U-233 Project Lessons Learned

Urgent Bulletin

Date: 28 JUNE 10 **Bulletin Number: ISO-LL-10-71**

Title: Near miss to an electrical fatality

Lessons Learned Statement: Equipment operators who contact energized electrical lines should be aware that you and the equipment are at the same potential as the power line, and immediate action should be taken to back the equipment away and break contact with the energized conductor. This should be done instead of attempting to exit the vehicle. For emergency response personnel and other personnel who are in the immediate area, be advised that a voltage gradient exists from the equipment that is contacting the energized electrical source. Every effort should be made to stay away 35 feet or more where the ground potential is 50V or more. For wet soils this safe distance should be doubled to 70 feet.

Discussion of Activities: On March 26, 2010, at the Hanford Site, an excavator accidently contacted a energized 13.8 KV electrical power line. Since the contact was with one phase, the actual contact voltage to ground was 7.96 KV. When a Project Safety Representative (PSR) observed the occurrence, and saw sparks emanating from under the excavator at the time it made contact with the 7.96 KV (phase to ground) power line, he inappropriately responded by driving his vehicle near (approximately 12 feet) to the excavator. The PSR stepped out of his truck and moved toward the excavator. Fortunately the excavator driver had backed his equipment away from the power line prior to the PSR arrival.

Analysis: According to technical documents referenced below, the voltage gradient along the ground is halved for every 2.5 to 3 feet from the electrical voltage source. If the excavator was still energized at 7.96 kV when the PSR stepped out of his truck (approximately 12 feet away) on to damp/wet ground (observed from pictures showing standing water on the associated road soon after the occurrence), the voltage potential would have been over 500 volts On the PSR's first step to the excavator approximately the same voltage potential (or more) would have been realized between his two feet. The PSR was extremely fortunate that the equipment operator took the initiative to back away from the electrical power line before the PSR stepped out of his truck and walked toward the excavator. **If the excavator was still in contact with the power line, the PSR would have been severely shocked and possibly killed during his first step.** The DOE-RL Electrical Subject Matter Expert interviewed the author of the referenced article, and found that the above conclusions were based upon multiple tests using 1.4 KV and 7.2 KV voltages sources.

Recommendations:

Equipment operators who contact energized electrical lines: Be aware that you and the equipment are at the same potential as the power line, and immediate action should be taken to back the equipment away/break contact with the energized conductor. This should be done instead of attempting to exit the vehicle. In any event, unless other hazards arise (such as fire, etc.) it is safer to stay within the vehicle until emergency response and utility personnel have safely de-energized the line and verified that it is safe to exit.

Emergency response and all other personnel who are in the immediate area: Be aware that a voltage gradient exists from the equipment that is contacting the energized electrical source which is at the same voltage potential. Every effort should be made to move away to a safe distance where the ground potential is 50V or less. For example, using the gradient rule mentioned above, for 13.8 KV phase to phase systems, a minimum safe distance would be at least 22 feet, and for a for 230 KV phase to phase system a safe distance would be at least 34 feet. For wet soils this safe distance should be doubled to 70 feet.

References: 2010-RL-HNF-0035; Electrical World, November 1990, “Why proper grounding is vital for worker safety” by Clayton C. King; Encyclopedia of Grounding for De-Energized Construction & Maintenance, Copyright 2008 Hubble

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