COURSE TITLE: Telecommunications Earthing

Course Outline:

Earthing is an important element in designing a telecommunications facility. Good earthing systems will protect the telecommunications network, against the devastating effects of lightning and reduce the noise level in everyday operations. This course is designed for telecommunications technicians, engineers and electricians who are involved in the design, installation and maintenance of earthing, lightning protection and surge protection equipment. The course will provide theoretical understanding of telecommunication earthing and bonding. It will provide real life examples of designs of earthing systems. Practicals will include testing of soil resistivity and earth resistance and a site visit to a local telecommunications facility. The site visit will allow the participants to examine the existing earthing at the facility and then use their knowledge to make recommendations for improving the site.

Objectives:

To enable the participants to

- Develop a theoretical knowledge of earthing, lightning protection and surge protection.
- To learn how to carry out soil resistivity and earth resistance test.
- Carry out design of an earthing system
- Identify problems of earthing at a typical telecommunications site
- Select appropriate surge protection for telecommunications lines and the power supply feeding telecom facility.
- Select appropriate lightning protection for a telecommunications facility

Target Audience:

Telecommunication technicians, engineers and electricians.
Prerequisites and requirements:

- An appreciation of what a telecommunications facility looks like.
- Basic understanding of electrical terminology and electricity.
- A scientific calculator.

Outcome:

At the end of this training the participants will:

1. Understand the fundamental principles of earthing
2. Understand how to measure earth resistivity and earth system resistance.
3. Understand the techniques for improving earth resistance.
4. Understand about conductors and connections used in earthing.
5. Design an earthing system for a telecommunications site.
6. Implement improvements in the earthing at existing sites.
7. Understand the earthing section of AS3015 including equi-potential bonding.
8. Understand how to select surge protection
9. Understand how to select lightning protection..

Mode Of Delivery:

- Powerpoint presentation.
- Use of Whiteboards
- Field testing in the ground.
- Site visit to a typical telecommunication facility. (If possible)
- Report writing in classroom.

Duration: 2 Days
1) Earthing
This seminar captures the essential elements of practical earthing and discusses products and techniques available to the designer, installer and maintenance personnel.

a. Explanation of soil resistivity and earth resistance.
b. Impact of soil resistance, electrode depth and electrode thickness on the earth resistance.
c. Discussion on parallel earth electrodes
d. Methods of testing soil resistivity and earth resistance.
e. Discussion on copper bonded vs copper sheathed rods.
f. Discussion on earth improvement techniques including earth enhancing gel, Bentonite, GEM and chemical earth rods.
g. Methods of connecting earthing systems including mechanical connectors, hammer-lock and CADWELD.
h. AS 3015 – Standard for Extra Low Voltage power systems for telecommunications. Earthing section will be covered in detail
i. Apply AS3015 principles – To a hypothetical telecommunications sites.
j. How to improve earthing on existing telecommunications sites – Case Studies from Solomon Islands and Fiji.

k. **Practical 1 - Testing and Design**
Carry out soil resistivity testing of the soil available. From this calculate the expected resistance on one rod. Then install one rod and measure its resistance to ground to verify the calculated result. Calculate resistance of multiple rods. Install these multiple rods and measure the resistance to compare with the calculated resistance.

l. **Practical 2 - CADWELD**
Carry out CADWELD using CADWELD PLUS.

m. **Practical 3 - Practice (Where Possible)**
Visit a site of the local telecommunications carrier. Carry out a site survey and prepare a report on how the earthing system can be improved. If necessary carry out testing of the existing system.
2. Surge Protection

The selection of appropriate surge protection devices can be simplified if there was a basic understanding of key yardsticks, that can be used to size up a surge protection device and core technologies could be understood. This training will provide this understanding.

a) Introducing the concepts of surge diversion in power circuits.

b) Discussion on various surge protection devices, including Gas Arrestors, Metal Oxide Varistors and Spark Gaps.

c) Discussion of advantages of surge reduction filters for enhanced protection.

d) Discuss surge protection for telephone lines

e) Selecting surge protection devices and writing performance specifications for telecommunications applications

f) Discuss Surge Ratings, Imax (Max Discharge) and In (Nominal Discharge)

g) Discuss Voltage Ratings Up (Voltage protection Level) and Uc (MCOV)

h) Discuss ERICO technologies including Transient Discriminating, Triggred Spark Gaps and Multi Stage Protection

3. Lightning Protection

There has been a lot of development in the field of lightning protection especially in the techniques of lightning rod selection and placement. Some of these developments have already began to have an impact on practices around the world. This training discusses some new developments.

a) Discussion on lightning formation and the key criteria for lightning to attach to a target.

b) Discussions of various air terminals and their advantages and disadvantages

c) Discussions of various down-conductors and their advantages and disadvantages