**SEMINAR PRESENTATION**

**ON**

**THUNDER LIGHTNING PROTECTION OF BUILDINGS – A SURVEY**

**PRESENTED BY**

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**CERTIFICATION**

This is to certify that this seminar work on “**Thunder and Lightning protection”** was doneby Salihu Abdullahi ST/PHY/HND/21/001 and presented during the 2022/2023 academic session in the department of Applied Physics, Federal Polytechnic, Mubi.

**ABSTRACT**

*A lighting strike can cause significant structure damage to building, it can lead to damage of machinery and electronic equipment, both inside and outside the building and may result in harm to people. The paper presented a review of lighting protection principles and set out a methodology to be followed to provide a solution to both the direct and indirect effect of a lightning strike. Lighting protection and grounding of electrical and mechanical equipment for the protection of the human beings, structure of the building and equipment protection, safe working of the worker industry as per my latest practical knowledge in the site environment in extreme climatic condition of low-lying areas of the Gulf region in the challenging projects. All the conductor calculation, all the system information regarding the level of protection required for site are mentioned in this paper. Lighting electrical and mechanical equipment surge protection is the one of the major complicated protection in the world as it is unpredictable.*

**Introduction**

Lightning is one of those natural event that catches people imagination with its obvious violence and the destructive power attributed to it. The considerable damage it cause to property and its unfortunate victim plainly demonstrate that the imaginary is based on a phenomenon that is very real and can be fairly well explained only modest attempts can be made to control its effect an the consequences. Lightning can be likened to a disruptive electric discharge due to the dielectric break down of the air between the clouds or between the cloud and ground, certain clouds (cumulo nimbus) create meteorological condition that are favourable to the accumulation of electrostatic charge breakdown, which is visible in form of the lightning flash itself has a very complex phenomenology (precursor, leader stroke return discharge) normally accompanied by a sound wave. Thunder caused by sudden expansion of the air which is overheated by the electric arc. When lightning reaches the earth its generally does so directly on natural element (tress, hills, water etc.) and sometimes on structures, building, pylon and other man made structure. There are two types of direct and indirect, the direct which are due to the circulation of the intense current (several tens of thousand of amperes) which heat material and cause several damage such as fire, calcination and collapse, the indirect effect which produce over voltage by conduction, induction or increasing the earth potential mostly destroying electronic appliance and machinery (Hassan, 2013).

However, a review of some Lighting protection system and survey was carried out, those include are:

Dissipation Array System which prevent direct lighting strike by reducing the electric field to below lightning collection levels within the protection system help to prevent down time and loss of assets (Kamil, 2022).

Lightning conductors with spark over device, these are a development of a single rod equip with a spark over device which creates an electric field at the tip, helping to catch the lightning and improving their effectiveness. Several lightning conductors can be installed on the same structure. However, they must be interconnected as well as their electrode (Ruhul, 2021).

Lightning conductor with meshed cage, this type of lightning protection system consist of a network of conductor arrange around the outside of the building so that its whole volume is circumscribed, catches rods (0.3 to 0.5m high) are added to this networks at regular interval on projecting point (roflops gathering) all the conductors are interconnected to the earthing system (foundation) by down conductor (Hui, 2022).

Surge Protection Device System (SPDS): This type of protection is a Lightning protection system that uses cable shielding and equipotential bonding in regards to the earthing system. A low impedance is desirable because it reduces the step and touch potential which reduces the voltage along the lightning structure, by using this lightning system during the occurrence of lightning strike or any over voltage event (surge) the lightning energy can be absorbed with minimum risk for the critical electrical and electronic component within the building (Sokratis, 2023).

A review of ligtning protection concept introduce by Benjamin Franklin and James Clerk Maxwell is given as a modern approach to lightning protection of building and after structures. A use of electrogeometric model (one version of which a rolling sphere method) and the typological shielding are made (Berta, 2022).

**Aim and Objectives**

The aim of Lighting Protection System is to minimize the risk of damage to the external and internal part of the structure from a lightning strike and the objectives are:

1. To introduce simple means of lighting protection
2. To use less costly materials for lightning protection
3. To give awareness on the damages involved in lightning to human activities.

**Discussion**

Lightning protection system are used to prevent or lessen lighting strike to building. They protect the internal electrical component of a building helping to prevent fire or electrocution. The cheapest type of lightning protection comes in the form of a lightning conductor metal rod mounted on a building to protect it from lighting strike. This system will intercept a strike so if lightning hits the building the lightning rod will be hit first causing the strike to be conducted through a wire and passing through the ground safety. Lightning rods come in many different forms including hollow, solid pointed or rounded, all lightning rods are made of conductive materials such as copper and aluminum.

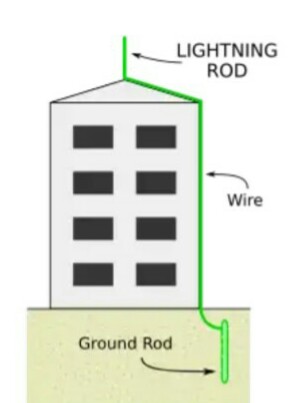


Figure 1: Lightning rod on a building

Other cheaper ones are ground rods. These are long thick rods buried deep into the earth around a protected structure. They are normally made of copper or aluminum and are designed to emit positive streamers.

The LPS should be installed to prevent side flashes between objects, by maintaining the electrical continuity of object to a bonding conductor, any difference in electric potential can be zeroed, allowing any voltage change to occur simultaneously.

**Conclusion**

Lightning is an important and essential part of the earth ecosystem by can be destructive at time. It is sometimes hard to understand why some places seem to be prone to lightning. Very tall objects are frequent target because they represent the shortest path from a cloud to earth injury damage and fires are usually the result of lightning not being able to find a quick and easy path. The lightning protection system helps to provide that path which reduce the probability that damage will occur to building or structure.

**Recommendations**

1. It is recommended that the protection has to be designed during building a structure.
2. It is recommended that all sensitive equipment or machinery will employ the use of lightning protection system
3. It is recommended that awareness of the damages of lightning strike shall be done to citizen.
4. It is recommended that building engineers shall introduce it in the building design.

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