

GROUNDING - *It's not really a "Black Art"*

Introduction

Grounding and bonding are an integral part of any modern electrical protection system. It is crucial in ensuring personnel safety, as well as providing reliable protection for vital equipment and to minimise interruptions of service and costly down time.

With almost a century of experience in the design and manufacture of bonding and grounding products, ERICO is the single source provider that offers the best in long lasting, cost effective, grounding products.

The design below identifies a typical grounding system and the components necessary for the job. However, this amounts to very little if the design is ineffective.

Grounding Design

Achieving an acceptable ground can be challenging! They are often required to meet minimum designed guidelines / conditions as nominated by the principal or required by the governing standard. For lightning, most standards nominate a resistance of ten (10) ohms or less and yet it must be noted that the impedance of the system is a more critical factor. High voltage electrical installations are generally designed to a value of one (1) ohm.

A site survey is an idea manner in which to kick off the design of a grounding system for a larger installation. It is a good opportunity to give thoughtful consideration to the characteristics of the site. These include:

- Soil resistivity
- Shape and available area
- Impact of seasonal variations

- Corrosive nature of the soil
- Purpose of the installation
- Existing structures and associated grounding system(s)
- Utility services and pipe lines
- Public access

Ground Conductor

This component must be robust and of sufficient cross section to carry the maximum potential fault current on a repeat basis for the life of the installation. Where lightning is involved, it must have a low inductance.

The most common ground conductor is stranded copper cable. Copper strap is also popular because it has a large surface area. When site conditions are corrosive (eg. sulphurous) tinned copper is often the first choice.

Ground Electrodes

They are the means by which currents are dissipated into the soil. Conductor can be laid in trenches but the most common electrode is a driven rod. This is generally steel and it is often protected from corrosion by an electrolytically applied layer of copper. This application method is preferred because rods with a tubular copper sheath are easily compromised when the sheath is damaged in transit or torn whilst being driven into the ground.

An electrolytic coating of 0.25mm will comfortably provide a service life of 35 years in most soils. Where the soil is detrimental to copper, stainless steel is considered a suitable alternative.

Grounding Connections

This aspect is often overlooked, and yet it is a

vital component. There are a variety of connections but the superior type is CADWELD. This process eliminates connections from the system. Made properly, they carry the full fault capacity of the conductor and last the whole life of the conductor. They can be buried directly in the ground and "forgotten".

When mechanical connectors are used, they should be located in an inspection pit and checked on a regular basis to ensure the connection is sound and has not been compromised by corrosion. The inspection pit should provide sufficient access via a "lockable" lid, and be robust enough to handle the traffic through that area.

Soil Enhancement

The soil resistivity plays a significant role in determining the overall performance of a grounding system. It must be known before a proper grounding system can be designed. In poor soil conditions, the effectiveness of the electrodes can be improved and a lower resistance achieved by use of an ground enhancing material.

GEM is the ideal material for this task. It has a resistivity 20 times lower than the typical values for bentonite. The product is stable and sets hard. It does not shrink during dry periods and can be installed dry or as a slurry. In addition to this, GEM is environmentally friendly.

Design Services

If you are still of the opinion that grounding is a "Black Art", then why not let ERICO design your next grounding system. Our Application Engineers design earthing and lightning protection systems. They are also available to conduct site surveys and audit existing systems.

