower ground with bare tinned solid #2 AWG minimum copper wire.
    d. Tight bends are recommended for cables where transitioning from tower towards equipment to help prevent lightning current from continuing towards the equipment.
4. **Tower grounding and bonding:**
    a. Each tower leg should be connected to a standard grounding electrode.
    b. A tower should have a minimum of 3 grounding electrodes.

c. Grounding electrodes should be spaced by a minimum of 6'. The ideal minimum spacing is 2X ground rod length.
d. Each grounding electrode should be connected via a ground ring comprised of either (1) #2 AWG minimum bare tinned solid copper wire or (2) 1/0 AWG minimum bare tinned stranded copper wire.
e. Ground ring should be buried at least 2.5' below the surface and the frost line.
f. The tower grounding system should be bonded to all other grounding systems within the same compound.
g. Exothermic welds are recommended for bonding ground wire to the tower and grounding electrodes, especially below-grade bonding. Exothermic welding directly to the tower may be prohibited in some cases because the welding may weaken the tower structure. Irreversible fittings and pressure connections can be used rather than an exothermic weld.
h. Tower guy wires and guy anchors should be grounded using appropriate mechanical connections.
i. Ice bridge and cable supports should be bonded to the tower or tower grounding bus bar, or isolated from the tower and bonded to the building ground and to the tower ground.

5. **Resistance to ground:**

   a. Ensure resistance to ground is no larger than 25 ohms.
   b. If the equipment in the nearby shelter is critical, then <5 ohms resistance to ground is recommended - this may require supplemental grounding techniques and an extensive below-grade electrode system.

6. **Building and equipment grounding and bonding:**

   a. Additional isolation, grounding, bonding, and surge protection may be required when transitioning cable into shelters and buildings, including, but not limited to:
      i. Coaxial cable center conductor surge protection.
      ii. Port entry boots.

Note 1. These common practices for radio towers do not pertain to base-insulated towers.

Note 2. It is the responsibility of the installer to ensure all appropriate industry standards are followed in the installation of grounding electrodes and ground wires, as well as bonding. Such standards include but are not limited to NEC (NFPA 70), TIA-607, and Motorola R56.

If engineered plans or drawings are required, don't hesitate to get in touch with LBA Group for a quote.

STRIKE MASTER® Lightning Protection