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POLY-SET®

January 28, 2005

Poly-Ground® Texas 1 Data:

Scope:

This test was an actual installation of Poly-Ground®, Utility Structural Systems newest line of engineered backfills. In our opinion, Poly-Ground® has many benefits, such as worker safety and enhanced grounding, but perhaps one of the most significant benefits that can be noted is the lower impedance, which decreases line loss, of the system.

Conditions and Installation:

The jobsite was located in central Texas. The weather was approximately 52°F and gradually warmed up to about 76 °F by 2:00 p.m. On arrival, I met with the general foreman who brought me up to speed on what was happening. He informed me members of the utility would be arriving around 10:00 a.m. for the installation. I decided it would be appropriate for me to start setting up for the measurements. After I donned my protective gear, I asked permission to go the installation area. Upon inspection, I took note of the specifics of the installation. A 36" hole had been augured to a depth of 8' and a concrete pole was in place and braced with large rocks. I viewed the "brand label" on the pole and found the specifics to be a Newmark International manufactured concrete pole classed as "Dead End Unguyed", 60' in length, and 12,484 pounds in weight. I took a groundline diameter reading and found the pole to be about 23" in diameter. I would estimate the butt diameter to be approximately 25" given the taper of the pole. Soil conditions were decent. The soil appeared to be somewhat loose in nature and I estimated the strength to be about 5000 psf (pounds per square foot), but I stress this was my estimate. This particular line was a 14.4kv, double circuit, line that was being refurbished for unknown reasons. The concrete poles were replacing wood poles. It appears concrete poles were being used due to the increase in span length required to clear a creek crossing east-west.

I proceeded to set up the earth resistivity measuring device (megger). Utility Structural Systems uses a DET 2/2 Auto Earth Tester manufactured by AVO International. The instrument was most recently tested and calibrated on October 25, 2004 by Instrument Repair and Calibration in Houston, Texas.

Conditions and Installation (continued):

The testing process Utility Structural Systems uses is the "Fall-of-Potential" method that is most common to the electric utility industry and is also considered the standard measuring method. This method has two electric leads that are connected to the electrode to be grounded, one probe driven into the soil at 62' from the grounding electrode and another at 100' from the grounding electrode. The meter reads soil resistivity as it relates to the probe being measured.

Prior to the trip, I was contacted by an authorized manufacturer's representative who had contact with the utility personnel and had obtained the specifics for the project. I had calculated it would take approximately 40 cubic feet of backfill for each pole installation. That is a lot by any standard, being just shy of 2 cubic yards. So I calculated the required amount of Poly-Ground as requested.

When everyone had arrived at the site I conducted a brief instructional talk on Poly-Ground, and what we hoped to achieve that day. We decided I would personally install the Poly-Ground, one kit at a time, and take a reading 10 minutes after each pour in order to allow the exothermic heat reaction to cool a little (since heat is resistance in this case). A ground rod was being installed on each structure that was attached with a clamp to #2 stranded copper wire that would eventually be tied into the neutral. The rod was placed into the annulus of the hole but was not driven into the soil so that we could backfill the rod in the installation. There was no rod reading for a base comparison. I provided the opportunity for questions and did my best to answer each and every question to the best of my ability. After all questions were answered, I informed everyone that this could take an hour or so given the wait time between each pour in order to measure the resistance. I made the first pour and waited 10 minutes prior to taking a megger reading. This was followed by 4 more pours, 1 from each side of the structure so to assure even distribution, and subsequent measuring. See chart below for readings:

14.4 kv Concrete Pole Measuring in Central Texas

Pour Number	Depth of Poly-Ground	Megger Reading
Pour #1	10"' Depth	43.2 ohms
Pour #2	20"' Depth	36.6 ohms
Pour #3	30" Depth	26.7 ohms
Pour #4	39" Depth	21.2 ohms
Pour #5	48" Depth	19.7 ohms
Pours 5-10 on Pole #2	48" Depth	18.4 ohms

We did not measure this pole in increments because it was decided that the point had been proven. Furthermore, USS did not want to hold up the construction process anymore than necessary.

The reading obtained on the Poly-Ground® structure was initially 43.2 ohms. This was classified as a single made electrode, meaning that no phases, neutrals, static wires, or other equipment was currently attached to this pole. Ultimately, we were able to obtain a resistance reading of 19.7 ohms and it appeared that the readings were leveling off, suggesting that the readings were not going to get much better. It was suggested that installation of Poly-Ground be stopped there to reduce cost per structure, and fill the remainder of the void with another manufactures foam backfill. This foam backfill was not conductive in nature.

Conclusions:

We feel quite confident, as evidenced by the numbers that Poly-Ground® has had a significant, positive effect on the grounding of these types of poles. It furthermore indicates that surface area is playing a key role in the grounding of structures when Poly-Ground is used. This is the reason that we conducted the test in this fashion, so to prove that very theory.

Respectfully submitted:

Jason Davenport

Jason Davenport
Account Executive
Utility Structural Systems

Appendix A Photos:

Pole #1 60’ North Side of Creek

Pole #2 65’ South Side of creek

Pole #1 Close up prior to installation

Pole #2 close up prior to installation

Creek Crossing Between Spanns