



Talk on “Overview of IEC 60325” on 26th April 2016

by Dr Siow Chun Lim, Grad. IEM

Dr Siow Chun Lim, Grad. IEM is currently the Associate Editor of Journal of Engineering Science and Technology and is also an active reviewer for several conferences and journals.

Lightning is an atmospheric discharge of electricity which needs no further introduction in current era. In an open area or field, the occurrences of thunderstorms are disastrous and hazardous in the sense that you are the highest object in the closest vicinity. Footballers being struck in the middle of a game are not uncommon. As the highest object, you would emit upward streamer and once it meets with the stepped leader from the cloud, a complete path for lightning current to flow to the ground is now established with you being a part of the path. Similarly, standing in close proximity to trees is also highly inadvisable because although the tree has the higher probability to be struck by lightning, step potential would arise circumferentially away from the trees. Therefore the lightning current would actually flow through the human body due to the difference in potential level between one foot with the other.

Electrical engineers need to be aware of the key changes from BS6651 to IEC62305. Familiarization with general principles such as the source, damage and loss aspects of lightning is imminent. By understanding them, it is then possible to design the lightning protection system which consists of air-termination, down-conductor, earth-termination, lightning equipotential bonding and electrical insulation and hence separation distance against external Lightning Protection System.

Risk assessment is also paramount to determine the protection level needed for a particular system. Malaysia is having 240-300 thunderstorm days per year which is 6-8 times higher than the European countries and US. Therefore, this is directly translatable to the importance of lightning protection system here. The presence of a lightning awareness system is a boon especially for risk assessment.

Next thing to know is the 3 basic protective methods for positioning of the air termination system which are rolling sphere method, protective angle method and mesh method. Proper identification of reference plane is important in the protective angle method as the height influences the angle of protection. On the other hand, in the rolling sphere method, the size of the sphere determines the number of the air termination system needed to be installed. The higher the protection level required, the smaller the size of the sphere which indicates higher amount of air termination rods needed.

It is also advisable for down conductors to be installed in as straight a path as possible. This is crucial as they form the bridge for the intercepted lightning current to flow to the ground or earth. Circuit breaker

is to offer protection from overcurrent whereas surge arrester is to offer protection from transient damage. This is why surge arrester should be installed before circuit breaker.

Data centers are important in the current 4th industrial revolution which centers around IoT and digitalization. Grounding and bonding are important aspects in data centers. Transient earth clamp which is actually consists of spark gap technology only operates when transient is encountered is advantageous to minimize nuisance tripping of circuit breakers due to the equipotential bonding. At rocky sites, soil conditioning agents such as salts are a viable solution to bring the ground resistance value down. Bonding between the bus stops with the lamp posts is advantageous to reduce the probability of side flashover. Step and touch voltage danger can be eliminated by either equipotential bonding or isolation.

For the protection of electrical and electronic equipment, the understanding of the coupling concept is paramount. This is because it describes how systems pick surge voltages and currents which can either be due to galvanic or direct, inductive or capacitive way. Termination of lightning current down to the ground could also be potentially hazardous because it is generally accepted that 50% of the energy flows down to ground while the remaining flows back to the panel. Differentiation of lightning electromagnetic pulse which is characterized by 10/350 μ s from the switching electromagnetic pulse (8/20 μ s) allows proper selection of surge arrester.

Although the international lightning protection standards are getting more comprehensive and developed as we speak, there is still no lightning protective method as advocated by the standards which can offer 100% protection level. Therefore, basic understanding of how lightning damages or harms human beings is important.