ABSTRACTS of SESSION 8

Paper n°41

Ground potential rise, step and touch voltages during lightning strokes to GSM base station

Abstract: One of the major tasks of a grounding system is to ensure safety for persons during various fault conditions. The purpose of this paper is to provide knowledge about the step and touch voltage distributions in and around a freestanding GSM communication tower during direct lightning stroke in it. Scalar potential at the earth surface as well as step and touch voltage distributions were computed based on field theory approach. The results of calculation give the possibility to find the most dangerous places for persons, which can be present on the area of station or in close vicinity.

Keywords: Lightning protection, lightning dangerous, step and touch voltages, GSM base stations.

Paper n°42

Assesment of the electric schock hazard during lightning at the small electric power system

Abstract: The main objective of this paper is assessment of the electric shock hazard during the lightning. This hazard depends on many factors such as step and touch voltages. They occur when a lightning current is injected into the earthing system of the electric power substation. Reliable approximation method for the distribution of the surface potential, step and touch voltage will be presented. The final design is to limit touch and step voltage to safe levels for personnel within the substation area during lightning strikes.

Keywords: Electric shock hazard, lightning, power system

Paper n°54

Grounding procedures to assure people and equipment safety againstlightning

Abstract: In places of high lightning activity, as it is the case of Florida, in US, and Amazonia, in Brazil, lightning is an important hazard, for people and equipment, specially in installations with high antennas and radar towers, and for electronic equipment. To obtain safety, one essential aspect is to adopt adequate grounding systems, with the eventual need of additional measures, such as shielding and overvoltage limiting equipment, and masts and shielding cables, to limit current amplitude of lightning strikes incident in protected zones.
We present methodologies and procedures that allow to consider such aspects in a coordinated and practical way. The examples are related to concrete projects.

Keywords: Lightning, grounding, safety

Paper n°96

Lightning caused injuries in humans

Abstract: A lightning flash may interact with humans in several ways. The possible pathways of interactions are direct strike, side flash, contact voltage, step voltage, subsequent stroke, connecting leaders and shock waves. The permanent or the temporary injuries that a victim suffers depends, among other parameters, on the type of interaction through which the body is exposed to a lightning strike and the path and the strength of the electric current passing through the body. In addition to the effects of electric current passing through the body, strong

light and shock waves may also interact with the body in various ways. In this paper the different types of injuries that may result from a lightning strike are documented and they are summarized, from an engineering rather than a medical perspective.
Key words : Lightning effects, Lightning injuries

Paper n°111

Analysis of lightning accident at floating roof tank system

Abstract: Fire and explosion accident caused by lightning in petroleum house has occurred all over the world. By post-analysis Yellow Island oil farm accident, it is found that non-metal oil tank has many defects in lightning protection, so that the national standard of China has declared that the construction and application of non-metal oil tank is prohibited since 1995. The performance of metal oil tank and metal floating roof oil tank in lightning protection is also discussed in this paper.
Keywords: lightning protection, oil farm, oil tank

Paper n°126

Acceptability of risk of damage due to lightning using fuzzy logic

Abstract: A lightning Risk assessment necessarily implies a set of uncertainties related to lightning strike probability, presence of a damage channel (type of coupling) or presence of a victim (equipment, human beings, structure itself etc). In order to quantify and qualify these uncertainties a risk assessment methodology using Fuzzy Logic was proposed in [1]. In this paper, the concept of Importance Indexes is presented and developed with the aim of representing the damage severity involved in a harmful event. These indexes either qualify or quantify the impact caused by harmful events via fuzzy linguistic labels [2], and show the subjectiveness related to possible involved losses as a tool for determining risk acceptability. In addition, a fuzzy logic system is proposed to determine whether a certain level of risk is acceptable or not.

Keywords: Lightning, Risk, Fuzzy Logic.

Paper n°143

The resistance measurement of living trees and model experiments for the shielding effect of resistive objects to distribution lines

Abstract: Although shielding effect of trees for power distribution lines are expected, sometime lightning incidents to the lines have been occurred by side flash from the struck near trees. This paper presents and discusses the resistance measurement of living trees and the model experiment for the attractive characteristics of resistive objects like as tree have been done. As the results, the measured resistance of living trees between tip of branches and the ground are 2.0 MΩ to 16 MΩ and their earthing resistances from tree center of stem to the ground are some hundred Ω to 3.0kΩ. From the model experiment of the attractive probability to resistive objects, the shield effect of 100kΩ and 1MΩ objects for the model distribution line cannot be expected.

Keywords: Resistance measurement of tree, earthing resistance, model experiment of lightning attractive characteristics

Paper n°162

Meaning of the discrepancy between lightning strikes and lightning flashes for risk assessment.

Abstract: The paper deals with a calculation of risk, which may appear within a structure due to lightning discharges. An attempt to involve into the calculations not only lightning flashes but also their strokes has been undertaken. A discrepancy between results achieved for flashes and for strokes has been assessed and discussed. On the base of such considerations practical conclusions have been formulated.

Keywords: Lightning damages, risk of damage, risk assessment,

Paper n°212

Examples of severe destruction of trees caused by lightning

Abstract: The paper presents two examples of trees severely damaged by lightning strikes. The trees literally burst, when the lightning current passed through the trunk. Huge fragments were blasted away from the trunk and the roots, over distances of several tens of meters. The bursts even caused considerable damage in the surroundings, e.g. removing large patches of bark from nearby trees, when hit by fragments at high speed. The data of lightning location systems revealed that the trees were most likely struck by high amplitude positive cloud-to-ground lightning. Keywords: Tree, damage, positive stroke

Paper n°220

Use of lightning data services for risk prevention in the industry

Abstract: This paper presents existing lightning data services that can be use as part of a lightning prevention approach and the result of a study of the use of lightning data services by industrial users. The study takes into account the reasons for choosing a lightning prevention approach, the benefits of this approach and its success
factors.

Keywords: Lightning service, lightning risk prevention, early threat warning.

Paper n°239

Development of a risk assessment calculator based on a simplified form of the IEC 62305-2 standard on lightning protection

Abstract: IEC Technical Committee 81 is currently creating the new IEC 62305 series of standards on Lightning Protection. Working Group 9 is responsible for Part 2 of this series, which deals with the assessment and management of risk its CDV (Committee Draft for Voting) stage and has been circulated to National Committees for comment. The paper details the development of the Simplified IEC Risk Assessment Calculator software tool as described in Informative Annex J of IEC62305-2 Ed.1/CDV 2. This tool is intended as a simplified implementation of the more rigorous treatment of risk management found in the written document. It is designed to be relatively intuitive for users who wish to obtain an initial assessment of risk sensitivity, but should not be considered a substitute to a full understanding of the methods provided in the standard when dealing with more complicated structures or those where greater risks to personal or system operation are involved.

Keywords: Risk, Risk Management, Risk Assessment, Lightning Risk, Lightning Protection.

Paper n°243

Lightning data relevance in risk assessment

Abstract: In the process of risk assessment the calculation of risk for a specific arrangement would require such kind of statistical data that carries information for the arrangement itself. Statistics tend to be much more general, they are derived from lightning measurements

performed at different times, places and conditions. In order to get reliable and precise information on the degree of risk concerning a specific arrangement, there are two ways of handling the above problem. The first way would be that only strictly relevant lightning data is used during risk calculation. The preferred method, developed by the author, would take into account the differences between the circumstances of the lightning measurements and the examined arrangement on the basis of set criteria.