ANALYSIS AND FILTERING OF POWER LINE NOISE INTERFERENCES TO DATA AND VOICE SIGNALS IN COMMERCIAL BUILDING

A dissertation submitted to the Department of Electrical Engineering, University of Moratuwa in partial fulfillment of the requirements for the Degree of Master of Science in Electrical Installation

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DECLARATION

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

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3rd November 2011

We endorse the declaration by the candidate.

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Abstract

In modern developing world, ICT (Information and Communication Technology) usage is rapidly increasing and all commercial buildings comprise with very sensitive telecommunication equipments in order to facilitate day to day requirements. All such equipments are interconnected with network cable wiring system unless few remote operating equipments exist. On the other hand, building electrical wiring system is also laid throughout the building. In this context, it may have opportunity to interfere unwanted electrical noise to the data and voice systems hence malfunction or giving flaw data outputs. Electrical noise cause for an abnormal humming sound of the voice signals and thereby degrade the quality of sound systems. Such interference can happen due to both radiated and conductive electrical noise. One of major reasons for the conducted noise is, operation of switched mode power supplies hence lead to create of earth loops that should eliminate at the design and installation stages. Analysis of electrical noise in the system and design filtering systems need to be practiced, when noise issues are raised after the commissioning of electrical installations.

It is required to do analyzing of electrical noise in the building in order to come across comprehensive conclusion for root cause for the disturbances. In doing so, harmonic levels, noise in the live wires, noise through the earth wire and earth loop possibilities are investigated. The most important part is to identify major frequency components filter those from the system. Different type of filter arrangements can be used to evaluate its performances against the noise level of the site. Similarly, installation guide lines can be followed prior to the site erection and that is the very effective method to avoid unnecessary noise induced in sensitive equipments.

Though general filter arrangements eliminate noise, some frequency ranges need to be filtered separately, according to the site conditions. Since calculated L and C values can't be exactly found out, next closet practical values were chosen thereby cutoff frequency is slightly shifted. Simulation results, for common mode noise filtering indicate, 106Hz to 107Hz minimal variation of cutoff frequency and 0.03 variation in damping factor. Earth leakage currents drastically reduced with increasing of the earth line choke and that is possible way to control common mode noise. Introducing separate earth cables instead of single copper tape in the vertical busbar trunking system, is the elimination method of the earth loops between floors at far apart in the high rise building. Besides, it is required to use same earth termination point for the camera and the display system of the CCTV system in high rise buildings.

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