What is “Good” Grounding and Why is it Important?

Electrical systems need to be rigorously designed to be safe in both normal operating conditions, as well as during fault and lightning strike conditions. There are numerous electrical safety mechanisms, including circuit breakers and arresters, whose sole purpose is to handle “non-normal” flows of electricity by sending the flow directly to ground. However, in order to function correctly and predictably over the life of the system, these safety systems rely on low impedance, low resistance, pathways to ground.

Why Does Current Go To Ground?

In “non-normal” operation, (a typical ground fault for instance), current cannot travel back to the source through its usual conductor. This could occur for example when a tree falls on a conductor and breaks it. The current will then travel through the ground and back to source, if it has a good connection to the ground. Often, a broken line will intermittently touch the ground, or come within reach causing a large arc. Intermittent arcing, as in recent California fires, can have disastrous impacts. A similar phenomena occurs when lightning strikes a line or tower. The current wants to travel to ground and if effective lightning mitigation strategies are not used extensive damage may be the result.

How Does A “Good” Ground Help?

A good ground exists where there is a low resistance path to the earth. This is dependent on:

- A continuous conductor – not stolen, corroded, or missing entirely
- A low resistance termination in the ground (ground rod or ConduDisc)
- Low resistivity soil is not always available - installing the correct number / type of electrodes to achieve a low resistance termination in earth, depending on the geology and specific soil conditions.

The safety devices function correctly with a “good” ground connection. Additionally, if the conductor passes current to the ground, it functions properly with a “good” connection. The data overwhelmingly suggests that less than 10 ohms resistance is ideal in power utility applications.

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Personnel Safety

All structures surrounding an electrical installation, or boxes or covers etc. that could be touched by workers or the public, need to be bonded to the grounding system. By doing this, non-normal electrical energy can flow to ground and properly trip a circuit breaker. In the case of fences surrounding substations or other high voltage installations, proper equipotential bonding is required in place of active circuit breakers. For example, if a fence was not properly connected, and it was energized by a fallen line, a person touching the fence would provide an alternate path to ground with potentially serious consequences.

Field Conditions

From experience, some of the critical gaps that exist in the grounding network are:

- Old, corroded conductors or ground rods that do not form a good path to ground.
- Missing conductors or connectors – aged or perhaps stolen for copper value.
- Insufficient (high) resistance components – due to poor installation, lack of testing or years of adding structures and components to an installation - causing faulty operation or excessive stress and damage to assets
- Poor geology that requires additional remedial techniques (such as a deep ground well) to achieve a tested and verified low resistance level.

Ground Rod Failure

Protection Failure: Unseen underground damage

A qualified audit of installed equipment and geology can be extremely useful in designing a sufficient and functional “good” ground network. Additionally, modern methods of augmenting ground electrodes and protecting them from devastating and unseen corrosion, should be utilized to best ensure the long-term safety for personnel, and exceptional asset reliability.

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