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Scope:

This test was an actual installation of Utility Structural Systems newest line of engineered backfills known as Poly-Ground®. 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:

On arrival at the jobsite, I met with the utility personnel and found the structures were 115kv, wood H-Frames currently in the process of being refurbished. The soil condition at this particular site was extraordinarily rocky in nature. This was a remote site, not easily accessed, which made it a perfect location to test the new "hybrid foundation" we had designed in conjunction with the utility's personnel.

The wood H-Frames were being replaced with newer steel H-Frames identified as H1 class 70' poles. The majority of the embedded portions of these structures were coated with corro-coat but the bottom 2' was left galvanized. Upon examination of these structures, we were able to ascertain there was a problem with the corro-coat. It could not be determined at what point the damage actually occurred. This could have been an adherence problem, or it could just as easily been a pole handling issue. According to the people on site, this was not at all uncommon. What they were looking for was solid data leading to a possible solution of two independent problems they are encountering. The first problem is the resistance on transmission lines in areas where the soil is not beneficial to lowering impedance values. The second was the issue of corrosion on these specific structures throughout the majority of their system. Since Utility Structural Systems has a solution to both of these problems, it was decided the "hybrid foundation" be employed and evaluated. Utility Structural Systems newest product, Poly-Ground®, would be installed at the lower depths to cover the uncoated portion of the steel poles so to enhance the grounding thus, lowering the impedance value. The remainder of the void would be filled with Poly-Set® to add to the corro-coat, reinforcing any defects and adding several inches of protection. There were also several locations on the poles where large patches of corro-coat were completely missing. One area had about a 3"x18" strip completely missing that did not appear to have adhered at all.

We proceeded to obtain a soil resistivity reading to provide a baseline for Poly-Ground® effectiveness in this particular location. The soil resistivity reading was obtained using the fall-of-potential" method and was performed by utility personnel using their equipment. It was done only to a depth of 5' and 10'. (*See chart for specific soil resistivity data*)

Conditions and Installation (continued):

Table 1: Line Traverse (7/25/2002) – Thermopolis, Wyoming

feet	ohm - meter	Average Soil Resistivity to Depth in ohm - centimeters
5	35.40	3540.00
10	21.59	2159.00

The holes were augured to a depth of 10' and a diameter of 36". The approximate diameter of the butt of the pole was 19". Poly-Ground® was mixed and poured; filling the bottom 3' of void, ensuring the entire portion of the pole not coated was covered with Poly-Ground® (to obtain maximum square inch contact to the pole and the soil). The remainder of the void was filled with Poly-Set®.

Once this was completed, the structure (which was isolated from the remainder of the line and had protective grounds installed prior to our arrival), we were able to obtain a megger reading of 13.30 ohms. We did not have a baseline to compare to, but according to utility personnel, they could remember times they could not achieve readings below 100 ohms in certain areas. It was unclear if this was one of those areas. Once the conductors and shield wires were connected (with the line still de-energized), we were able to obtain "system" resistance. At the newly installed pole, the reading was 1.65 ohms, and one structure down, was 1.75 ohms.

Structure No.	Ohms	Comments
37/5	13.3	Structure completely isolated from conductors and overhead ground wires
37/5	1.65	Structure with installed conductors, overhead ground wires, and personnel protective grounds removed
37/1	1.75	Structure with installed conductors, overhead ground wires, and personnel protective grounds removed

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.

Jason Davenport

Jason Davenport
Account Executive
Utility Structural Systems

Appendix A Photos:

Pole being lifted info position

Pole showing Corro-Coat issues

H-Frame being set into position

Mixing materials on the job site

H-Frame on the ground being lifted