

GROUNDING OVERVIEW

POLY-SET is a patented and proven water insensitive backfill material for utility poles. The POLY-SET system was developed in the field 30 years ago to provide an economical and sound structural backfill material. When Utility Structural Systems began investigating the grounding concerns of the electrical industry, our research led us toward the new application called POLY-GROUND (patent applied for) that maintains the same reliability as POLY-SET with the additional ability to solve the grounding needs of the utility industry.

Grounding is important to an operating utility because it is part of the “return wire” of the electrical circuit.

Grounding is related to a “safety valve” of an electrical system, both to protect the system itself and the personnel working on the system.

Important aspects in dealing with the electrical problems in a system are:

- All electrical equipment must be grounded because of a possible short circuit inside the equipment.
- Electrical sensors (called relays) require a reference, which is the ground.
- Harmonics created by semi-conductor based switching devices and unbalanced loads depend upon “good grounds” to stabilize the electrical system.
- The speed of discharging a lightning strike keeps both the conductor and equipment from being damaged.
- An electrical ground is also referred to as the NEUTRAL, COMMON or GROUND.
- Ground connection points are arranged so that under normal circumstances there will be no excessive flow of current in any portion of the neutral conductor.

POLY-GROUND for pole installation has the equivalent of 15 to 25 times more surface area than a 5/8 inch by 8 foot ground rod at each pole installation. By increasing the area in which electrical energy can use the earth’s crust, the electrical system can operate more efficiently and therefore requires less maintenance.

Grounding systems are broken into four categories:

1. Workman’s Safety
2. System’s Safety
3. Lightning Protection
4. Harmonics

Workman's Safety

The purpose of good grounding is protection from electric shock for the workmen in the field. If excessive voltage is encountered due to accidental high voltage contact or by lightning, a good ground is required on each pole to form the preferred path to ground rather than passing through the workman. POLY-GROUND will potentially increase the protection for the workmen by up to 500%.

System Protection

Due to the combining of all the electrical operating systems that presently form the North American Electrical Grid, protection of the complete system has become a very necessary and difficult science needed to keep the whole system working. The fast acting relays necessary to accomplish system protection are dependent upon good grounding throughout the system. If POLY-GROUND is installed on each pole in the system the results could potentially be improved by up to 500%.

Lightning Protection

The goal for shielding transmission and distribution lines is to attract the static charges from the clouds and to dissipate the charge into the earth's crust, which is an infinite reservoir of electrons.

The movement of the clouds through the atmosphere creates a charge on the cloud in which the positive charges go to the bottom of the cloud and the negative charges go to the top of the cloud. When the voltage buildup between the potentially charged clouds and the earth or grounded static or grounded structure has risen above the break down value of the air between these entities, a "feeler" of electrons makes an invisible journey to the clouds and leaves a narrow ionized path, which becomes a good conductor between the two points.

Lightning is the positive discharge from the rain cloud that follows the ionized path formed by electrical "feelers" that are traced from the earth to the cloud. This narrow path of ionized air becomes a conductor and results in the concentrated, positive charges that accumulate on the bottom of the rain cloud being discharged in the form of lightning into the earth's crust.

Lightning discharges can be in excess of 5000 amps.

POLY-GROUND will provide your system with a faster more positive ground because of the many POLY-GROUNDS of extra capacity.

Harmonics

The recent realization among electrical engineers is the effect of harmonics on the electrical system as a whole. The basic curve plotted by the rise and fall of an A.C. voltage in the standard 60 cycle system of the United States is a perfect sine wave. Harmonics are extra rises and falls that occur in the original sine wave that follow at multiples of the original period and is super imposed on the original curve. When all of these are combined a ragged non-sine wave is created. This can make the peak of the wave 50% to 70% higher than the expected wave. This is sometimes called the “unsolicited load” and must be accommodated for by relay protection used on the line for system protection.

These harmonics are caused by unbalanced loads; such as those produced by single phase motors and the use of semi-conductor based switching devices, e.g., power supplies used in computers, and temporary faults on lines or in equipment. These harmonics can be eliminated when the power flows through a grounded “Y” to a delta transformer. This is accomplished by the use of a strong ground at the transformer bank. By using POLY-GROUND on your transformer bank you have provided a higher capacity ground.