

Whitepaper

Overvoltage in public LED lighting

LED technology has been strongly on the rise in the lighting industry in recent years. LED lighting's continually improving quality, low energy costs, and long lifespan play an important role in its popularity. Also the assumption that LED lighting requires less frequent maintenance checks than traditional lighting is considered as a great advantage. Also in the Public lighting market. The question is, however, whether LED lighting's reputation is justifiable at the moment, considering its young age.

Historically speaking, LED technology is still in its infancy. The vulnerability of the electronics present in LED lighting and related equipment is a point of concern. Overvoltages are one of the issues that could potentially influence the lifespan of LED lighting. Along with power transitions and network pollution, overvoltages can be caused by lightning striking the lamppost, or indirectly by lightning strikes in the vicinity.

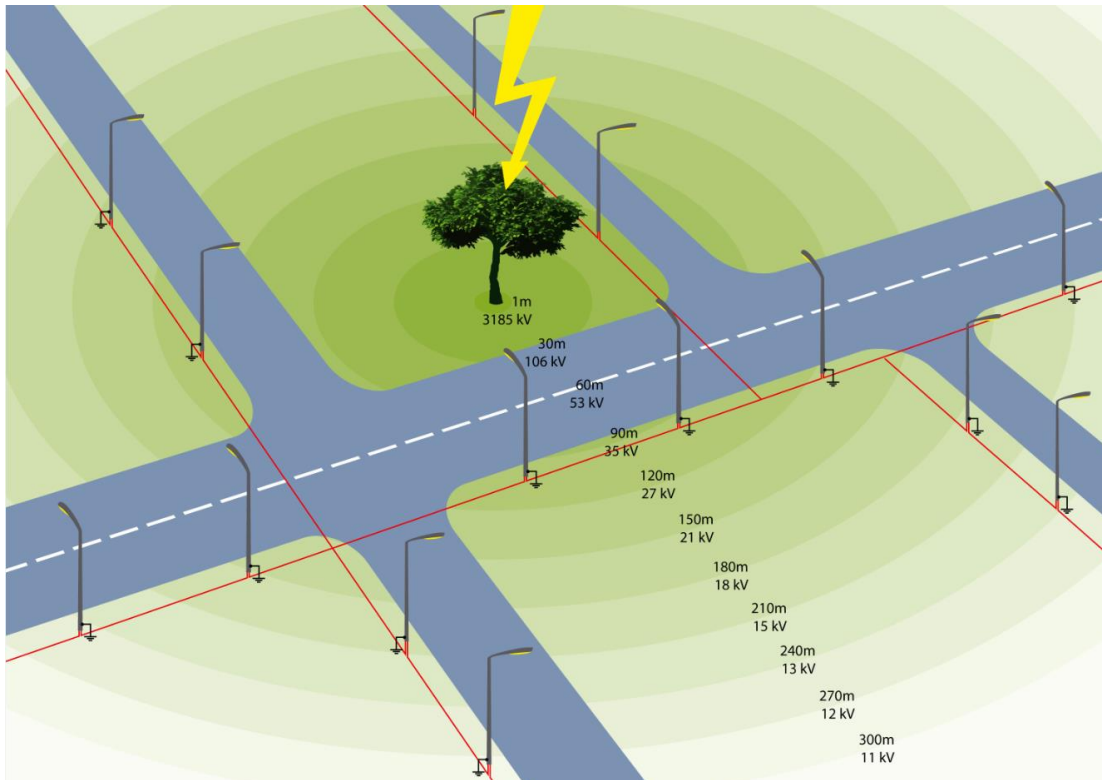
Research shows that lightning strikes almost always damage more than one armature. Aside from lightning strikes causing a dangerous situation, need for maintenance and/or replacement will increase for LED armatures, even more so than for conventional armatures when a strike appeared.

Lightning strike

The violence that occurs with a lightning strike is immense. Although the energy level is too low to warm your house with in the winter, the voltages and currents involved are enormous. A lightning strike can therefore cause a lot of damage.

When striking an object or the ground, the lightning voltage, a few megavolts, will disseminate across the environment. Near the point of impact, the "step voltage" (voltage difference in the ground) can be tens of kilovolts per meter, which is a major reason why livestock is so vulnerable in pastures during thunderstorms.

Illustration 1: Ground current distribution during a lightning strike



The decrease in voltage, as well as the corresponding large voltage differences in the ground cause high voltage differences (tens of kV) in conductive objects such as metal constructions, pipes, and power lines. The standard protection used in electrical equipment is not designed to handle such loads, resulting in breakdowns. The mechanical forces and heat generated by the high currents (tens of kA) can also cause considerable damage. Furthermore, induction in the various conductive circuits can result in increased voltages.

Surge protection

Overvoltages are quite common in the voltage supply and can be caused by network pollution and power transitions, as well as by lightning strikes. Though usually no more than a few kV in 230/400V grids, these spikes can be a lot higher in the event of a lightning strike.

Vulnerable devices, which is often equipped with electronics, is often fitted with surge protection. This basic protection suppresses voltage spikes to reduce the danger to the connected equipment.

Built-in surge protection is intended for 'regular' voltage spikes, such as from power transitions or network pollution. It is usually not intended or suitable to protect against the high energy level of a lightning strike. Not all public lighting experts are aware that this also applies to LED lighting fixtures.

LED technology provides new opportunities in public lighting and is therefore used increasingly often. However, the benefit of lower energy costs and a longer expected lifespan should be weighted against the clearly higher risk of damage and the resulting extra costs, as demonstrated by a number of internationally known incidents. Along with reports of dozens of lampposts failing after a lightning strike, one well-known incident is the calamity in the Danish town of Esbjerg (October 2014). Here part of the town was left in the dark for several weeks after 400-500 insufficiently protected LED lighting armatures were irreparably damaged during a thunderstorm. Due to the high price of the LED armatures, this resulted in hundreds of thousands of euros in damage. It also resulted in a media storm, with Danish news outlets questioning how it could have been prevented, what the experts had to say about it, who was responsible, and who would pay for it.

The need to consider the risk of damage from lightning strikes is becoming inevitable now that LED technology is being more widely used in public lighting.

For more information, feel free to contact ELEQ by phone at +31 521 533 333 or send an e-mail to info@eleq.com

Read more about surge protection devices in the Whitepaper "86007 Surge Protection Device Public LED Lighting".

