United States Government **Department of Energy**

memorandum

Ohio Field Office

DATE: SEP 30 2004

REPLY TO ATTN OF: OH:ORRISON

DOE-0001-05

SUBJECT: ELECTRICAL SAFETY PERFORMANCE CHALLENGES AND GOALS

TO: Paul M. Golan, Acting Assistant Secretary for Environmental Management

In response to the request contained in EM-1 memorandum, dated July 13, 2004 on the above subject, the Ohio Field Office (OH) has completed a review of electrical safety performance at OH sites. This was done by: 1) reviewing performance data for electrical safety at each site; 2) determining the underlying causes and activities that resulted in electrical safety issues; and 3) developing and approving action plans to improve performance for 2004 at each site.

Attached is a summary for the OH sites including a corrective action effectiveness verification and improvement plan; and site specific reviews with approved actions for the Fernald Closure Project, Miamisburg Closure Project, and West Valley Demonstration Project. All approved actions are scheduled to be completed by December 31, 2004. In contrast to the overall results of the Office of Environmental Management analysis, OH found more electrical safety occurrences related to Deactivation and Decommissioning (D&D) work. In other categories, improvement was found regarding electrical safety occurrences involving movement of heavy equipment and regarding lockout/tagout procedures. The major focus of the OH action plan relates to electrical safety occurrences related to D&D work.

If you have any questions, please call me at (513) 246-0018 or Glenn Griffiths at (513) 246-0033.

Robert F. Warther
Manager

Attachments

Fiscal Year 2004
Electrical Safety Performance
September 30, 2004

Reference Documents

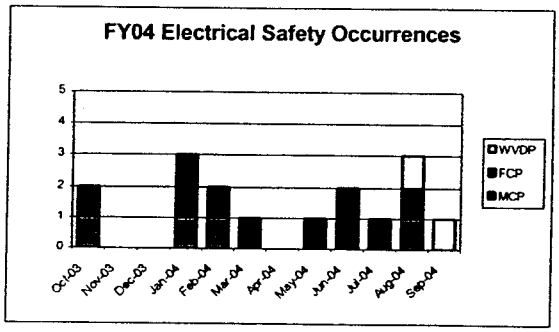
- Memorandum from Jessie Hill Roberson, EM-1, *Electrical Safety Performance Challenges and Goals*, July 13, 2004
- Office of Performance Assessment and Analysis, *A Review of Electrical Intrusion Events at the Department of Energy: 2000-2001*, June 2002
- Fernald Closure Project (FCP), *2004 Electrical Safety Incident Review*, September 20, 2004
- Miamisburg Closure Project (MCP) Surveillance Report MCP-ESH-04-051, *Electrical Safety Performance Challenges and Goals at the Miamisburg Closure Project*, September 13, 2004
- West Valley Demonstration Project (WVDP), *2004 Electrical Safety Performance Review*, September 23, 2004

Purpose and Scope

To ensure continued improvement in electrical safety performance, a review was conducted at OH sites including the following actions: 1) review of performance data for electrical safety at each site; 2) determine the underlying causes and activities that result in electrical safety issues; and 3) develop and approve an action plan for 2004 to improve performance that is tailored to the unique conditions found at each site.

Summary of Results

Attached are review reports for the Fernald Closure Project, Miamisburg Closure Project, and West Valley Demonstration Project. These reviews examined the performance data for each site, analyzed underlying causes to electrical safety issues, and developed action plans to improve performance. The chronological data for OH overall, shows two clusters of events, one in the January to March timeframe and another in the June through September timeframe.



Of the six (6) events in the January to March timeframe, three (3) were related to vehicle contact with lines or poles. Aggressive management attention was brought to this issue and has reduced these types of events with only one occurrence since March and none in the last three months. The two West Valley events in the last two months have prompted that site to start an aggressive electrical safety campaign in order to head off any future occurrences. The details of the campaign are contained in their report (attached), which appears to be comprehensive. OH will continue to monitor their progress.

OH will continue to track and trend electrical safety related events on a monthly basis to identify changing trends and look for lessons learned to ensure performance improvement.

OHIO FIELD OFFICE
ELECTRICAL SAFETY RELATED OCCURRENCE REPORTS
FY2004

Decontamination & Decommissioning (7)

10/16/03
Ohio, Mound Plant, Tritium Facilities
OH-MB-BWO-BWO01-2003-0004-**The Cutting of a Live 110 Volt Electric Line in Semi-Works Building, Room 152**-(Off-Normal)
An electrical near-miss occurred when a craftsman cut through a conduit and contacted an energized 110-volt line with a reciprocating saw during D&D activities in the Semi-Works Building. There were no personnel injuries. After the line arced and the circuit breaker tripped, the craftsman stopped work, notified his foreman, and called an electrician. Although the craftsman did a cursory check for an air-gap of the wires inside the conduit, there was no "meter check" to verify that all of the wires were de-energized.

01/29/04
Ohio, Mound Plant, Sites and Grounds
OH-MB-BWO-BWO04-2004-0002-**Damage to High Voltage Vault at G Building Slab**-(Significance Category 4)
While breaking up a concrete slab at the G Building, an electrical near-miss occurred when a backhoe operator initiated work in the wrong area and inadvertently damaged the cover of the High-Voltage Vault with the backhoe's concrete hammer. No personnel injuries were mentioned in the report. The damaged vault cover was discovered the next day by a site foreman, who subsequently stopped work. Site personnel observed no visible damage to the high-voltage cables, located inside the vault. Site personnel believe that, since the cables were located some distance below the vault cover, the backhoe's hammer was not likely to have contacted these energized cables. Also, the transformer fed by these cables appeared to be operating normally, and no power upset conditions were reported. Subsequently, broken concrete debris was removed from atop the vault cover in order to prevent this debris from falling onto the energized cables inside the vault. A preliminary investigation determined that the work area utilities were not adequately prepared/marked, although the location of utilities, including the High-Voltage Vault, was discussed at the pre-job briefing. Investigators also determined that a required excavation permit for the concrete slab removal job was not obtained. The vault was later covered and the area was secured.

03/12/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0007-**Workers Performing Removal of Electrical Conduit Cut Into a Energized 120 Volt Line**-(Significance Category 3)
While cutting into an underground conduit near Building 82 with a battery-powered reciprocating saw, an electrical near-miss occurred when a worker contacted an energized 120-volt electrical line and observed a small arc flash. The worker was not shocked. Work was stopped. Site personnel tracked down the source of the live wire and discovered an energized line in a junction box that was hidden by still-connected neutral wires. Later, site personnel learned that when the electrical lines were disconnected before the conduit was cut, one line was left energized in order to power an exterior street light. The energized wire was located and disconnected. A debriefing was held.

07/20/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0021-**Energized 120-Volt Signal Wire Discovered During Removal of 480-V Motor Control Center Cubicle**-(Significance Category 3)
During electrical work activities to remove a 480-volt cubicle, one of the electricians noticed an electrical arc after an energized 120-volt signal wire contacted the frame of the panel, and caused a blown fuse. Work was suspended and electricians began a review of the electrical configuration. A debriefing with all involved personnel was held.

08/16/04

Ohio, West Valley Site, Balance of Plant

OH-WV-WVNS-WVNSGEN-2004-0004-**[Near-Miss]-Unexpected 480 Volt Conduit Breached During Excavation Activities**-(Significance Category 3)

During excavation activities on an old concrete duct bank, a near-miss occurred when workers breached an energized 480-volt electrical line that was unexpectedly found inside the duct bank. There were no personnel injuries. Although site personnel had isolated and secured two known conduits that entered the duct bank, as shown on the as-built drawings, workers later unexpectedly discovered seven additional conduits in the duct bank. After concrete debris was removed, workers discovered several breached conduits, including the 480-volt energized line. Subsequently, all current work activity in the area was suspended. Management appointed two investigation teams to review this event. In addition, a site-wide stand-down was initiated.

08/25/04

Ohio, Fernald Environmental Management Project, Balance of Plant

OH-FN-FFI-FEMP-2004-0026-**Near Miss-Laborer Inadvertently Cuts Live 120-v Portable Bandsaw Power Cord**-(Significance Category 4)

While using a double-insulated portable bandsaw to sever previously de-energized cables and cords in Building 14, an electrical near-miss occurred when a laborer inadvertently grabbed the energized 120-volt power cord (for the bandsaw he was using) and cut it. The laborer was not shocked, and exited the area. Subsequently, supervision determined that the laborer was uninjured and checked the electrical distribution panel to ensure that it was in a safe configuration. Later, maintenance electricians verified the safe condition of the electrical panel, before re-setting the tripped breaker.

09/23/04

Ohio, West Valley Site, Vitrification Facility System

OH-WV-WVNS-VFS-2004-0002-**Near Miss-Operator Inadvertently Cuts 120 Volt Portable Band Saw Power Cord**-(Significance Category 4)

During cutting activities while standing on a fiberglass ladder, an operator inadvertently cut into the electrical cord to his portable 120-volt portable band saw, causing an electrical arc. The operator was not shocked. Another worker later unplugged the saw's power cord. Subsequently, work in the area was stopped, the saw was removed from service, and area personnel were briefed on precautionary measures needed when working with power hand tools.

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Vehicle Transportation (4)

01/13/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0002-**Excavator Strikes Overhead Electrical Line During Transit**-(Significance Category 4)
An electrical near-miss occurred during transit of a Caterpillar 375 tracked excavator, when the excavator struck an overhead (un-energized) 480-volt electrical line at the On-Site Disposal Facility. The operator did not immediately know he struck the overhead line, and did not stop. The line separated, but did not break. Although the electrical line was not energized at the time it was contacted, there were no positive controls in place to keep it from being energized. The line had been used to supply power to an air sampler, however the air sampler was removed over a year ago, while the line remained in-place. Following the incident, site management took appropriate action to ensure that the line was locked out/tagged out of service. In addition, site electricians assessed the property damage caused by the excavator. Later, Occupational Safety & Health personnel conducted a debriefing of the incident.

01/30/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0004-**Light Plant Tipped Over by Articulating Front-End Loader**-(Significance Category 4)
A near-miss occurred when an articulating front-end loader knocked over a light plant, which had its mast fully extended to a 20-foot height. The loader was backing up when the contact occurred. There were no personnel injuries. A preliminary investigation found that the light plant outriggers were lowered, but were not extended, as required. Site personnel righted the fallen light plant, and determined that two of the light shrouds were damaged while the mast remained undamaged. After the event, work crews were briefed on the proper procedures for stabilizing fully extended light plants, including the requirement to extend all outriggers. Also, foreman personnel inspected the other 12 light plants in use at the project to ensure that outriggers were properly extended, as required.

02/25/04
Ohio, Mound Plant, Environmental Restoration Facilities
OH-MB-BWO-BWO07-2004-0001-**Volvo Hauler Snaps 480VAC Overhead Line**-(Significance Category 3)
A near-miss occurred after a truck driver, who was operating a heavy equipment hauler, snagged an overhead energized 480-volt line, breaking the line. There were no personnel injuries and no damage to the hauler. The bed of the hauler was raised approximately 3-5 feet when it contacted the overhead line. Preliminary indications are that the driver forgot to fully lower the hauler bed after dumping his load. After contacting the line, the line stretched, broke, and fell to the ground in two sections behind the hauler. Nearby personnel observed the electrical arc flash, saw the broken lines behind the hauler, and radioed the driver to leave the vehicle and go to a safe area. The immediate area was secured. All heavy duty equipment operations at the site were suspended by site management. Site management have initiated plans for all-hands safety meetings. A critique was held.

06/14/04
Ohio, Fernald Environmental Management Project
OH-FN-FFI-FEMP-2004-0015-**Heavy-Duty Forklift Knocks Down Light Pole in West Parking Lot**-(Significance Category 4)
A near miss occurred when a Fluor Fernald heavy equipment operator (HEO) knocked over an in-service light pole while operating a heavy-duty forklift. As the HEO climbed into the cab of a heavy-duty forklift, he noticed a small pile of gravel to his left. The HEO began to move forward, looking to miss the gravel, and struck the concrete base of a light pole. The black, metal pole was directly in line with the left side of the mast, which is also black, in his blind spot. The light pole base was pulled about 12 inches out of the ground and knocked over, breaking the pole and the light. The HEO contacted his supervisor, who made other necessary notifications. Electricians were dispatched to the incident scene to cut electrical power to the light poles in that area. A barricade was set up around the area where the incident took place to put the area in a safe configuration.

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Lockout/Tagout Issues (2)

10/01/03
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2003-0033-**Potential Lockout/Tagout Violation at Trailer T-512**-(Off-Normal)
Unauthorized electrical work was performed at Trailer T-512 with no record of compliance with site lockout/tagout procedures. Following an earlier safety inspection at the trailer, several electrical and safety deficiencies were noted by the inspector. Subsequently, the inspector hung electrical "Do Not Use" tags on two electrical outlet boxes as well as tagging both trailer doors that the trailer was not approved for occupancy. Later, the inspector noted that the trailer was being occupied. An inquiry by the inspector determined that unauthorized work had been performed on an electrical junction box inside the trailer. A walkdown of the incident scene was conducted by Occupational Safety and Health personnel, who later debriefed appropriate management personnel. A critique was held.

05/21/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0013-**Lockout/Tagout Procedural Infractions during Construction Modification in Silos Transfer Tank Area (TTA) Slurry Pump Module**-(Significance Category 4)
During modification of a slurry pump module in the Silos Transfer Tank Area, two subcontract pipefitters violated site lockout/tagout (LOTO) requirements by hanging personal locks on two 480-VAC electrical circuits without proper LOTO authorization. The violation was discovered by a Fluor Fernald employee the next day, after the two subcontractors had departed at the end of their shift, while leaving their personal locks in place on the circuits. There were no personnel injuries. Subsequently, management observed a "Time Out" for safety and conducted a briefing with all shift personnel regarding site LOTO requirements.

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Other Issues (3)

02/18/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0005-**Light Fixture Falls When Struck by Descending Scissors Lift**-(Significance Category 4)
As an electrician was performing work from an elevated scissors lift, a near miss occurred when a permanent light fixture was torn from its four-foot ceiling stem, after being struck by the descending scissors lift handrail, leaving energized electrical wiring hanging out of the broken stem. In addition, the glass component of the falling light fixture shattered upon contact with the floor, approximately 10 feet from a ground worker who was spotting for the scissors lift electrician. Subsequently, the electrician continued his descent to the floor and work was stopped. Later, a foreman went to the electrical breaker panel next door, opened the breakers, and locked the electrical cabinet. Site personnel put the broken fixture's exposed wiring into a safe configuration. The Electrical Construction Manager conducted an evaluation of the area before authorizing work to resume. Site personnel conducted a debriefing with the work crew.

06/15/04
Ohio, Fernald Environmental Management Project, Balance of Plant
OH-FN-FFI-FEMP-2004-0016-**Welder Receives Mild Shock While Arc-Welding at WPP MHB**-(Significance Category 4)
A near miss occurred when a welder received a mild shock while performing arc welding on a steel plate in the Material Handling Building (MHB) at the Waste Pits Project (WPP). No injuries resulted from the incident. When, the welder and a millwright entered the area to replace a steel plate on the front of Mass Flow Feeder #A, the floor was wet, so they put down a 3/4-in. sheet of plywood on the floor, and covered it with a flame-retardant blanket. The welder began arc welding on his knees, and when he was nearing completion, he placed his left hand on the feeder enclosure to give himself support. As he struck an arc, he felt a mild shock in his knees. He immediately broke the arc and stood up, noticing that the legs of his coveralls were wet in the knee area, and the blanket was also wet. He finished the weld from a standing position then exited the area. Thereafter, the welder notified his supervisor of the event. The supervisor transported the worker to the on-shift AEDO. The worker displayed no visible external injuries and denied needing any medical attention. WPP management directed all welding activities on the project be stopped pending further investigation.

08/24/04
Ohio, Mound Plant, Waste Management Facilities
OH-MB-BWO-BWO06-2004-0002-**Worker Receives Electrical Shock**-(Significance Category 3)
While installing communication cable conduit to Trailer 43, an electrician received an electrical shock after leaning against a trailer, while touching the conduit. Unsure of what had occurred, the electrician continued work, and observed a small electrical arc. Subsequently, the electrician stopped work and, using a voltmeter, verified a 101-volt drop between the grounded conduit and the energized trailer. The electrician went to CH2M Hill Medical, and was later transported to an off-site medical facility, where he was evaluated and released with no restrictions. Subsequently, management directed troubleshooting of the problem.

Fernald Closure Project

2004 Electrical Safety Incident Review

September 20, 2004

Summary of Events

The following is a summary of the reportable occurrences and non-DOE reportable events at the FCP for Reporting Year 2004 in which electrical safety was the primary issue of concern:

1. OH-FN-FFI-FEMP-2004-0007 "Workers Performing Removal of Electrical Conduit Cut into a Energized 120-Volt Line"

   Project: Demolition, Soils & Disposal Facility
   Location: Area 7 of the On-Site Disposal Facility (OSDF) north of Building 82
   Summary: On Wednesday, March 10, at approximately 0820 hours, two laborers were assigned to continue removal of the below-grade conduit lines running outside north side of Bldg. 82. Five conduits turning towards the west remained to be cut. One of the conduit lines turning west was cut without incident. While cutting the second line, the worker noticed a pop and saw a small arc flash. The worker immediately halted the work and notified the supervisor.
   Significance Category: 3
   Reporting Criterion: 2C(2) – Failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout) or a site condition that results in the unexpected discovery of an uncontrolled hazardous energy source
   Investigation and Analysis: Post-discovery debriefing, extensive follow-up interviews, in-depth root cause analysis and evaluation; full investigation report; Level of Effort: 6.5
   Observed ISM Weaknesses: Analyze the Hazards, Develop and Implement Hazard Controls
   Causes:
   A3B3C03 – Individual justified action by focusing on biased evidence
   → couplet: A4B3C08 - Job scoping did not identify special circumstances and/or conditions
   A4B3C09 – Work planning not coordinated with all departments involved in task
   A4B1C01 – Management policy guidance / expectations not well-defined, understood or enforced
   A3B1C07 – Omission/repeating of steps based on assumptions for completion
   → couplet: A5B4C05 – Information sent but not understood
   Formal Corrective Actions: 5. For example:
   - DSDP Construction Traveler modules were revised to require that supervision and involved personnel will conduct a safe condition check before start of demolition work which will include a visual inspection and verification of air gaps. If an air-gap is not verified, personnel will implement site lockout/tagout procedures.
   - Maintenance revised Facilities Shutdown procedure D10-05-001 "Energy Isolation Procedure" and other associated procedures accordingly to incorporate measure for air-gapping of equipment or components in facilities that are not ready for complete/ total isolation for full decontamination and demolition. Review of work orders shall include other groups/projects that may be impacted to verify work scope and the conditions/configuration that should exist when the work performed by Maintenance is completed.

   Report / Corrective Action Status: Final / Closed

2. OH-FN-FFI-FEMP-2004-0013 "Lockout/Tagout Procedural Infractions during Construction Modification..."

   Project: Silos
   Location: Transfer Tank Area (TTA), 2nd floor, Slurry Pump Module #SLR-13-201A

Summary: On May 18, 2004, mechanical construction subcontractors performing modifications to piping inside a slurry pump module in the Silos Transfer Tank Area (TTA) hung personal locks on two electrical disconnect switches but did not do so with proper authorization to perform a lockout/tagout.
Significance Category: 4
Reporting Criterion: 4B(5) – A facility operational event caused by deviating from a written procedure or using an inadequate procedure resulting in an adverse effect on safety
Investigation and Analysis: Post-discovery debriefing; Level of Effort: 2
Observed ISM Weaknesses: Perform Work Within Controls
Causes:
A6B2C01 – Practice or "hands-on" experience LTA
A4B1C01 – Management policy guidance / expectations not well defined, understood or enforced
Corrective Actions: 2. For example:
- The site lockout/tagout subject expert personally rebriefed the two subcontractor pipefitters and their foreman, and the subcontractor electrical supervisor on the site lockout/tagout procedure requirements (OP-0004).

Report Status: Notification/Final

3. OH-FN-FFI-FEMP-2004-0016 "Welder Receives Mild Shock While Arc-Welding..."

Project: Waste Pits Project
Location: Material Handling Bldg., Mass Flow Feeder #A
Summary: On second shift of June 12, 2004, after the area was sprayed down, standing water was removed using a front-end loader. At approximately 2200 hours, a welder and a millwright entered the area to replace a steel plate on the front of Mass Flow Feeder #A. Because the floor was still wet, they put down a 3/4-in. sheet of plywood on the floor, and covered it with a flame-retardant blanket. After cutting out the plate, the welder tacked the replacement plate in the opening. Working on his knees, he then proceeded to weld the plate in place. As the welder was nearing completion of the weld, he placed his left hand on the feeder enclosure to give himself support. As he struck an arc, he felt a mild shock in his knees. He immediately broke the arc and stood up, noticing that the legs of his coveralls were wet in the knee area. The blanket was also wet in the area where he had been kneeling.
Significance Category: 4
Reporting Criterion: 10(3) – A near miss, where no barrier or only one barrier prevented an event from having a reportable consequence. One of the four significance categories is assigned to the near miss, based on an evaluation of the potential risks and the corrective actions taken.
Investigation and Analysis: Post-discovery debriefing; Final Event Report (FER); Level of Effort: 3
Observed ISM Weaknesses: Develop and Implement Hazard Controls
Causes:
A4B3C08 – Job scoping did not identify special circumstances and/or conditions
A4B3C11 – Inadequate work package preparation
Formal Corrective Actions: 4. For example:
- Safety Instruction #2 "Hot Work Activities" was revised to require, for areas were the potential for migration of water or standing water exists, that an additional person be assigned to monitor for migrating water and keep it out of the welding work area. If water cannot be kept out of the welding work area, then work is to be stopped and the supervisor notified immediately.

Report / Corrective Action Status: Notification/Final / Closed

4. OH-FN-FFI-FEMP-2004-0021 "Energized 120-Volt Signal Wire Discovered During Removal of 480-V Motor Control Center Cubicle"

Project: Silos
Location: Bldg. 94G, Silos Radon Control System (RCS) Electrical Room
Summary: On July 17, 2004, at 0850 hours, the Silos Radon Control System (RCS) equipment went off-line as a result of a blown fuse in a control panel. The fuse blew when an energized 120-V wire contacted the frame of the Motor Control Center (MCC) in Bldg. 94G Electrical Room as an MCC cubicle was being removed by subcontractor electricians.
Significance Category: 3
Reporting Criterion: 2C(2) – Failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout) or a site condition that results in the unexpected discovery of an uncontrolled hazardous energy source
Investigation and Analysis: Post-discovery debriefing, moderate investigation, root cause analysis; Level of Effort: 4.5
Observed ISM Weaknesses: Analyze the Hazards, Perform Work Within Controls
Causes:
A3B1C07 – Omission/repeating of steps based on assumptions for completion
→ couplet: A4B1C01 – Management policy guidance / expectations not well-defined, understood or enforced
A3B1C01 – Check of work was LTA
→ couplet: A6B2C03 – Refresher training LTA
A3B2C05 - Situation incorrectly identified or represented results in wrong rule used
→ couplet: A4B1C01 – Management policy guidance / expectations not well-defined, understood or enforced
A1B2C01 – Design output scope LTA
Formal Corrective Actions: 3. For example:
- Energy Isolation Plan (EIP) #Start-Up & O&M 024 was revised to include the following in section 5.0 "Specific Steps...": "Note: All Leads (Circuits, Wire or Jumpers) Lifted Shall be Tape of a Wire Nut placed on the end of the Wire."

Report / Corrective Action Status: Final / Closed

5. OH-FN-FFI-FEMP-2004-0026 "Near Miss – Laborer Inadvertently Cuts Live 120-V Portable Bandsaw Power Cord"

Project: Demolition, Soils & Disposal Facility
Location: Administration Building, Room 147
Summary: On Monday, August 23, 2004, at approximately 1645 hours, a Laborer working in Room 147 of the Administration Building (Building 14) was using a portable bandsaw to cut previously de-energized cables and cords on the floor of the room when he inadvertently grabbed the power cord for the tool he was using (along with a number of similar-looking cords from the floor) and cut it.
Significance Category: 4
Reporting Criterion: 10(3) – A near miss, where no barrier or only one barrier prevented an event from having a reportable consequence. One of the four significance categories is assigned to the near miss, based on an evaluation of the potential risks and the corrective actions taken.
Investigation and Analysis: Post-discovery debriefing; Level of Effort: 2.5
Observed ISM Weaknesses: Analyze the Hazards
Causes:
A4B4C06 – Job performance and self-checking standards not properly communicated
A4B3C11 – Inadequate work package preparation
A4B3C08 – Job scoping did not identify special circumstances and/or conditions
Corrective Actions: 2. For example:
- Electrical cords for operating equipment will be identified with yellow and black tape to make it readily distinguishable from abandoned lines.

Report / Corrective Action Status: Notification/Final / Completed

6. 04-09-341 (no title)

Project: Silos / Maintenance
Location: Administration Area, Trailer 24
Summary: Maintenance personnel while performing removal of refrigerant at T-24 HVAC unit exceeded the work scope of SEWP #7 by cutting of the electric line to the 220-volt compressor. The compressor voltage was de-energized by a breaker verified by testing equipment under exclusive control of personnel performing work.
Significance Category: 5
Reporting Criterion (Considered, But Not Met): 2C(2) – Failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout) or a site condition that results in the unexpected discovery of an uncontrolled hazardous energy source (e.g., live electrical power circuit, steam line, pressurized gas). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.
Investigation and Analysis: Post-discovery debriefing, root cause analysis, Final Event Report (FER); Level of Effort: 4
Observed ISM Weaknesses: Perform Work Within Controls
Causes:
A4B3C11 – Inadequate work package preparation
A4B1C04 – Management follow-up or monitoring of activities did not identify problems
A4B1C01 – Management policy guidance / expectations not well-defined, understood or enforced
Formal Corrective Actions: 3. For example:
- A new standing electrical work plan (SEWP) will be developed for addition and removal of freon on in-service HVAC units.

Report / Corrective Action Status: Draft Final / Open

Evaluation and Conclusions

Information about each of these events was readily available from published reports, including not only a detailed description of the sequence of events, but also the investigation, analysis, causes and corrective actions. Though relative to the significance of the event, causes were identified and actions were taken to correct those causes for all of these events. These corrective actions were completed and documented, and were commensurate to the consequences and impact of the event for which they were written.

The events reviewed in this report were identified by a search of the AEDO's Daily Event Log. Of the events reported by FCP personnel, the number of events at the Fernald Closure Project relating to electrical safety since January 1, 2004 is small. No common or generic cause was identified that indicates a major sitewide or programmatic weakness. Although barriers failed or were not in place, in none of these events was there any serious potential for direct contact with or being in the path of hazardous energy, due to other barriers that were still in place. Nevertheless, though the highest significance category for any of these events was SC3, Fluor Fernald continues to review and report all events, even minor ones, to ensure that we are doing the best job of understanding electrical hazards and staying well within the margin of safety.

Additionally, Fluor Fernald reviews occurrence reports and lessons learned from across the DOE complex, looking for those events that may have some applicability to the Fernald site. For example, in early September 2004, an incident at Mound Laboratories occurred in which a metal conduit was being used as the sole means of grounding a trailer. It was determined that a piece of PVC was in the conduit run that rendered ineffective the path to ground for the distribution panel in the trailer. Within days, the lessons learned article was distributed to with direction from the

Director of Safety, Health & Quality for all trailers on site to be inspected to ensure that they are properly grounded and that there is no potential from the trailer wall to ground.

Fluor Fernald must continue to stress the importance of electrical safety through implementation of ISM. The electrical hazards of planned tasks must be identified based on the defined scope of work. Barriers and controls that are tailored to the specific tasks to be performed must be identified and selected that will ensure the safety and protection of the personnel performing the work involving hazardous energy. Those personnel, with oversight from supervision and technical support personnel, must ensure that those identified barriers and controls to protect employees from electrical hazards are implemented and upheld. During execution and following completion of the work, feedback from the personnel involved on enhancements or adjustments to established electrical-safety controls must be obtained and utilized for the betterment of future work activities. This feedback must also include reporting and investigation of events that occur, so that any deficiencies and weaknesses in established work-authorization systems may be identified and corrected.

MCP SURVEILLANCE REPORT

TITLE: Electrical Safety Performance Challenges and Goals at the Miamisburg Closure Project (MCP)

Date(s) Performed: August 31, 2004 **Surveillance Number:** MCP-ESH-04-051

Participants: Geoffrey Gorsuch

Reference Documents:

(a) EM-1 Memorandum for Distribution, Subj: Electrical Safety Performance Challenges and Goals of July 13, 2004
(b) SMO-005/04, CH2M Hill Analysis of Contamination and Cutting Lines Events, January 15, 2004
(c) SMO-055/04, CH2M Hill Analysis of Heavy Equipment Related Events, June 8, 2004
(d) MCP Surveillance FR 04-037, June 30, 2004

Scope/Purpose:

Reference (a) directed this office to (1) review performance data for electrical safety, (2) determine underlying causes and activities that resulted in electrical safety issues, and (3) develop and approve an action plan to improve performance at the site. Because the site is rapidly changing and is intended for closure in about 18 months, the review only focused on events occurring from July 1, 2003 to August 31, 2004.

Discussion:

Review of Performance Data for Electrical Safety. A review of electrical safety performance indicators indicates the following six incidents during the past 14 months:

- 21 Jul 03 / Cutting Active Fire Alarm in W building
- 12 Aug 03/ Cutting or Melting hole in active fire suppression system in H building
- 14 Oct 03/ Cutting of energized 110 volt line in SW-152
- 23 Jan 04/ Damage to High Voltage Vault – G Slab
- 20 Feb 04/ Hauler Bed Snaps 480V AC Overhead Line
- 18 Aug 04/ Discovery of Improper Grounding of Subcontractor Trailers

Underlying Causes/Activities Resulting in Electrical Safety Issues. The first five events were all related to site demolition and soil excavation activities. The first three occurred during preparation for building demolition, the fourth during building demolition, and the fifth during hauling of soil and debris. At least three of six involved work performed by subcontractors. The Root Causes for the first three events were identified in reference (b), which as performed at the direction of the DOE MCP. The Root Causes for the fourth and fifth events were identified in reference (c), which was also performed at the direction of the DOE MCP. At this project, demolition of the last large building should be complete by the end of this is year, but excavation and the hauling of soil and debris on site will continue for another year. The Root Cause and contributing causes for these incidents are shown below.

Cutting Active Fire Alarm in W building. Pre-job briefing needed improvement. Joint walkdown by contractor and subcontractor focused too much on asbestos. Policies/administrative controls were not clear. The subcontractor assumed discretion that site contractor did not intend.

Cutting or melting hole in active fire suppression system in H building. The sub-contractor asbestos abatement worker assumed cuts could be made without additional protective measures.

Cutting of energized 110 volt line in SW-152. The site policy was ignored so enforcement needed improvement. The worker had not verified that the conduit was gapped. The pre-job walkthrough was not effective in identifying lines.

Damage to High Voltage Vault. Site standards, policies, and administrative controls were not used. Their enforcement needed improvement. Work preparation and pre-job briefings needed improvement. The project supervisor was responsible for covering too many jobs.

Hauler Bed Snaps 480V AC Overhead Line. Site standards, policies, or administrative controls not strict enough.

Improper Grounding of Subcontractor Trailers. Specifications for subcontractor did not reference exact section of NFPA 70, National Electric Code (NEC), that the contractor desired to be implemented.

Development/Approval of Action Plan to Improve Performance. Corrective Actions for the first three events were contained in reference (b), and for the next two events in reference (c). The contractor implemented the corrective actions at the time of the issuance of the analysis reports. There were no electrical incidents on site between February and August of this year. The corrective actions for all six incidents are shown below.

Cutting Active Fire Alarm in W building. Perform a walkdown of remaining asbestos abatement areas to identify remaining Fire Alarm System lines. Emphasize to sub contractor the need to direct questions about cutting non-asbestos lines to the contractor POC. Assess the subcontractor's Health and Safety Plan to verify its adequacy in a rapidly changing D & D environment.

Cutting or melting hole in active fire suppression system in H building. Abatement contractor to hold tool-box meetings re-emphasizing the danger of cutting abandoned lines within close proximity of active lines. Emphasize need to remove additional non-asbestos insulation when cut will be made in close proximity. Determine the need for fire suppression to remain in building where it could be deactivated and confirm the presence of a fire watch in building during non-work hours.

Cutting of energized 110 volt line in SW-152. Conduct toolbox meetings that cover utility marking procedure. Change work documents to require supervisor sign-off documenting verification of air-gapping or line de-energized. Review site Integrated Work Policy (PP 1059A) to determine if additional site-wide hold points needed. Walk down remaining buildings to determine status tags on abandoned lines.

Damage to High Voltage Vault. A Lessons Learned was issued. Project personnel performing similar work were to be briefed on work packages and permits relating to slab removal. Pump water from damaged vault, perform visual inspection, and secure vault with a temporary cover.

Hauler Bed Snaps 480V AC Overhead Line. Reconsider techniques for rad survey that required hauler bed to be raised to perform survey. Visually verify hauler configuration prior to leaving rail area. Examine potential enhancements to radio communications at the rail. As part of its surveillance relating to overhead lines, DOE to perform a surveillance, reference (d), to verify effectiveness of contractor corrective actions.

Improper Grounding of Subcontractor Trailers. Inspect all trailers on site for proper grounding. Install independent ground from service disconnect to trailers, verified by site contractor staff. Evaluate site Safe Work Authorization process to ensure there are appropriate controls on subcontractor electrical installation.

Concerns: None

Findings: None

Observations: None

Conclusions:

Corrective Actions proposed did or would reduce the likelihood of repetition of similar incidents.

Surveillance Leader: Geoffrey Gorsuch **Date:** September 13, 2004

Response Required: _X _ **No** __**Yes**

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WEST VALLEY DEMONSTRATION PROJECT

2004 Electrical Safety Performance Review

SUMMARY

Electrical safety is of critical interest at the WVDP. Several proactive programs have been successfully implemented and completed in 2004 in support of performing electrical work safely. Additional focus will continue to be placed on electrical safety to ensure that all employees have the necessary knowledge to safely conduct work. This will be accomplished by completing specific actions, as listed throughout this document.

SECTION I - Electrical Safety Improvements Implemented in 2004

Electrical Safety Review, May, 2004

During the months of April and May, WVNSCO conducted and in-depth review of our electrical safety program. All past electrical-related occurrences were evaluated, along with current risk and future operations. One important factor that has been taken into account is the work scope involving demolition work that frequently introduces varying electrical hazards. The program review resulted in the following actions being implemented:

- *A targeted electrical safety communication campaign.* This campaign was implemented in May and included banners and posters that were placed in strategic locations throughout the entire site. Every employee participated in a staff meeting where each received booklets on both indoor and outdoor electrical safety.
- *Assessment of overhead electrical hazards.* A site-wide overhead line electrical assessment was performed. Corrective actions were made that included the implementation of engineering controls to minimize any risk of contact with overhead electrical / utility lines.
- *Electrical safety emphasis.* The president of WVNSCO issued a letter to all WVDP team members that specifically communicated: Electrical safety occurrences within the DOE complex, electrical safety statistics, and potential risks and consequences of electrical occurrences.
- *Review of electrical procedures.* Industrial Safety, electrical, instrument and calibration, electrical engineers, and supervisory personnel performed a verification of all electrical procedures to ensure compliance with current standards and that all safety concerns relative to the work at the WVDP were being addressed.
- *Review of DOE lessons learned.* A special report was compiled and distributed to all employees that discussed specific electrical safety events from other DOE sites.
- *Enhanced Training.* NFPA 70 E training was conducted for 30 project employees. This training emphasized the need to continue electrical hazard recognition as well as necessary precautions while working with electricity. An OSHA electrical class was also offered in which 42 supervisors and managers participated in. The training provided additional points of electrical safety awareness by concentrating on safe work practices in both general industry and construction. An OSHA 10-hour course, which is available to all WVDP employees, includes a (mandatory) electrical safety section. As of September,

2004, 157 employees have completed the 10-hour course.

6) *Establishment of an electrical safety committee.* An electrical safety committee was established that includes representation from engineering, supervision, field workers, safety, and DOE. The goal of the committee is to communicate positive practices, recommend and implement improvements and reviews where needed, and ensure that electrical concerns are addressed. This committee meets on an as-needed basis, as directed by the Industrial Safety Manager.

SECTION II - Analysis of Current Risks and Action Plan

An analysis of current electrical safety issues at the WVDP was performed in September, 2004. The top five electrical risks and the actions planned to address these risks are:

i) The potential of striking underground electrical utilities during excavation activities.

The practice of relying solely on "as-builts" during excavation activities has been reviewed. Generally, "as-builts" can be inaccurate and are used as only *one* method to successfully plan and perform an excavation. Underground detection equipment along with employees that have the technical ability to recognize conditions that have changed and utilizing stop work authority when needed are our best method in avoiding compromising underground utilities. A well-defined and utilized permit system is used in conjunction with the other methods. West Valley is currently reviewing and revising each method used during excavations as necessary to address the current and changing work scope and conditions. This review will be maintained as "on going" as demolition work continues.

Another method that will be used to reduce the potential of striking an underground utility in instances where buildings are being demolished is by implementing the practice of trenching around the building prior to its demolition. This practice will provide for an air gap to exist between all utilities and the building. For trailer and other more temporary structures that are being removed, an air gap will be established at ground level.

In addition to the above-mentioned measures, the requirement to utilize dielectric personal protective equipment, mats, grounding, and other similar measures will be included in all work instruction packages.

The specific actions that are being completed in support of this area of the risk analysis are described in section III.

ii) Overhead wire contact by mobile equipment

The utilization of mobile equipment by project employees and subcontractors in numerous locations of the WVDP is another area of concern that has been and will continue to be addressed. In May 2004, and evaluation of overhead lines was completed. As a result of the evaluation, utilities are relocated or transportation route are changed on a case by case basis. Other actions that resulted from this assessment are:

• Development of an aerial utility map to provide guidance in routing mobile equipment to be used in the job planning process. This map will be updated should utilities or structures change.
• All crane routing is planned and escorted.
• A list of specific equipment and locations where escorts are required has been developed.
• Briefings summarizing lessons learned and hazards were presented at Tool Box meetings and in the quarterly conduct of operations newsletter.
• A list of specific areas of concern was developed and a course of action was determined for each. Actions included installation of clearance barriers, blocking off of selected areas and removal and raising of lines.

iii) Floor and wall demolition

In addition to the actions discussed in section i), detection devices will be used on all walls, floors, and other surfaces in buildings during demolition activities. Each piece of conduit will be tested prior to cutting. The implementation of these actions will preclude any chance that a conduit is live in a building during demolition. In instances where temporary power is to be utilized, power will be provided from an approved, external source and marked as such in the proper location. The same plan of action exists in areas where ventilation or instrumentation is required, however, in instances where hard wiring is necessary the supply will be from a temporary source and the feed will be adequately marked to prevent any breech.

Forms of penetration (i.e. drilling) into walls will be performed utilizing tools designed to stop when metal, such as conduit, is encountered. As previously discussed, dielectric personal protective equipment, mats, and tooling is, and will continue to be, used when needed

iv) Subcontractor electrical safety knowledge and culture.

Subcontractor safety has been a predominant safety issue at the WVDP. The use of subcontractors for specialized work will increase. Currently, active participation and dialogue between WVNSCO and the subcontractor takes place at all phases of the subcontract. All subcontractors are met at the gate and are treated and trained as if they were WVNSCO employees. A flow down of all electrical requirements, safety precautions, training and equipment is enforced by WVNSCO supervisors. Subcontractors involved in electrical work are required to follow, and are trained to the WVNSCO Lock Out /Tag Out (LO/TO) program. WVNSCO is currently in the process of implementing a card that each subcontractor will receive and sign in duplicate that outlines general safety requirements and expectations, including electrical safety while working at the WVDP. It is expected that this card will begin to be utilized in November, 2004.

5) Routine maintenance activities involving LO/TO.

WVNSCO has a LO/TO program that is well proceduralized, with an equally well-managed training program. The LO/TO program is periodically audited and the results of these audits have not shown any significant findings. Training and awareness activities

are presented site-wide.

A survey was completed a survey of the WVNSCO electricians to ensure that the electricians have the proper tools readily available for each task, the proper work instructions, and the training needed to complete electrical tasks safely.

WVNSCO will continue to focus on the 5 main areas of electrical risk by continually reviewing and modifying, if necessary, the electrical safety program. Additionally, the following will be completed:

- An electrical safety campaign will be conducted in December, 2004 that will focus on subcontractor electrical safety.
- Additional training will be ongoing to include NFPA 70 E training for additional supervisors, safety personnel, and engineers. Training needs will be reassessed by 11/30/04 to ensure that the proper personnel are being trained..
- A hazard recognition course will be developed that will provide a focus on stopping work and present techniques on technical "inquisitiveness". The course will be fully developed by 12/31/2004.
- A electrical safety survey of select personnel will be completed by 12/31/2004, with the results to be used to drive additional electrical safety program improvements

SECTION III - Additional Actions as a Result of Event on August 11, 2004

In addition to the actions currently underway to the overall site electrical safety program, specific improvements are being taken as a result of the August 11, 2004 conduit breach event (ORPS #OH-WV-WVNS-WVNSGEN-2004-0004). The root cause of this event was found to be that the Underground Utility Review (UUR) was less than adequate (LTA). Additional errors and omissions were identified relative to the location and identification of known utilities, as well as issues concerning lack of management expectations and communication in the UUR process. Numerous recommendations and actions were developed in response to this event. These actions will improve electrical safety performance, and in cases, specifically address some of the issues specific to the conditions unique to the WVDP.

An investigation team made up of WVDP personnel as well as off-site personnel consisting of highly experienced managers in operations, engineering, and electrical conducted parallel investigations into this event. The following actions specifically related to electrical safety are being implemented as a result of the investigations:

- Review and revise, as necessary, the underground utility review process by 10/31/2004.
- The work instruction package preparation document is to be revised to implement the use of non-destructive testing prior to commencing underground or hidden utilities work, adding additional criteria and explanation for notifications, verifications, and hold points. This is to be completed by 10/31/2004.
- A review of site controls will be completed by 10/31/2004 to ensure electrical safety issues do not exist for work activities involving penetrations of walls and other structures.
- Work instruction engineers and originators will be given training on the use of underground non-destructive test equipment use. This training will be completed by 10/15/2004.
- Ground penetrating radar equipment to be used during excavation work will be

subcontracted by 10/15/2004.

- Develop a briefing for supervisors and managers to reinforce expectations for stop work authority and responsibility and accountability for safety to be completed by 10/31/2004.
- Review and revise, as necessary, the pre-job briefing checklist to clearly define stop work expectations and authorization to continue process to be discussed. This review is to be completed by 10/15/2004.
- Develop, by 10/31/2004, a briefing for supervisors and managers to emphasize the priority for safe work above project completion and prepare a lessons learned and communicate key stop work and hazard recognition failures.
- Existing management communications will be used to periodically provide a success or lessons learned relative to electrical safety. This is an ongoing goal and will be reassessed by 11/30/04 to ensure continual success.

SECTION IV - Review of Data

A review of past occurrences at the WVDP was conducted. ORPS reports and critiques relating to electrical safety from 2002 - 2004 at the WVDP were reviewed for commonalities in order to develop potential areas of improvement. They are as follows:

ORPS # (OH-WV-WVNS-...) or critique #	***Event Cause***
VFS-2002-0001	*Event*: No LO/TO established during modifications to an electrical disconnect switch *Cause*: Inadequate work control / scope.
Critique CM2002-002	*Event*: Component failure in Motor Control Center *Cause*: Failed part / end of life failure
FRS-2002-0005	*Event*: LO/TO not performed. *Cause*: Procedure not used or used incorrectly, inadequate supervision.
CF-2003-0001	*Event*: Electrical pull box struck during snow removal activities. *Cause*: Personnel error, weather, inadequate administrative control.
VFS-2004-0002	*Event*: Operator inadvertently cuts 120 volt portable band saw power cord. *Cause*: not determined (09/20/2004).
WVNSGEN-2004-0004	*Event*: Unexpected 480 volt conduit breached during excavation activities. *Cause*: Underground Utility Review (UUR) was less than adequate (LTA)

Although there is no significant repetition in causes in these events, two identify LO/TO issues. In response, the following will be implemented by 12/31/2004:

- A refresher briefing will be developed for all LO/TO personnel. This briefing will review all procedures that are applicable to LO/TO and will also include lessons learned

and other learning tools to provide additional information.

• A tool box meeting / briefing will be developed on LO/TO for *all* WVDP personnel. This meeting / briefing will focus on the overall program and will also utilize lessons learned in order to increase knowledge of the LO/TO program.