

# What is Lightning

Lightning is believed to have become the costliest weather related force. The reason is the proliferation of electronic equipment that is highly susceptible to damage or destruction from lightning-induced voltage and currents as well as direct strikes.

## How Lightning Selects a Target

A typical cloud-to-ground flash is initiated when an avalanche of free electrons sets off from the base of a thundercloud toward the intense positive charge that has been building up below. This first “stepped leader stroke” approaches ground in discrete steps of about 100 to 150 feet or more. This channel is composed of negatively charged air molecules and is not the actual lightning strike. It is barely visible but can carry currents of 100 to 1,000 amperes or more. As the “stepped leader approaches the earth the ground’s positive charge increases sharply.

Near the ground electrons are stripped away by air molecules creating positively charged channels. These channels reach up toward the leader. The channels or “point discharge currents” strain upward toward it from the corners and edges of buildings, trees, poles, vehicles, people, and even blades of grass.

These channels or point discharge streamers are fed by an intensifying ground charge that is deficient in electrons and has followed along directly below the cloud center. The upward-reaching positive streamers lengthen as the negative stepped leader descends. When the leader stroke is a step or more above effective ground, a positive streamer shoots upward from a dominant pointed object. This streamer may be joined near its base by lesser streamers from nearby points.

When the positive streamer meets the negative leader, an ionized path is completed between the cloud and earth. Instantly an intensely luminous “return stroke” occurs, during which the negative charge laid along the ionized path of the stepped leader flows to earth, taking the best conductive path the object struck is able to provide. These types of flashes are usually negative.

Positive flashes, on the other hand, are triggered by tall buildings or mountain top points and comprise about five percent of all cloud to ground lightning. The taller a building, the greater its chances of being struck, and the larger the percentage of positive flashes among the strikes it receives.

## Lightning’s Destructive Effects

Lightning’s effect on an earthbound object depends on:

1. The characteristics of the particular flash - current flow, potential and duration.
2. The vulnerability of the struck object to the destructive properties of the strike.

**Lighting currents vary from a few thousand to (it is estimated) more than 300,000 amperes. The largest recorded lightning strike current was about 280,000 amperes. A flash with a peak flow of 25,000 amperes is well within destructive range. Lighting strokes vary in potential from a million volts to rare strokes of 80 million volts or more. Thirty million volts of potential is average among destructive strikes.**

**Durations of lightning flashes vary with the number of strokes and the presence or absence of continuing current strokes. A typical flash consists of a downward stepped leader stroke of free electrons which ionizes a path from cloud to earth (the first return stroke); another dart leader followed by a return stroke; and finally one or two more sequences of a dart leader return strokes. Such a flash has a duration of about 4/10 seconds.**

**The stepped leader descends in discrete steps. The dart leader descends in a single, long step along the already ionized path. Each leader stroke lays down a negative charge which flows to earth during the following return stroke.**

**Leader strokes descend from cloud to earth in milliseconds. The massively luminous return strokes are measured in microseconds. Lightning flashes have been monitored which registered 42 sequences of leader return strokes.**

**“Cold Bolts” consist of strokes that create a core heat as high as 27,000 degrees Centigrade. However, they do not transfer enough heat during their microseconds of duration to ignite wood or other ordinary materials. “Hot Bolts” transfer sufficient heat and are frequent enough to cause more forest fires than smokers and campers combined.**

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