

# Static Voltage Near Transmission Lines



Duke Energy is committed to safely providing electric service for our customers and ensuring a safe working environment for our employees.

- Static voltage is present when excess electric charge is developed on one surface and is in close proximity to another surface with less electric charge.
- Static voltage is also called static electricity and static charge. Static voltage is best described as an imbalance of electric charge between two surfaces.
- Static voltage can be developed by rubbing two dissimilar materials together. One material will gain extra charge and has a propensity to discharge to a nearby less charged material or surface. Most people have experienced this type of occurrence on dry winter days. Exiting a vehicle on such days can move and concentrate electric charge, and sometimes a surprise shock occurs when touching the metal body of the vehicle.
- Static voltage can also be impressed, or induced, on any object that is located in a high electric field. This is the mechanism that allows a high-voltage transmission line to create a charge imbalance on objects near or within the right of way (ROW).
- The degree of the charge imbalance on an object depends on the:
  - Voltage magnitude of the transmission lines
  - Transmission line design
  - Proximity of an object to the transmission lines
  - Composition of the object
  - Surface area of the object
  - Weather
- The higher the voltage magnitude of a transmission line, the greater the electric field, and the greater the charge that can be impressed on a particular object. Transmission line electric fields are measured in kilovolts per meter (kV/m). The power line's physical design can vary the electric field magnitudes.
- The proximity (height and horizontal distance) of an object to the transmission line plays a major role in the ability of a static voltage imbalance to be perceived.
- Objects made of metal allow electric charge to collect and flow freely. Objects made of other material do not develop that same level of electric charge. However, even insulating material can develop some electric charge if it's close enough to a transmission line.
- The surface area of an object is proportional to the amount of electric charge that can be developed. A 25-foot-long copper gutter will hold much more electric charge than a copper penny when both are exposed to the same electric field.
- The weather has a significant impact on the amount of electric charge that can be developed. Drier conditions allow more electric charge to accumulate. More humid and wet conditions can limit the amount of electric charge developed by providing a path for the charge to be dissipated to earth.

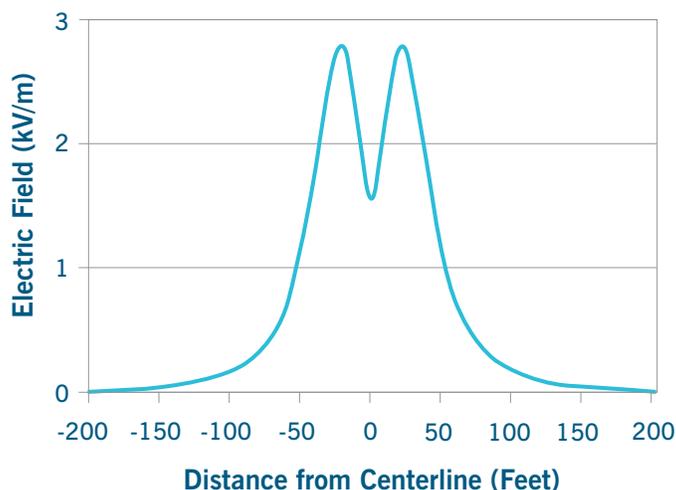


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- A typical criticism of static voltage shock occurs when installing or performing maintenance on metallic gutters. This is especially true when the gutters are on a two- or three-story structure and within 100 feet or less of the nearest transmission line conductor. Figure 1 shows how the electric field begins to increase significantly once you get within 75 feet of the line.

■ **Figure 1**

**A Double Circuit Transmission Line Electric Field Profile**



- Static voltage can be reduced by making sure the large metal objects are bonded and grounded. For affected gutters, all sections of the gutters should be mechanically and electrically bonded (connected), and then grounded at all downspouts with a ground rod. Nonmetallic gutters are a good choice for structures that are very close to transmission lines. Also, using rubber gloves and nonmetallic ladders can decrease the chance you are surprised by a static shock while at elevated heights.
- Another time individuals commonly have issues with static voltage shock is while performing activities within the right of way of a transmission line, such as mowing grass with a riding mower. As seen in Figure 1, the highest electric fields exist within 50 feet of the centerline of the transmission line. Higher induced static charge is more likely in this area. ROW limits vary and are not shown in Figure 1.
- Static voltage shocks while on riding lawn mowers can be reduced or eliminated by making sure your body – such as hands and/or legs – is safely in good contact with the mower frame.
- Never handle or transfer volatile fluids where a static charge may be present.