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Lessons Learned Issued in 2005

Downed Perimeter Light Pole Leads to Electrical Near Miss

Title: Downed Perimeter Light Pole Leads to Electrical Near Miss

Date: August 25, 2005

Identifier: 2005-RL-HNF-0030

Lessons Learned Summary:
Facilities should be especially cautious of leaving equipment in an abnormal status for prolonged periods of time, and should consider interim corrective actions such as removing power if repair actions are delayed. If regulatory or other considerations require the equipment remain operating, periodic evaluations should be conducted to ensure hazardous conditions do not develop. Managers should understand their responsibilities and the interface agreements that exist with other support organizations to ensure that equipment is adequately maintained.

Discussion of Activities:
On 3/13/05, during a high wind event, a 30-ft perimeter light pole at the Canister Storage Building (CSB) facility failed (fell over). When performing the unmanned facility checklist at the CSB facility, it was noted that Perimeter Light Pole L-25 on the southeast side of the facility had blown down. Electrical Utilities (EU) inspected the pole and reported that the electrical wires were intact and placed caution tape around the area. The pole remained in this condition until April 6, 2005.

Investigation determined that during the weeks following the light pole being blown over, the insulation on the wires became degraded to the point where some bare wire was exposed, which created an electrical hazard. Facility Operations was unaware of this condition.

On April 6, 2005, an electrician and engineer were conducting a visual inspection of all CSB perimeter light poles to determine if there were problems with welds, rust, etc. Inspections of Poles L-18 through L-24 had been completed and the group moved to Pole L-25. This pole differed from the other perimeter lights, because it had a conduit attached which contained electrical wires running to a nearby environmental monitor. The electrician noticed that the wires were tight and over the metal edge of the pole base. While visually inspecting the pole, the conduit was accidentally bumped causing a short and loss of power to the environmental air monitor and Perimeter Lights L-18 through L-26.

Analysis:
Initial assessment of the downed light pole determined that the 480Volt wires inside the pole were intact and that it would be appropriate to leave it as is (energized) for one night. Later it was determined that it would be safe to leave the pole energized and in its downed configuration until it could be repaired. Because the light pole also contained an electrical feed to an environmental monitor, there was a need to maintain power and operability. However, confusion over the ownership and responsibility for the repair of the CSB electrical system delayed the eventual inspection and repair. Further investigation revealed that procedures clearly define the demarcation point between the EU electrical system and CSB

electrical system and that a Memorandum of Understanding was in place that specifies the CSB has the responsibility for the 480 volt perimeter light pole breaker.

Leaving the wires exposed to the environment for a long period of time allowed the insulation on the wires to degrade to the point where some bare wire was exposed creating an electrical hazard. Unaware of this condition, Facility Operations performed an inspection about 3 weeks after the pole had blown down. During the inspection the wires were moved causing them to arch against the broken steel pole base and trip the 480 volt perimeter light pole breaker.

The primary cause of the light pole failure has been identified as fatigue cracking and is the result of repetitive or cyclic wind loading. The poor welding technique (weld start/stop and size) is likely to have contributed to and accelerated fatigue crack initiation. Many of the light poles on the Hanford site are 30-foot long, 5-inch square, 0.180-inch wall structural steel tube welded to a 1-inch thick by approximately 12-inch square structural steel base plate. Poor weld tie-in, characterized by weld bead cold roll and sharp re-entrant angles, can produce areas of increased stress. This in turn, creates a material condition that is more susceptible to cyclic fatigue loading, than would otherwise be. In addition, excessive weld size can affect base material microstructure and residual member stress in a way that can exacerbate the effects of fatigue loading.

Recommended actions:
Projects that have interface agreements with Electrical Utilities (EU) should review them to ensure their responsibilities are clearly understood and discuss with their staff the appropriate actions to be taken for similar events which could occur in the future.

Plant/facility conditions should be continually assessed to ensure that unsafe conditions are identified and previously unrecognized hazards are addressed.

Facilities with similar light poles should perform a visual examination to determine if the tube-to-base plate connection is of similar design and determine if the weld is oversized. The weld quality should also be evaluated, especially at the tube corners to determine if there are signs of cracking at the top toe of the weld. Defective poles should be repaired or replaced.

Estimated Savings/Cost Avoidance: N/A

Priority Descriptor: BLUE/Information

Work / Function: Conduct of Operations-Lockout/Tagout, General-Engineering and Design

Hanford-Defined Category: Associated Causal Factors - A3B2C04-Previous success in use of rule reinforces continued use of rule, couplet-A5B2C07-Factos wrong/requirement not correct

Hazard(s): Electrical Personnel Exposure

ISM Core Function(s): Define Work, Analyze Hazards, Develop and Implement Controls

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Authorized Derivative Classifier: Not required

Reviewing Official: Gerald Whitney

Keywords: Light, Pole, Electrical, Wind, Design, Construction, Near Miss

References: Occurrence Reports: RL--PHMC-SNF-2005-0009; HFF-26585 Canister Storage Building Facility Perimeter Light Pole Investigation, July 2005, G. R. Cannell

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