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POLY-SET®

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Scope:

This test was an evaluation 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 is the lower impedance, which decreases line loss, of the system.

Conditions and Installation:

The sun was out with temperatures around 80 degrees and no surface moisture of any significance. The location was a newly constructed 16kv, two-piece, steel pole project. An approximately 24" hole had been dug prior to my arrival and the class 5 50' pole was already in place and plumb. The bottom of the pole was fitted with a bottom plate that was about 213 square inches of surface contact (it was also the 3/16" minimum thickness according Trans American stated literature). It is unknown whether or not the plate was for grounding purposes or for vertical bearing capacity or a combination of both. According to the utility personnel, it is common practice to place approximately one or two 25 pound bags of some sort of grounding enhancement material in the bottom of the hole in order to obtain lower resistance values. The holes are then backfilled with either select backfill or native soil from the excavation. In this instance, the bottom 3' of the pole was set with Utility Structural Systems' Poly-Ground® backfill and no other enhancement material was used other than the Poly-Ground.

Conditions and Installation (continued):

Poly-Ground® was supplied as a two component system consisting of a 5-gallon pail and a 2-gallon jug. The content of the 2-gallon jug was poured into the content of the 5-gallon pail (the 5-gallon pail serves as the mixing container). The Poly-Ground® was mixed for approximately 20 seconds using the supplied mixing tool and a ½" drill. Once mixed, it was poured into the void. The residual was then scraped from inside of the pail directly into the void. This accounted for approximately three feet six inches (3'-6") of covering on the uncoated portion of the pole. The poles were covered from approximately 6" above grade to 3' below grade with what appeared to be Corro-Coat. Two Poly-Ground® kits were needed due to the large size of the auger being used in this particular case. If a smaller auger had been used, significantly less Poly-Ground® would have been required to accomplish the same result. Two Poly-Ground® 30 (PG30W) kits were used yielding about 3'-6" of backfill. This particular pole would have taken 14 cubic feet of any type of backfill under normal circumstances to backfill the pole from top to bottom.

Conditions and Installation (continued):

Once the pole had the proper amount of Poly-Ground® applied, we decided to measure the structures ohm resistance. The testing process used was the "fall of potential" method, which is also known as the 61.8% rule. Two probes are placed in the ground, one at 62 feet and another at 100 feet. Two additional leads are attached to the pole itself since it is being used for the grounding electrode. The two electrodes attached to the pole were attached to the grounding lug normally used to connect a ground rod to the pole. The instrument used to test this structure was a DET 2/2 Auto Earth Test manufactured by AVO International. The instrument was recently calibrated and had the on-board battery replaced by Instrument Repair and Calibration in Houston, Texas on October 25, 2004.

The reading obtained on the Poly-Ground® structure was initially 42.6 ohms. This was classified as a single made electrode, meaning that no phases, neutrals, static wires, or other equipment was attached to this pole at this time. Next, we moved down one span south to the same type of installation. The pole had the previously mentioned ground enhancing material placed at the bottom of the pole to an unknown depth. Using the same fall-of-potential method for ground resistance testing, an ohm reading of 72.8 ohms was obtained.

Conclusions:

After approximately 45 minutes we decided to re-test the Poly-Ground® pole. This occurred after I explained that during the reaction of polyurethanes there is an exothermic reaction that takes place generating some heat. As the reaction cools, the heat dissipates and lower resistance values are obtained. In this case, the reading came down to 36.2 ohms, and it can be assumed that within two hours of setting, a reading in the lower 30's to upper 20's may have been achieved (based on previous field work by Utility Structural Systems personnel). After reviewing the obtained data, it is clear that Poly-Ground® significantly affected the grounding potential in this particular area of the utility's steel pole installations. The ground resistance was cut by at least 50% with potential for more resistance given the cooling effect that was continuing to lower the resistance reading over time. It should be noted, it is unknown what the ohm reading may have been on a standard pole with no ground enhancement of any type. It may have been higher than the powdered version of the enhancement, or it might have been equal to or lower than the powdered enhancement depending on what actual effect the enhancement had on the pole itself. We feel quite confident, as evidenced by the numbers, that Poly-Ground® had a significant, positive effect on the grounding of these poles.

Respectfully submitted:

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