



Surge and lightning protection – do we know the facts?

By P van As, Surgetek

How well is your electrical and electronic equipment protected in the likely event of an electric storm?

Too many people wait until they have experienced extensive damage to their equipment before considering installing some form of surge and lightning protection. It is a known fact, that in South Africa, lightning is generally seasonal, and some storms are worse than others. One thing that you can be sure of is that at some stage your equipment will definitely be exposed to surge and lightning induced voltages and currents. Adequate protection is therefore essential. Seeking expert advice can save a lot of money in preventing damage to electronic equipment, as well as coping with hassles such as electric gates not functioning, garage doors not opening, or the house alarm system out of action.

The actual chance of a normal house in South Africa being struck directly by lightning is less than once in 25 years, however during that time, it will be exposed to the effects of a lightning strike up to 10 times per year. Luckily, due to natural screening and shielding offered by buildings, steel conduiting, trunking and cable screens, these effects are greatly reduced. Unfortunately, with the greater use of plastic trunking, plastic conduiting and unshielded cables - UTP (unshielded twisted pair) cabling - the natural electromagnetic screening and shielding is lost.

Today, with all the electronic and electrical equipment used in our daily lives, we only realise how much we rely on these systems when they suddenly are not working. This always seems to happen at the most inconvenient time and it is normally at this time that we discover that those safety measures we put in place did not work.

The most common error is people believe that if the building has external lightning protection, the electronic and electrical equipment within the building will be safe.

Unfortunately, this is not true, and in actual fact, SANS 10142-1 [1] directive states that if external lightning protection is installed on a building, then additional internal lightning and surge protection measures need to be implemented. The external lightning protection is only there to offer protection to the building itself (structural protection) and thus does not offer any protection to the equipment within the building. It does help in offering a controlled discharge path to earth and thus can prevent the lightning strike choosing its own dissipation path to earth via the electrical and electronic equipment.

One of the most basic principles of electricity is that when current flows through a conductor it will generate an electromagnetic field around that conductor. The principle of a transformer is that the change in the magnetic field of the primary winding cuts through the secondary winding inducing a voltage in the secondary winding. The lightning bolt is nothing more than a large conductor (primary winding) with a massive electromagnetic field around it which can extend for up to one kilometre from the actual strike. This means that all the electrical and electronic equipment (secondary winding) will be exposed to a massive expanding magnetic field during the strike and then a second massive collapsing magnetic field once the strike is over. If lightning had to strike within 100 metres of your equipment, the induced voltages could be as high as 2 000 volts per metre. This is the very basic principle as to why equipment suffers damage during a lightning storm even though it may not even be struck directly.

It is a misconception that if a UPS (uninterrupted power supply) is installed, it will protect against the effects of lightning and switching surges. Once again this is not always true, as the primary function of the UPS is to ensure that your equipment will receive power in the event of a power failure or secondly to offer a stabilised power supply should your home or office be exposed to voltage fluctuations. In many cases, the surge protection offered by the UPS is very limited and cannot offer the required level of protection.

IEC – International Electrotechnical Commission

LV – Low Voltage

SABS – South African Bureau of Standards

UPS – Uninterruptible Power Supply

UTP – Unshielded Twisted Pair

Abbreviations



arresters. This means that for these plug-in type devices to be able to offer the required level of protection and be able to withstand the surge currents for which they are designed, they need to have Class 2 arresters installed in the main electrical distribution board. It often happens that people are told to only protect the cables that leave the building, but the fact that the cables within the building are very long, and in fact exposed to induced voltages, is sometimes overlooked.

Conclusion

Buying the best surge and lightning protection products available on the market may be advisable, but if they are incorrectly installed, they will not be able to offer the required level of protection. It is for this reason that it is important that you ensure that you have the products professionally installed by competent people.

Reference

- [1] SANS 10142-1:2003. Code of Practice for the Wiring of Premises, Part 1: Low Voltage Installations.



Many people are of the impression that if they install surge protection plugs they will be adequately protected. These protectors are normally classified as Class 3 arresters and are thus actually designed to offer protection against surges and spikes induced into the cabling within the building. SANS 10142-1 [1] specifically states that Class 3 arresters can only be used in conjunction with upstream Class 2



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