

# Lightning Protection for Trees



## 2019 Tree Specialist Training



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## Lightning Protection

### Why does lightning strike a tree?

Negative charges develop in the lower portions of a cloud and at the same time, positive charges develop below.

Eventually, a negative downward strike occurs in 150-foot jagged intervals and at the same time, positive ground charges are attracted upwards to neutralize the negative charge.

With a lightning protection system, the positive charge travels up through the system and upward through the air terminals. The two charges meet approximately 150-feet above the tree and are neutralized.

## Lightning Protection

One lightning strike can generate up to 30 million volts and the amperage varies. 25,000 amperes can reach a temperature of 50,000 degrees and catch a tree on fire.



## Lightning Protection



What happens to a tree that is struck by lightning? The result depends on many factors.

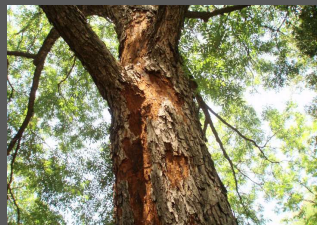
Most people are not aware of lightning protection systems for trees.



## Lightning Risks

The potential for a tree to be struck by lightning varies according to the following factors:

- ❖ The larger the size and height of the structure, the greater the risk of the structure and any nearby tree(s) being struck
- ❖ In some cases, a tree is struck and it travels over to the structure or the reverse
- ❖ Wood structures are at slightly higher risk than steel frame structures



Recent lightning strike

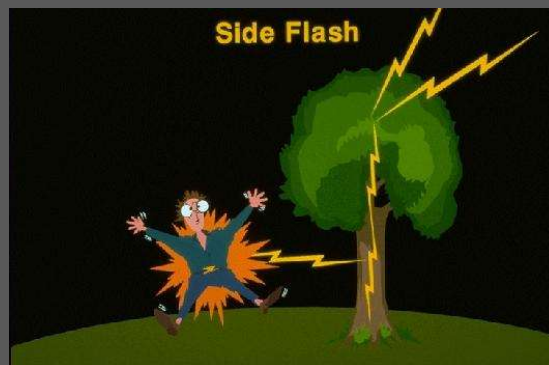
Older lightning strike



## Lightning Risks

### Side Flash

- ❖ Phenomenon of a lightning strike leaving its current path and “jumping” to reach a better-grounded conductor



## Lightning Risks

- ❖ The taller the tree in a forest or group of nearby trees and the higher the elevation, the greater the risk. This should not lead to the conclusion that smaller trees will not be struck.
- ❖ Topography risk factors:
  - On flat land = 1 (risk factor)
  - On a hillside = 2
  - On a hill top = 4
  - On a mountain top = 5



## Lightning Risks

Larger and taller trees are at greater risk and may be of a higher value, depending on their condition.

The value of a tree and its risk factor must be weighed against the cost of the protection system. Protection systems can be thousands of dollars for larger trees.





## Lightning System Design

Since each tree has very individual branching habits, the lightning protection system design is custom tailored to the structure of each tree.

Although aluminum can be used, copper can be smaller in diameter and does not corrode.

Air terminals are installed in the ends of primary upright leaders as well as outward growing primary leaders.



## Lightning System Design

### AIR TERMINALS (POINTS)

#### Short Tree Points

No. 194 – Points for standard conductor.  
No. 195 – Points for miniature conductor.  
Made of copper bronze. 8" overall length.  
Fasten with 4d copper nails.

#### Long Tree Points

No. 194A – 4" standard conductor points.  
No. 195A – 4" miniature conductor points.  
Other lengths can be furnished. Long tree points have loop that fastens around limb.



#### Drive Type Short Tree Points

No. 194D – Points for standard conductor.  
No. 195D – Points for miniature conductor.  
Made of copper bronze. 8" overall length.



### COPPER CABLES TREE CONDUCTORS

#### No. 325

32 strand, 17 gauge Smooth Twist Standard Tree Conductor. Used on main trunk and for grounding.

#### No. 22

14 strand, 17 gauge Smooth Twist Miniature Tree Conductor. Used on main high limbs.

### CONNECTORS

Connections from miniature branch conductors and standard trunk conductor shall be made with No. 193X or No. 297A Connector Clamps.

Brace cables shall be connected to the lightning protection system with No. 297 or No. 297A Many-Purpose Clamps.



No. 297A – Large Many-Purpose Clamp. Heavy duty for cable and brace end, or for clamping two cables together. Made of copper bronze.



No. 297 – Small Many-Purpose Clamp. For clamping cable end and standard and miniature cables. Made of copper bronze.



No. 193X – Finger type connector for standard and miniature conductors.  
No. 193A – Finger type connector for two standard conductors.



No. 32L – Straight splice for standard conductor.  
No. 32K – Straight splice for miniature conductor.  
Used in making end to end splice.



## Lightning Protection System Bob Woodruff Tree



## Lightning Protection System Bob Woodruff Tree



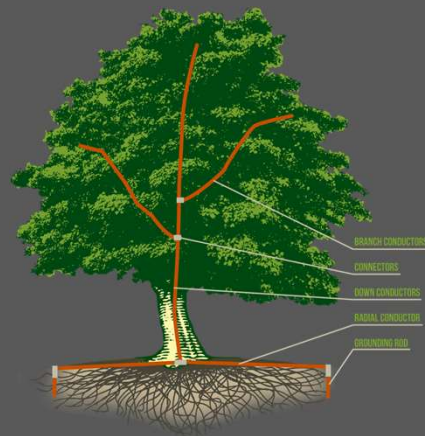
## Lightning Protection System Installation

The primary copper cables run from the air terminals in the top, down the trunk and out to the ground rods. Outward growing leaders which are not in the top, use a smaller secondary cable that runs from the air terminal to connect with the primary cables on the main trunk.



## Lightning Protection System Installation

The wires are run from the trunk outward through a trench. In some cases there is one primary cable and in others there are two cables.





## Lightning Protection System Installation



Ground Rod Installation

Grounding Rod Driver

Grounding Rod

## Lightning Protection System Lessons

Copper is more expensive than it was many years ago!!



## Lightning Protection Systems

Lightning protection systems saves our larger and older trees from loss and damage.

As a result, they are a wise investment that keeps cool old trees around longer for people and wildlife to enjoy!!