Office of Health, Safety and Security

Monthly Analysis of Electrical Safety Occurrences

February 2013

Purpose

This analysis resource provides the Department of Energy's (DOE) electrical safety community with a compilation of, and informal observations on, electrical safety occurrences reported through the Occurrence Reporting and Processing System (ORPS). The topics addressed in this analysis resource are responsive to requests for this information by the electrical safety community, who utilizes this information through monthly conference calls to foster information exchange and continual learning regarding electrical safety occurrences and their prevention across the DOE complex.

Key Observations

The number of electrical safety occurrences increased from seven in January to thirteen in February. There were four reported electrical shocks, three electrical intrusion occurrences, and four reported lockout/tagout occurrences. In February, workers identified electrical hazards only 38 percent of the time, which is a decrease in hazards identification from 57 percent in January.

Electrical Safety Occurrences

The following sections provide a summary of selected occurrences based upon specific areas of concern regarding electrical safety (e.g., bad outcomes or prevention/barrier failures). The complete list and full report of the occurrence reports is provided in Attachment 2.

Electrical Shock

There were four reported electrical shocks in the month of February, which is an increase from the two occurrences in January 2012. These occurrences are summarized below.

1. A subcontracted worker received a mild shock to his fingers while disconnecting a drill power cord from a lead cord. The worker was using the portable heavy duty drill with a magnetic base to drill holes in structural steel. The work conditions were damp and water from snow melt was present and dripping from the structure. The worker reported the shock to his work group supervisor and was medically evaluated and released back. The root cause of the shock was the failure of the job hazards analysis to consider unique electrical hazards at the work site, which resulted in improper controls and inappropriate design features of electrical power tools used in the planned work. A contributing cause was the failure to implement the work safety control process during the pre-job briefing to allow for

the recognition of potential hazards introduced by changed or changing conditions before authorizing the work to proceed.

2. An electrician received an electrical shock while using testing instrumentation on high-voltage lines while testing an isolated electrical transformer system. The electrician had just checked the cable using a Megohmmeter (megger) and was transferring leads before the static energy had fully dissipated. The worker flown by a medical helicopter to a regional hospital for assessment and was reported in good condition. Investigators determined that the electrician made contact with terminals and a cabinet connected to a stored energy source. The materials and configuration of the high voltage cables constituted a capacitor that became charged by the megger during testing. By touching the cabinet, the electrician completed a circuit to ground allowing the discharge of the energy on the cable. The electrician had performed similar testing without receiving a similar type shock in the past. The work team did not fully understand the limitations of the megger they were using and erroneously believed the test instrument provided automatic discharge of the energy introduced to the cable under test.

3. An instrument mechanic received a minor electrical shock while changing out a Criticality Accident Alarm System cluster that sits above an electric heater. He experienced a tingling sensation in his left wrist when his elbow touched the outside of an electrical conduit while re-connecting a heater cable to the cluster termination cabinet. A voltage check on the outside of two conduits connected to the cluster termination cabinet revealed a voltage differential of 100 VAC. The instrument mechanic was evaluated at the site medical facility and returned to work without restriction. Investigators determined that the cluster termination cabinet and conduit were not properly grounded, and the insulation on one of the circuit conductors had failed, resulting in the 120 VAC phase conductor inside the connector making contact with the metal connector housing. These two conditions caused the cluster termination cabinet and the conduit to become energized when the heater was plugged in and caused the technician to receive a slight electrical shock.

4. An employee received a mild electrical shock when he touched an ungrounded electrical conduit associated with a 277-volt lighting circuit. The employee was speaking with an electrical worker at the time and noticed a tingling feeling in his fingers when he touched the conduit. The electrical worker determined that the conduit was floating at about 120-volts above ground. The second employee notified the Facilities electricians, who de-energized and locked out the circuit. Initial investigation determined that the conduit was not properly bonded to the grounded light fixture. Investigators determined that the conduit was not properly bonded to the grounded light fixture and was ungrounded. The circuit (1960s vintage installation) does not include a separate equipment grounding conductor. If properly installed the conduit would have provided a low impedance return path for ground fault current. In addition, one of the wires inside the conduit had a nick in the insulation that allowed the energized conductor to contact the ungrounded conduit.

Figure 1 shows a 3-year trend of electrical shocks for the DOE complex. During this period, the average number of electrical shocks has remained below three (2.7) shocks per month.

Figure 1 – Three-Year Trend of Electrical Shocks

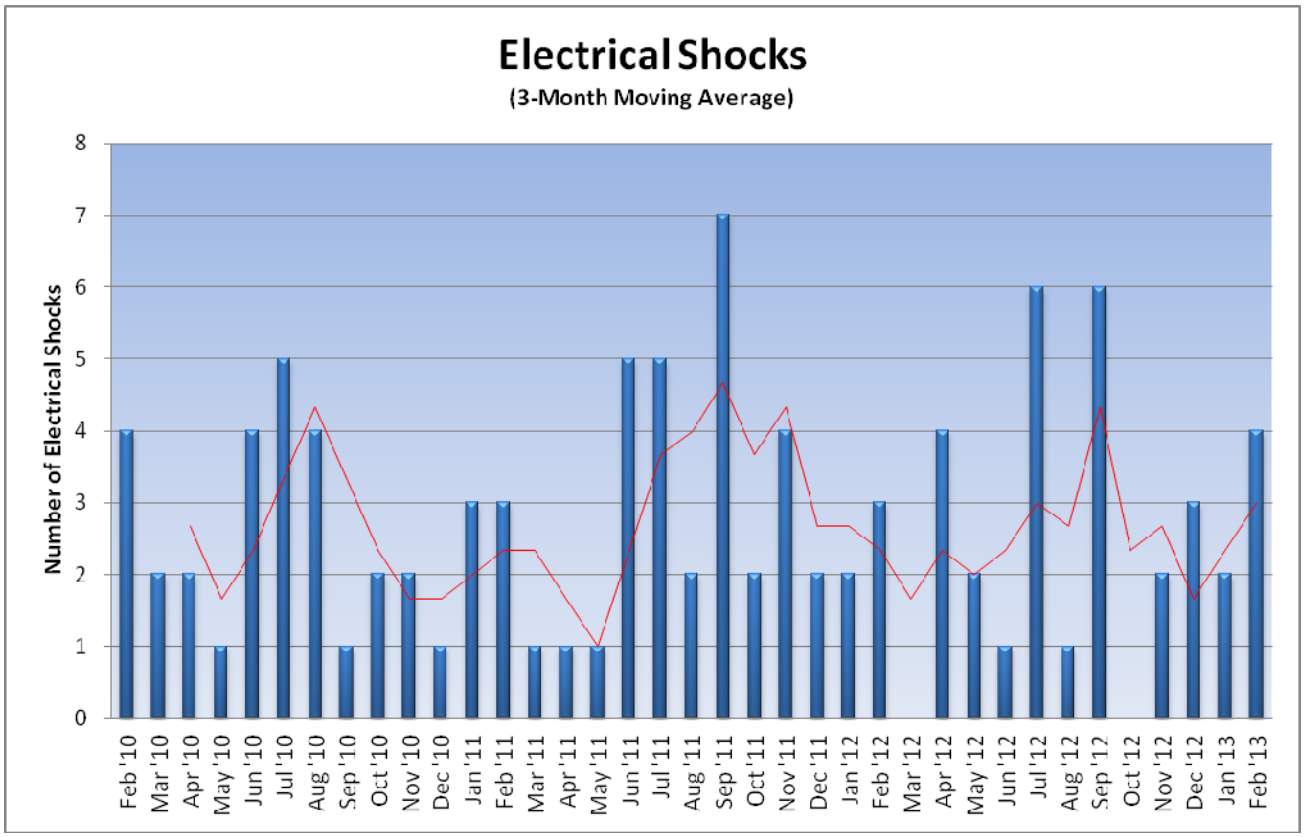


Figure 2 shows electrical shocks by worker type through February 2013. The number of shocks involving electrical workers slowly increased through 2012 and then dropped in 2013, while those involving non-electrical workers decreased after 2011. Since 2008, the majority of shocks (about 73 percent) involve non-electrical workers.

Figure 2 - Electrical Shock by Worker Type

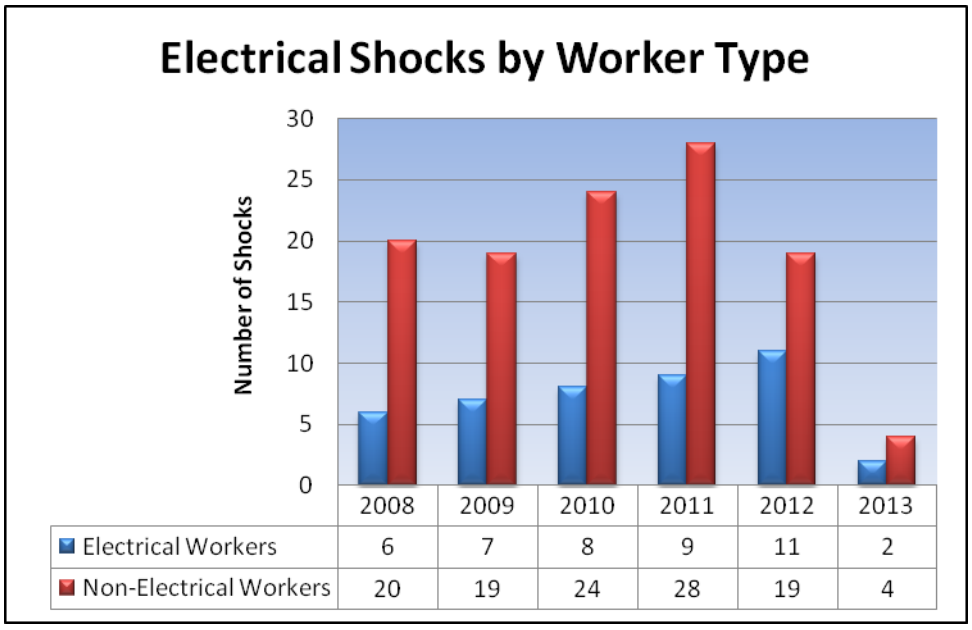
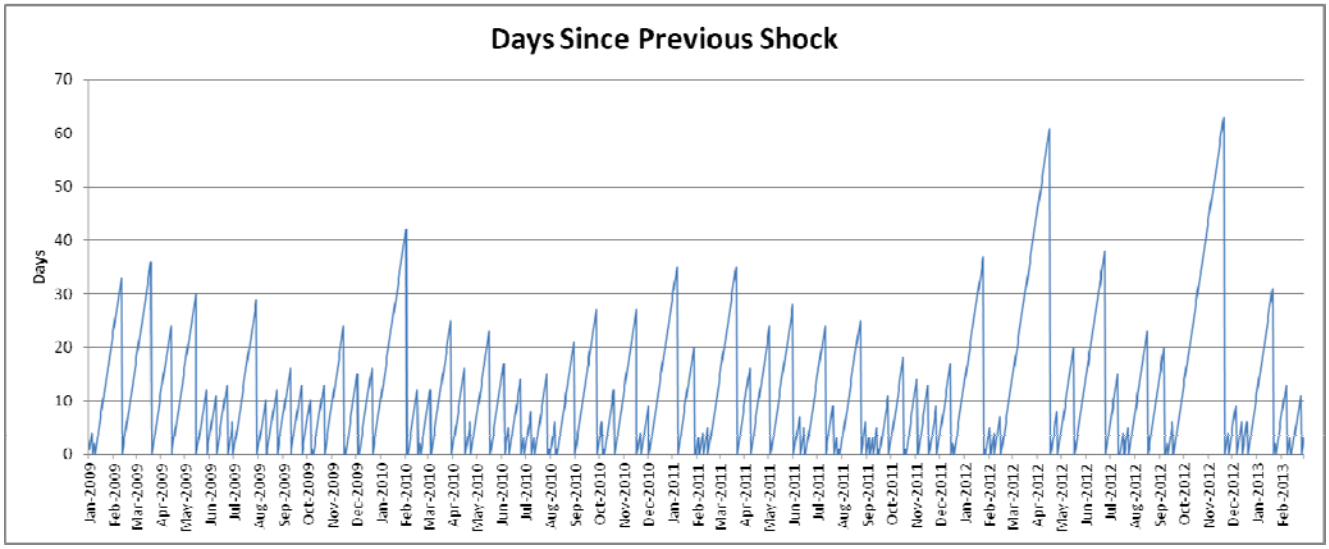


Figure 3 shows the number of days since the previous electrical shock for the DOE complex. The longest interval was 63 days (November 20, 2012) and the present interval is 3 days as of February 28.

Figure 3 - Days since Previous Shock



Electrical Intrusion

The number of electrical intrusion occurrences (i.e., cutting/penetrating, excavating, or vehicle/equipment contact of overhead electrical conductors) for February increased from one in January to three. These occurrences are summarized below.

1. The bucket of a backhoe hit two underground power cables, slightly damaging the cables (insulation was damaged and exposing bare wire) during an exploratory excavation in a well field. The cables were believed to be de-energized under a lockout/tagout (LOTO). There was no evidence of electrical arcing at the site of the two damaged cables, which supported the position that they were de-energized. An excavation permit and sub site survey were previously performed which noted the presence of these cables in the area, but did not specify an exact location. A third unidentified underground power cable was also discovered in the excavation and was not damaged during this incident. The third cable was believed to be de-energized but was not verified through the LOTO process. An investigation is continuing to determine the causes.

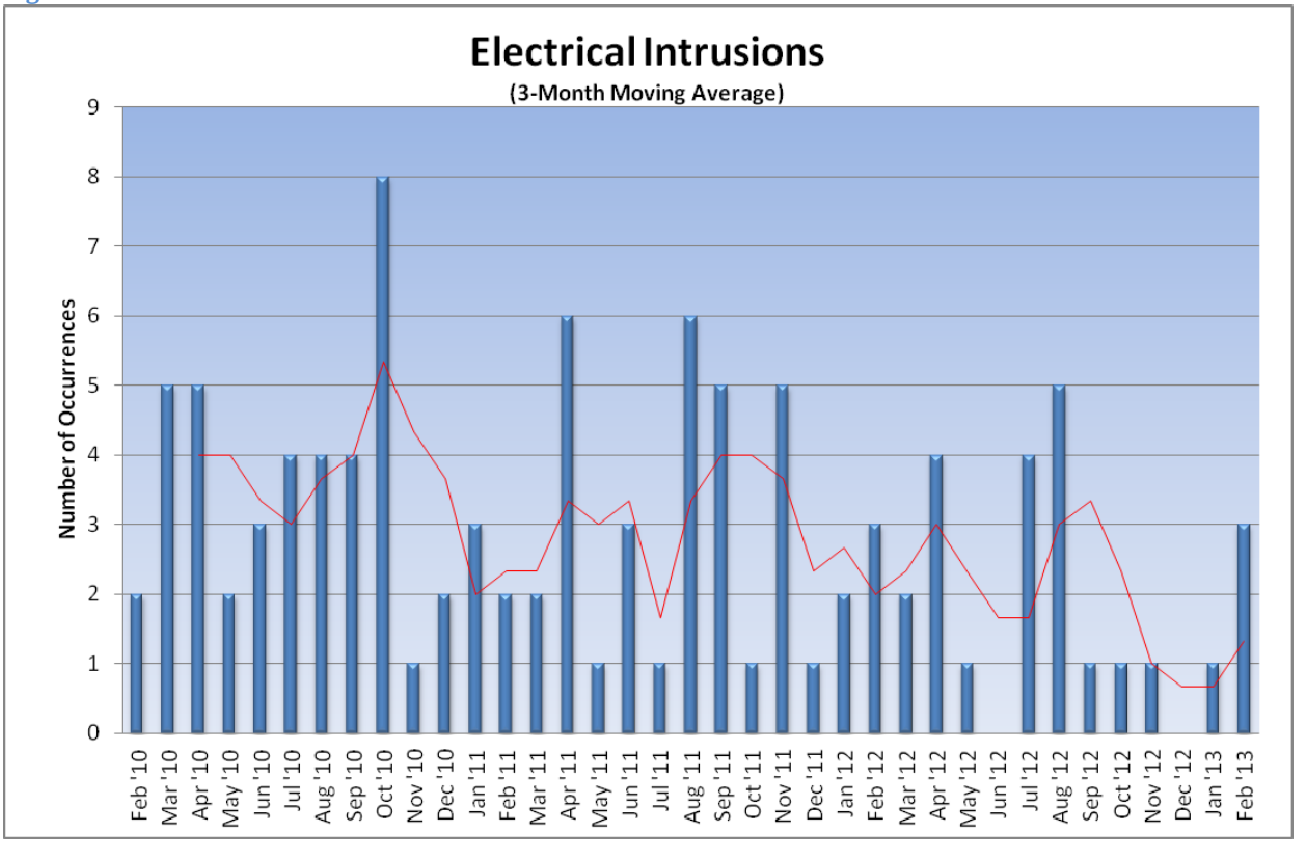
2. A subcontractor inadvertently pinched an energized wire with a tool when he removed a compression fitting on the outside of a 208/120-volt junction box, causing a circuit breaker to trip. The subcontractor then repaired the wire after a breaker tripped without implementing lockout/tagout control of the circuit. Management paused work and initiated an investigation.

3. A worker inadvertently severed an energized 110-volt extension cord being used for a lighting circuit, resulting in a spark and a trip of the circuit breaker feeding this circuit. Workers reconfiguring a hot cell were removing high-density polyethylene (HDPE)

pneumatic tubing from under a platform in the hot cell. The lighting extension cords were fed through the same hot cell penetration as the bundle of HDPE pneumatic tubing, and were similar in color and composition. The lighting extension cord had been flagged as energized. All work was stopped and he extension cords were unplugged. The worker knew that the line he was to cut was close to an energized extension cord and similar in appearance. He also knew that the energized extension cord was marked; however, he did not verify the lines before making the cut.

Figure 4 shows a 3-year trend of electrical intrusion occurrences for the DOE complex. During this period we have seen an average of just under 3 occurrences per month (2.8).

Figure 4 – Three-Year Trend of Electrical Intrusion Occurrences



Hazardous Energy Control

In February there were four reported occurrences involving lockout/tagout (LOTO), which is an increase from the three occurrences reported in January.

Occurrences Involving Lockout/Tagout

1. Personnel performing a pre-job walk-down of an approved 8 criteria checklist to troubleshoot a potential wiring issue, identified that the single-point isolation designated as part of the preparation of the 8 criteria checklist may not be adequate to justify the use of the 8 criteria checklist. The walk down was stopped. The event was investigated, and a critique was scheduled.

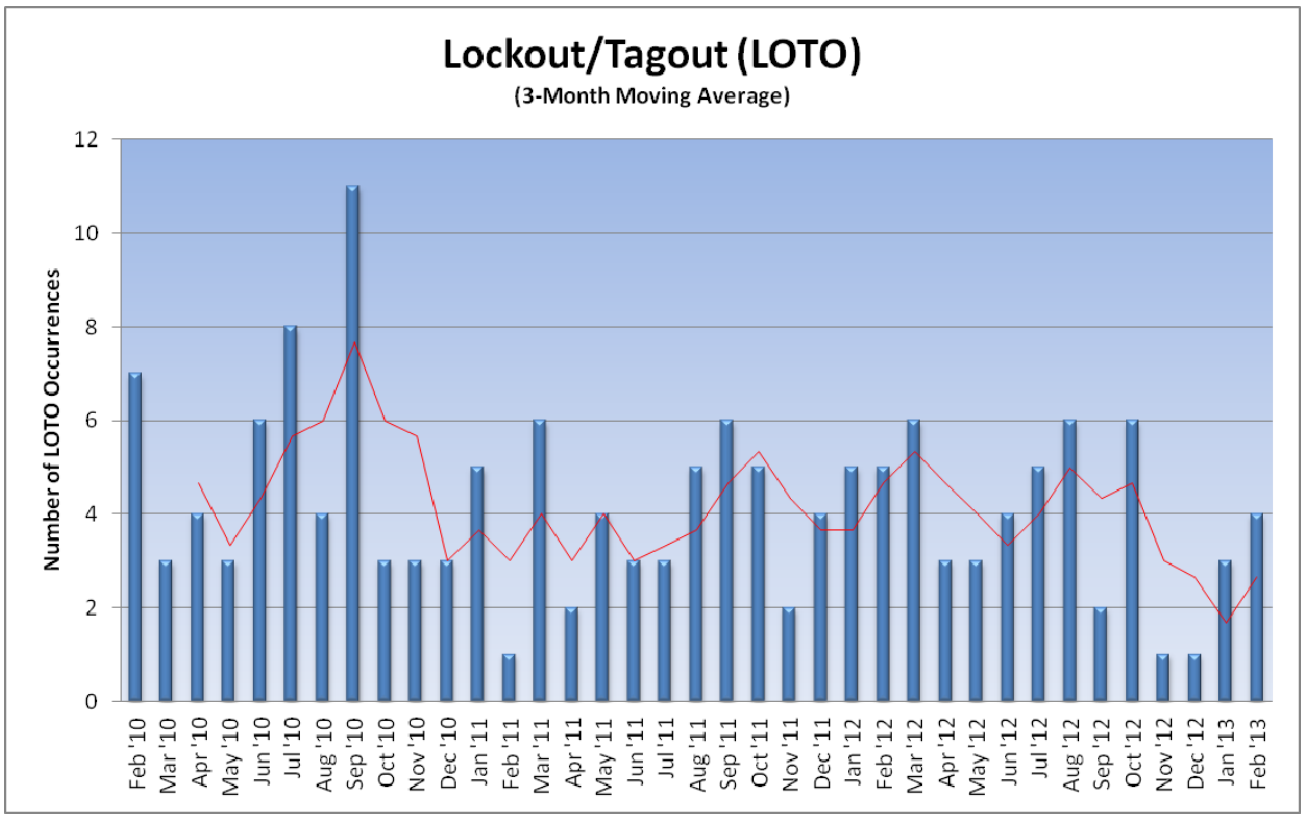
2. See event #2 in the Electrical Intrusion Section.

3. An investigation team was formed to investigate the cause of unexpected voltage found in a receptacle from a recently released LOTO to replace electrical receptacles. After the receptacles had been replaced, the LOTO permit was released. During a post work test, an electrician experienced problems identifying the power source for one of the newly installed receptacles. The investigation team determined that an electrician had inadvertently put a previously cut nonmetallic sheathed cable from a different job into the junction box being used for the newly installed receptacle in question. The cable ends were terminated with wire nuts and fed by a circuit breaker that was turned off, but not covered by the LOTO.

4. A subcontractor electrician implemented a LOTO but did not establish a subcontractor LOTO permit as required by Laboratory procedures while performing equipment inspections during Nationally Recognized Testing Laboratory program activities. The actual LOTO process was performed correctly and safely per procedures; there were no exposures or injuries.

Figure 5 shows a 3-year trend of LOTO occurrences for the DOE complex. The monthly average is 4.1 occurrences.

Figure 5 – Three-Year Trend of Lockout/Tagout Occurrences



Electrical Near Miss

In February, there were four occurrences that were considered to be an electrical near miss, which is an increase from the one near miss in January.

1. A subcontractor noticed an arc at an electrical junction box when a flexible conduit attached to the box moved while working above the ceiling in preparation for water pipe layout. The flexible electrical conduit was under a piece of plywood the subcontractor placed as a work platform and moved while he was on the platform. There was no slack in the conduit and it was attached to the junction box at a sharp angle. The subcontractor was not affected by the arc and the circuit breaker did not trip. The circuit breaker for the conduit was identified, de-energized, and locked and tagged out.

Monthly Occurrences Tables

Table 1 shows a breakdown of the outcomes, performance issues, and worker types associated with the electrical safety occurrences for February 2013.

Table 1 - Breakdown of Electrical Occurrences

Number of Occurrences (February)	Involving:	Last Month (January)
4	Electrical Shocks	2
0	Electrical Burns	0
4	Hazardous Energy Control (LOTO)	3
3	Inadequate Job Planning	1
2	Inadvertent Drilling/Cutting of Electrical Conductors	1
1	Excavation of Electrical Conductors	0
0	Vehicle Intrusion of Electrical Conductors or Equipment	0
4	Electrical Near Misses	1
7	Electrical Workers	4
6	Non-Electrical Workers	3
5	Subcontractors	2

NOTE: The numbers in the left-hand column are not intended to total the number of occurrences for the month and are only associated with the items in the center column.

In compiling the monthly totals, the search looked for occurrence discovery dates in this month [excluding Significance Category R (Recurring) reports] and for the following ORPS HQ keywords:

01K – Lockout/Tagout Electrical, 01M – Inadequate Job Planning (Electrical), 08A – Electrical Shock, 08J – Near Miss (Electrical), 12C – Electrical Safety

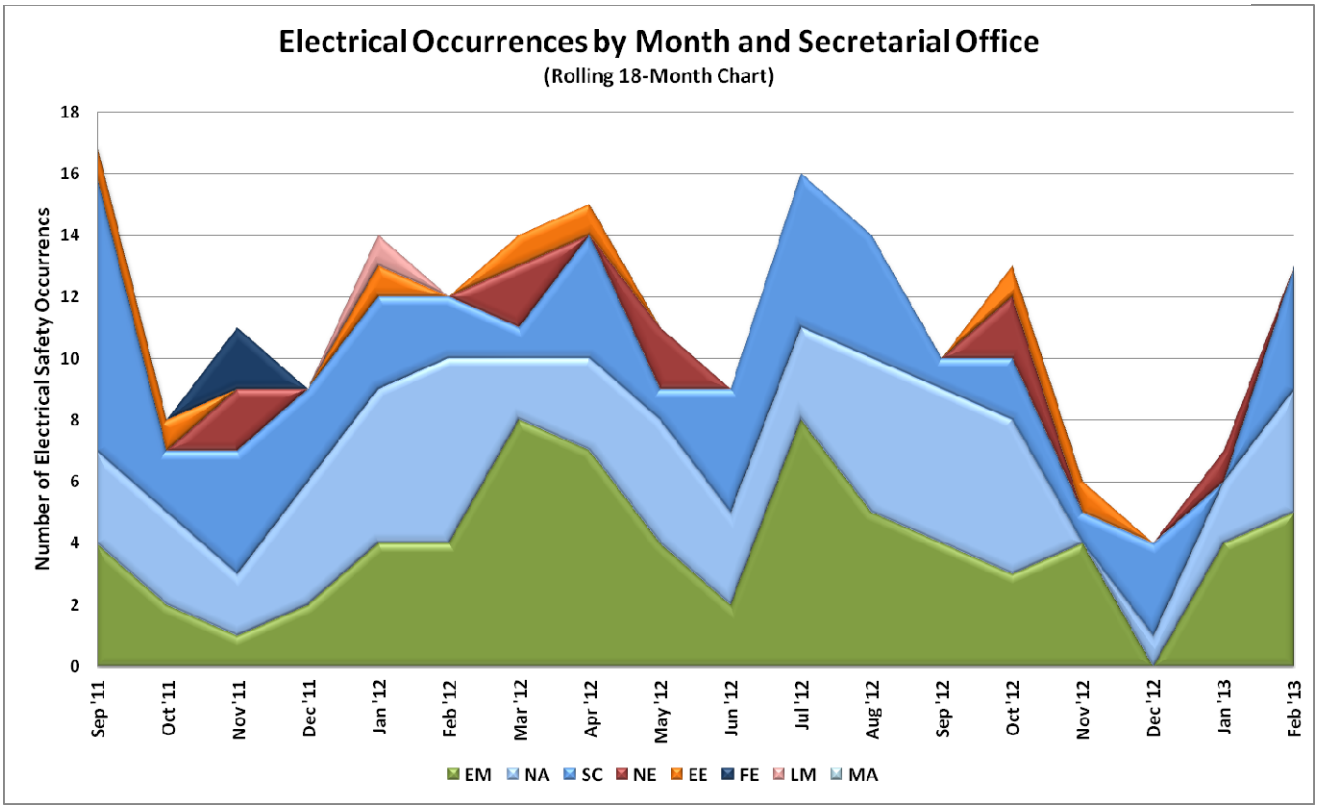
Table 2 provides a summary of the electrical safety occurrences for the previous 9 years and CY 2013. The average number of occurrences a year ago (February 2012) was 13 per month.

Table 2 - Summary of Electrical Occurrences

Period	Electrical Safety Occurrences	Shocks	Burns	Fatalities
February	13	4	0	0
January	7	2	0	0
2013 total	20 (avg. 10.0/month)	6	0	0
2012 total	138 (avg. 11.5/month)	30	1	0
2011 total	136 (avg. 11.3/month)	36	5	0
2010 total	155 (avg. 12.9/month)	28	2	0
2009 total	128 (avg. 10.7/month)	25	3	0
2008 total	113 (avg. 9.4/month)	26	1	0
2007 total	140 (avg. 11.7/month)	25	2	0
2006 total	166 (avg. 13.8/month)	26	3	0
2005 total	165 (avg. 13.8/month)	39	5	0
2004 total	149 (avg. 12.4/month)	25	3	1

Figure 6 shows the distribution of electrical safety occurrences by Secretarial Office

Figure 6 - Electrical Occurrences by Month and Secretarial Office



Electrical Severity

The electrical severity of an electrical occurrence is based on an evaluation of electrical factors that include: electrical hazard, environment, shock proximity, arc flash proximity, thermal proximity and any resulting injury(s) to affected personnel. Calculating an electrical severity for

an occurrence provides a metric that can be consistently applied to evaluate electrical occurrences across the DOE complex.

Electrical Severity Scores

The electrical severity scores (ES) are calculated using the Electrical Severity Measurement Tool, which can be found on the EFCOG website at http://www.efcog.org/wg/esh_es/docs/Electrical_Severity_Measurement_Tool.pdf. The thirteen occurrences are classified as shown in Table 3. Actual scores are provided in Attachment 1.

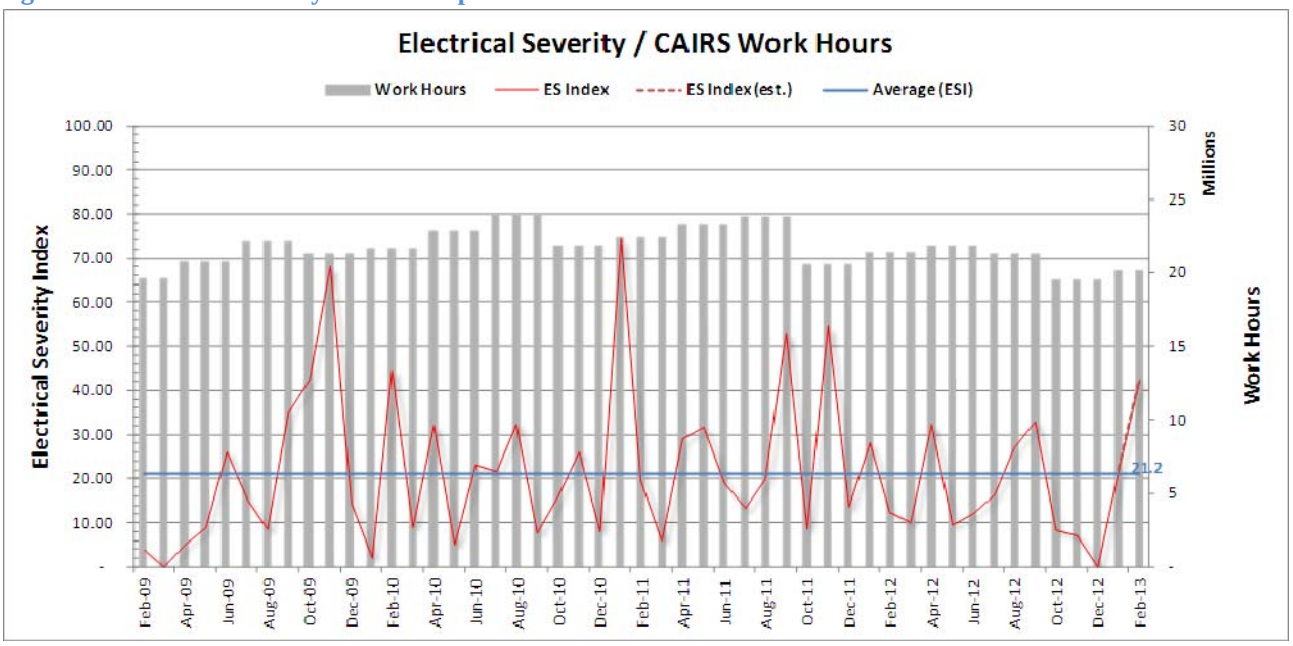
Table 3 – Classification of Electrical Safety Occurrences by ES Score

Occurrence Classification	Electrical Severity Score	Number of Occurrences
HIGH	≥ 1750	0
MEDIUM	31-1749	8
LOW	1-30	0
No Score	0	5

Electrical Severity Index

The Electrical Severity Index (ESI) is a performance metric that was developed to normalize events against organizational work hours. The ESI is calculated monthly and trended. Figure 7 shows a calculated ESI for the DOE complex and Table 4 shows the ESI and how it has changed from the previous month.

Figure 7 - Electrical Severity Index Compared to Work Hours



Note: An estimated ESI is calculated until accurate CAIRS man-hours are available. The chart is updated monthly.

Table 4 - Electrical Severity Index

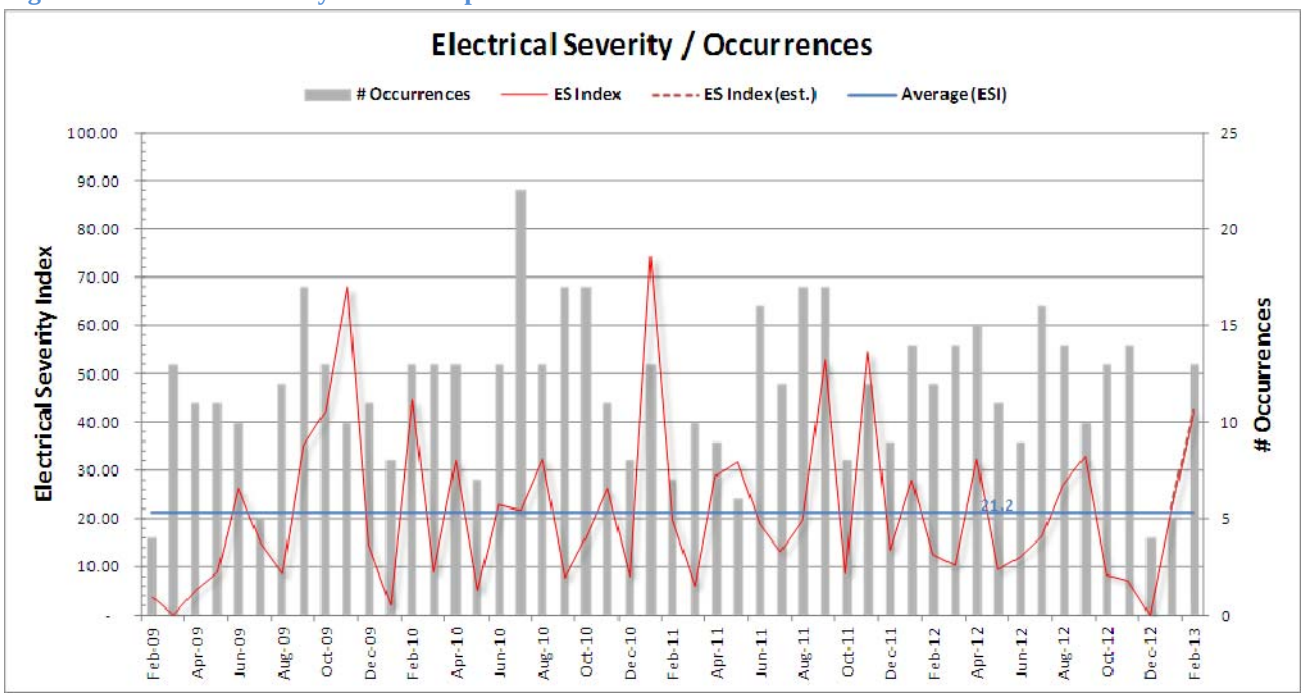
Category	January	February	Δ
Total Occurrences	7	13	+6
Total Electrical Severity	2,200	4,260	+2,040
Estimated Work Hours	20,093,413* (20,397,305)	20,093,413	0
ES Index	22.10* (21.77)	42.40	+20.31
Average ESI	20.8	21.2	+0.4

* These are estimated CAIRS work hours for September and ES Index based on the estimated hours. The estimated hours and ES Index based on the estimated hours (as reported in January) are shown below in parentheses.

Electrical Severity Index = (Σ Electrical Severity / Σ Work Hours) 200,000

Figure 8 shows the ESI with the number of Occurrences instead of Work Hours.

Figure 8 - Electrical Severity Index Compared to Number of Occurrences



The average ESI (21.2) increased slightly from last month. The lowest average ESI was 19.2 in June 2010.

Figure 9 shows the number of days since the previous high severity occurrence. The present interval is 667 days as of February 28. The previous longest interval was 181 days in 2009.

Figure 9 - Days since Previous High Severity Occurrence

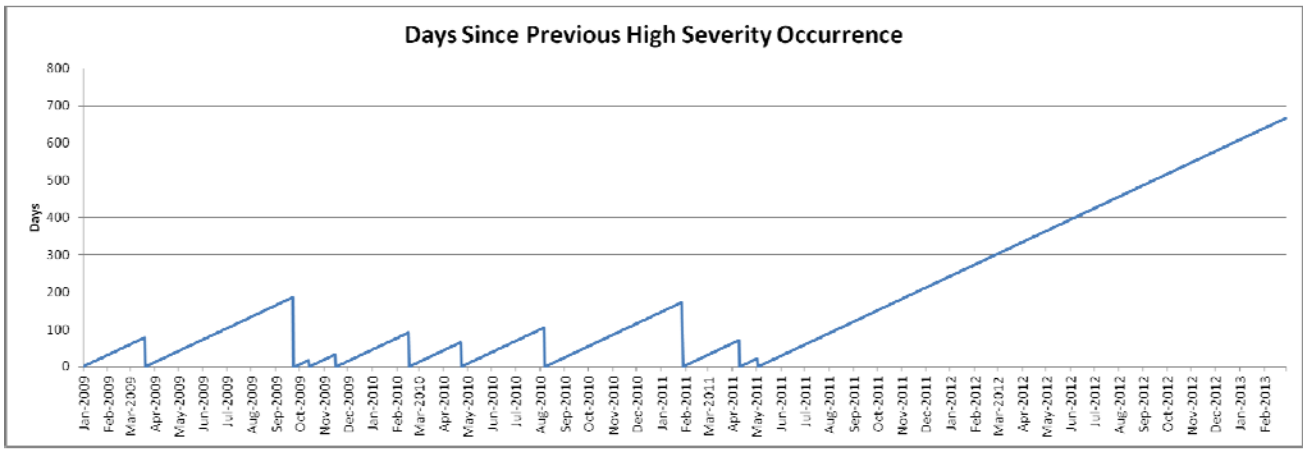
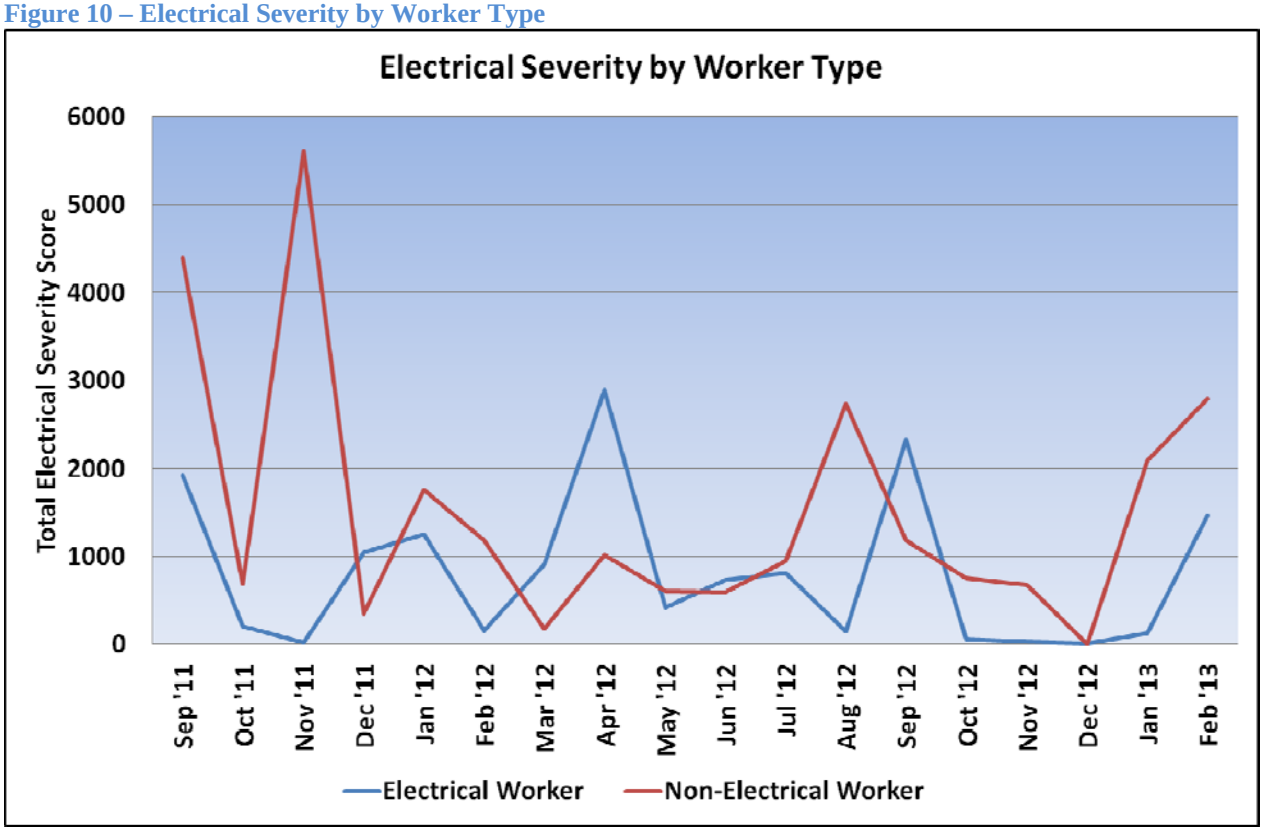


Figure 10 shows the total electrical severity score by worker type for each month.

Figure 10 – Electrical Severity by Worker Type

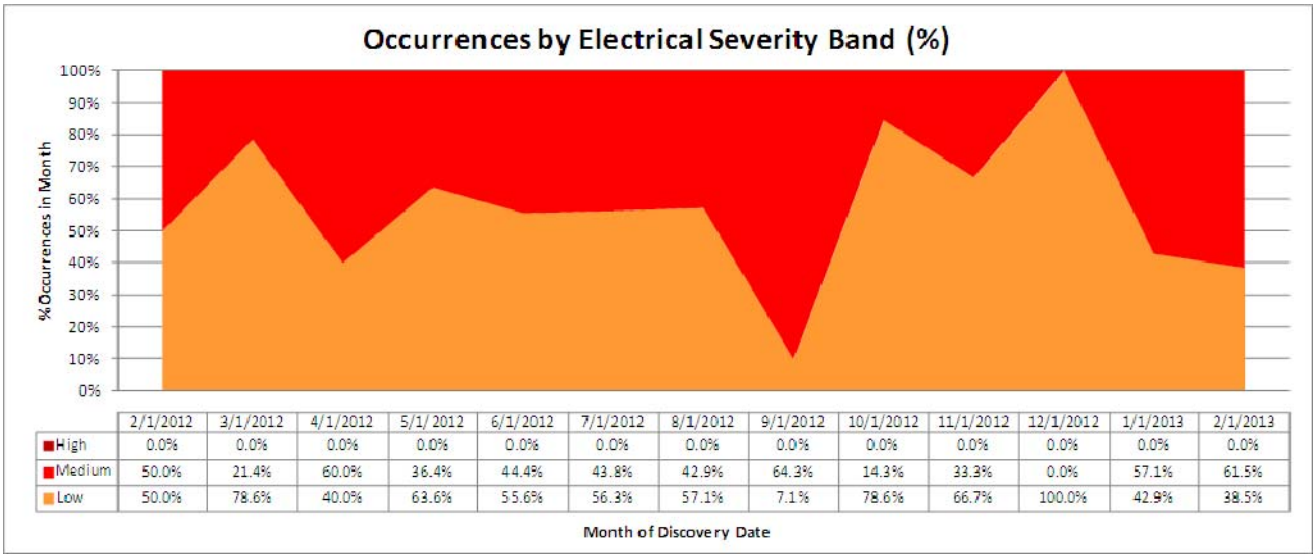


Electrical workers typically have the fewest number of occurrences. Following a low of 130, the ES score for electrical workers is up to 1470, while non-electrical workers ES scores have increased to 2,790. The average ES scores for the 18 month period are 808 for electrical workers and 1,530 for non-electrical workers.

Summary of Occurrences by Severity Band

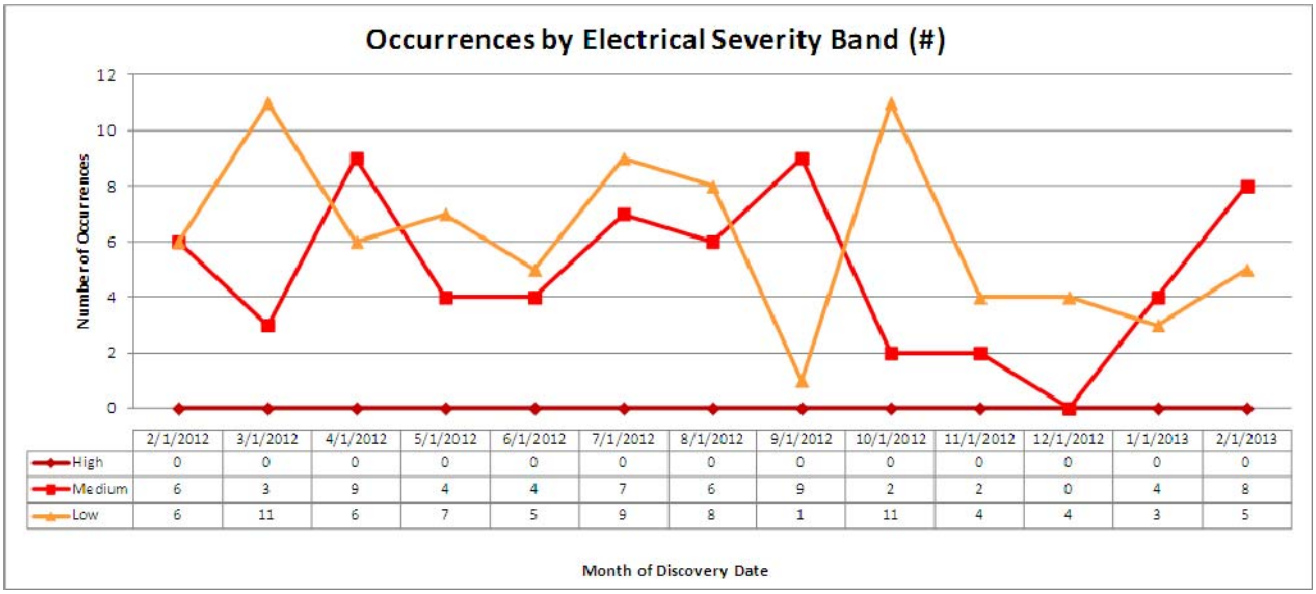
For the interval February 2012 through February 2013 (current month and the past 12), Figures 11 and 12 summarize occurrences by severity band and month of discovery date by percentage of total occurrences in month and number of occurrences in month.

Figure 11 - Occurrences by Electrical Severity Band (Percentage)



	2/1/2012	3/1/2012	4/1/2012	5/1/2012	6/1/2012	7/1/2012	8/1/2012	9/1/2012	10/1/2012	11/1/2012	12/1/2012	1/1/2013	2/1/2013
High	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Medium	50.0%	21.4%	60.0%	36.4%	44.4%	43.8%	42.9%	64.3%	14.3%	33.3%	0.0%	57.1%	61.5%
Low	50.0%	78.6%	40.0%	63.6%	55.6%	56.3%	57.1%	7.1%	78.6%	66.7%	100.0%	42.9%	38.5%

Figure 12 - Occurrences by Electrical Severity Band (Number)



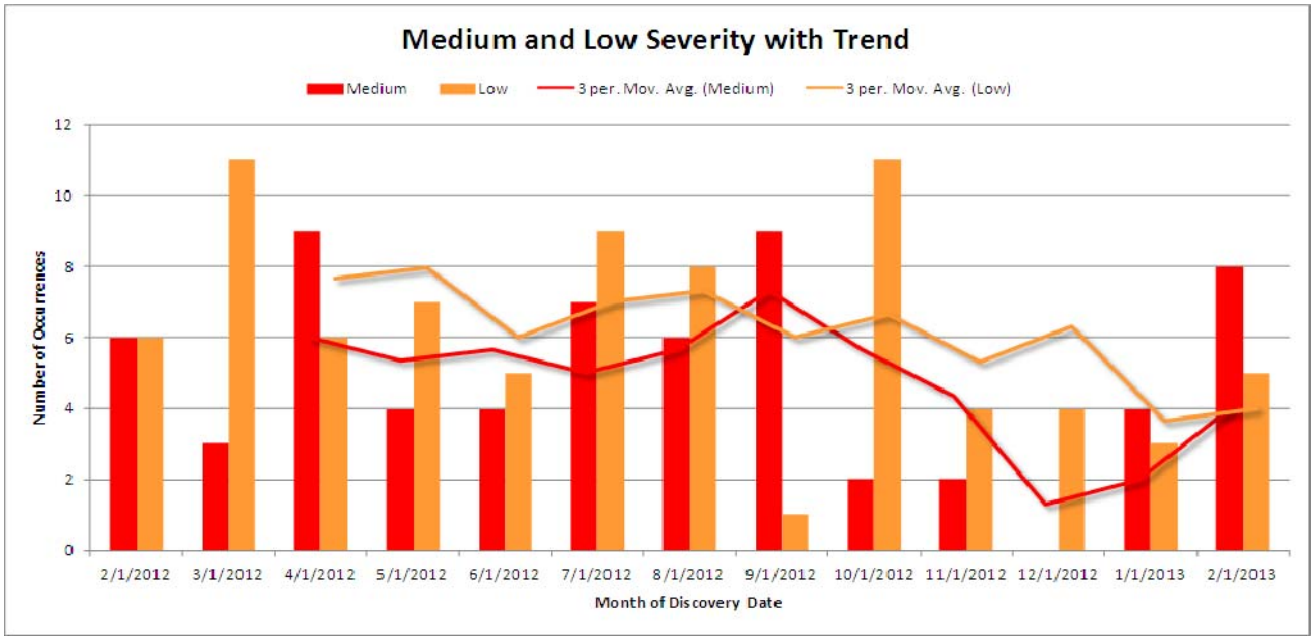
	2/1/2012	3/1/2012	4/1/2012	5/1/2012	6/1/2012	7/1/2012	8/1/2012	9/1/2012	10/1/2012	11/1/2012	12/1/2012	1/1/2013	2/1/2013
High	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium	6	3	9	4	4	7	6	9	2	2	0	4	8
Low	6	11	6	7	5	9	8	1	11	4	4	3	5

What can be seen from the previous two charts is that the number of occurrences with High electrical severity scores has remained at zero with the last event occurring back in May 2011. The number of occurrences with Medium continued to increase while the number of Low and zero severity occurrences increased following a slight decrease.

Medium and Low Severity with Trend

Figure 13 focuses on the Medium and Low severity data series for February 2012 through February 2013. Trend lines are included for each, using a 3-month moving average.

Figure 13 - Trend of Medium and Low Electrical Severity Occurrences



The 3-month moving average shows a slight increasing trend for Medium severity occurrences as Low severity occurrences leveled off. A higher percentage of Low severity occurrences is preferred.

Additional Resources

Electrical Safety Blog
http://hsselectricalsafety.wordpress.com/

Electrical Safety Wiki
http://electricalsafety.doe-hss.wikispaces.net/home

EFCOG Electrical Safety Subgroup
http://www.efcog.org/wg/esh_es/index.htm

Center of Excellence for Electrical Safety
http://www.lanl.gov/safety/electrical/

Contact

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Attachment 1

Electrical Safety Occurrences – February 2013

No	Report Number	Event Summary	SHOCK	BURN	ARCF[1]	LOTO[2]	PLAN[3]	EXCAV[4]	CUT/D[5]	VEH[6]	SC[7]	RC[8]	ES[9]
1	EM---WGI-G2H2-2013-0001	A subcontractor worker received a shock to his fingers while disconnecting a drill power cord from a lead cord.	X								2	2E(1)	480
2	EM--PPPO-FBP-PORTSDD-2013-0005	Electrician received static electrical shock while testing an isolated electrical transformer.	X								2	2E(1)	330
3	EM--PPPO-FBP-PORTSDD-2013-0006	An instrument mechanic received a minor 100V electrical shock while changing out a criticality accident alarm system cluster.	X								3	2E(2)	330
4	EM--PPPO-FBP-PORTSDD-2013-0008	A backhoe bucket hit two underground power cables, slightly damaging the cables.						X			3	10(3)	0
5	EM-RL--CPRC-SNF-2013-0002	A single-point isolation that was part of the 8 criteria checklist may not be adequate to justify the use of the 8 criteria checklist.				X					4	2E(3)	0
6	NA--LASO-LANL-PHYSTECH-2013-0004	An electrician did not wear PPE to troubleshoot a disconnect near exposed 480V terminals.					X				4	2E(3)	700
7	NA--LASO-LANL-TA55-2013-0006	A subcontractor saw an arc at an electrical junction box when a flexible conduit attached to the box moved.									3	10(2)	0
8	NA--LSO-LLNL-LLNL-2013-0006	A subcontractor pinched an energized wire with a tool and repaired it without using a LOTO.				X			X		4	2E(3)	110
9	NA--YSO-BWXT-Y12SITE-2013-0006	An electrician had inadvertently put a cut cable (with wire nuts) fed from an open circuit breaker and no LOTO into a J Box.				X	X				3	2E(2)	0
10	SC--BSO-LBL-ALS-2013-0001	A subcontractor electrician implemented LOTO but did not establish a subcontractor LOTO permit.				X					4	2E(3)	0

Attachment 1

No	Report Number	Event Summary	SHOCK	BURN	ARCF[1]	LOTO[2]	PLAN[3]	EXCAV[4]	CUT/D[5]	VEH[6]	SC[7]	RC[8]	ES[9]
11	SC--SSO-SU-SLAC-2013-0003	An employee received a mild electrical shock when he touched an ungrounded electrical conduit on a 277V lighting circuit.	X								4	10(2)	1650
12	SC-ORO--ORNL-X10BOPLANT-2013-0002	Worker inadvertently severed an energized 110V extension cord tripping circuit breaker.							X		3	2E(2)	110
13	SC-ORO--ORNL-X10BOPLANT-2013-0003	A photocell controlled de-energized 277V electrical lighting circuit was incorrectly removed.					X				3	2E(2)	550
	TOTAL		4	0	0	4	3	1	2	0			

Key

(1) ARCF = significant arc flash, (2) LOTO = lockout/tagout, (3) PLAN = job planning, (4) EXCAV = excavation/penetration, (5) CUT/D = cutting or drilling, (6) VEH = vehicle or equipment intrusion, (7) SC = ORPS significance category, (8) RC = ORPS reporting criteria, (9) ES = electrical severity

ES Scores: High is $\geq$ 1750, Medium is 31-1749, and Low is 1-30

Attachment 1

Electrical Safety Occurrences – February 2013

No	Report Number	Event Summary	EW[1]	N-EW[2]	SUB[3]	HFW[4]	WFH[5]	PPE[6]	70E[7]	VOLT[8] H	VOLT[8] L	C/I[9]	NEUT[10]	NM[11]
1	EM---WGI-G2H2-2013-0001	A subcontractor worker received a shock to his fingers while disconnecting a drill power cord from a lead cord.			X	X					X			
2	EM--PPPO-FBP-PORTSDD-2013-0005	Electrician received static electrica shock while testing an isolated electrical transformer.	X			X					X			
3	EM--PPPO-FBP-PORTSDD-2013-0006	An instrument mechanic received a minor 100V electrical shock while changing out a criticality accident alarm system cluster.	X			X					X			
4	EM--PPPO-FBP-PORTSDD-2013-0008	A backhoe bucket hit two underground power cables, slightly damaging the cables.		X		X					X			X
5	EM-RL--CPRC-SNF-2013-0002	A single-point isolation that was part of the 8 criteria checklist may not be adequate to justify the use of the 8 criteria checklist.	X								X			
6	NA--LASO-LANL-PHYSTECH-2013-0004	An electrician did not wear PPE to troubleshoot a disconnect near exposed 480V terminals.	X			X		X	X		X			
7	NA--LASO-LANL-TA55-2013-0006	A subcontractor saw an arc at an electrical junction box when a flexible conduit attached to the box moved.		X	X	X					X			X
8	NA--LSO-LLNL-LLNL-2013-0006	A subcontractor pinched an energized wire with a tool and repaired it without using a LOTO.	X		X	X			X		X			X
9	NA--YSO-BWXT-Y12SITE-2013-0006	An electrician had inadvertently put a cut cable (with wire nuts) fed from an open circuit breaker and no LOTO into a J Box.	X								X			
10	SC--BSO-LBL-ALS-2013-0001	A subcontractor electrician implemented LOTO but did not establish a subcontractor LOTO permit.	X		X	X	X				X			

Attachment 1

No	Report Number	Event Summary	EW[1]	N-EW[2]	SUB[3]	HFW[4]	WFH[5]	PPE[6]	70E[7]	VOLT[8] H	VOLT[8] L	C/I[9]	NEUT[10]	NM[11]
11	SC--SSO-SU-SLAC-2013-0003	An employee received a mild electrical shock when he touched an ungrounded electrical conduit on a 277V lighting circuit.		X		X					X			
12	SC-ORO--ORNL-X10BOPLANT-2013-0002	Worker inadvertently severed an energized 110V extension cord tripping circuit breaker.		X		X					X			X
13	SC-ORO--ORNL-X10BOPLANT-2013-0003	A photocell controlled de-energized 277V electrical lighting circuit was incorrectly removed.		X	X						X			
	TOTAL		7	6	5	8 X	5	1	2	0	13	0	0	4

Key

(1) EW = electrical worker, (2) N-EW = non-electrical worker, (3) SUB = subcontractor, (4) HFW = hazard found the worker, (5) WFH = worker found the hazard, (6) PPE = inadequate or no PPE used, (7) 70E = NFPA 70E issues, (8) VOLT = H (>600) L(≤600), (9) C/I = Capacitance/Inductance, (10) NEUT = neutral circuit, (11) NM = near miss

ORPS Operating Experience Report

ORPS contains 56145 OR(s) with 59455 occurrences(s) as of 5/28/2013 1:09:25 PM
Query selected 13 OR(s) with 13 occurrences(s) as of 5/28/2013 1:09:45 PM

1)Report Number: EM---WGI-G2H2-2013-0001 **After 2003 Redesign**
Secretarial Office: Environmental Management
Lab/Site/Org: Separations Process Research Unit
Facility Name: G2/H2 Facilities
Subject/Title: Electrical Shock from Drill
Date/Time Discovered: 02/11/2013 14:00 (ETZ)
Date/Time Categorized: 02/11/2013 15:48 (ETZ)
Report Type: Update/Final
Report Dates:

Notification	02/12/2013	16:11 (ETZ)
Initial Update	05/23/2013	14:08 (ETZ)
Latest Update	05/23/2013	14:08 (ETZ)
Final		

Significance Category: 2
Reporting Criteria: 2E(1) - Any unexpected or unintended personal contact (burn, injury, etc.) with an electrical hazardous energy source (e.g., live electrical power circuit, etc.).

Cause Codes: A2B3C02 - Equipment/ material problem; Inspection/ testing LTA; Inspection/ testing LTA
A5B2C08 - Communications Less Than Adequate (LTA); Written Communication Content LTA; Incomplete / situation not covered

ISM: 3) Develop and Implement Hazard Controls
4) Perform Work Within Controls

Subcontractor Involved: Yes
Pangea

Occurrence Description: The subcontracted worker was performing work for the construction of the H2 Enclosure. The worker was using a portable heavy duty drill with a magnetic base to drill holes in structural steel. The work was being performed approximately 12 feet off the ground with the worker in an aerial lift. Power to the drill was supplied from a portable generator through a lead cord connected to the drill. The work was being performed outside. Although not raining, the work conditions were damp and water from snow melt was present and dripping from the structure.

After completing the drilling, the worker was disconnecting the drill power cord from the lead cord and received a mild shock to his fingers. The worker reported the shock to his work group supervisor. Safety was also

present at the scene and reported the event. The worker was taken to EllisWorks, the project health services provider, for medical evaluation and released back to work later that day.

Cause Description: The root cause of the electrical shock event was the failure of the job hazards analysis (JHA)to recognize/appreciate unique electrical hazards at the work site, which resulted in improper controls and inappropriate design features of electrical power tools used in planned work.

The direct cause was the action of the subcontract worker touching an energized electrical circuit with no PPE (i.e., no gloves) while disconnecting the electrical equipment from the power source.

Contributing causes were:
1. Failure of the JHA to acknowledge how changes in environmental conditions could impact the hazards associated with the use of hand/power tools, so that work activities and controls involving the use of electrical equipment/tools and its controls are evaluated by workers and supervisors for adequacy prior to initiating work.

2. Failure to fully appreciate the hazards presented by changed environmental conditions at the work site when combined with the assigned scope of work and the work conditions.

3. Failure to effectively implement the work safety control process during the pre-job briefing on the day of scheduled work, to allow for the recognition of potential hazards introduced by changed or changing conditions, and the evaluation of controls adequacy prior to the authorization of work to proceed.

Operating Conditions: Construction of the H2 Enclosure was in progress at the time of the occurrence.

Activity Category: Construction

Immediate Action(s):
1. Medical evaluation of the worker was conducted. The worker was released back to work.
2. The drill was removed from service.
3. The electric drill, generator circuit and lead cord was inspected by a qualified electrician for defects and GFI. The GFI was in place and tested SAT. The drill power cord had a broken strain relief and did not have a molded plug on the power cord indicating the end plug had been replaced at some point. The power cord did not have any bare conductor showing.
4. Conducted a critique of the event on 2/12/13 at 0700 hours.
5. Conducted crew briefings at the 2/12/13 morning tailgate meetings.
6. Extent of condition inspection of portable electrical tools initiated on 2/12/13.

FM Evaluation: The electrical shock event resulted in a review of work involving electrical tools in outdoor environment and an extent of condition review for

portable electric tools being used on the project. The project made changes to the electrical safety program and work control process to reinforce the expectation that all work involving electrical tools be performed in dry conditions.

DOE Facility Representative Input:

DOE Program Manager Input:

Further Evaluation is Required: No

Division or Project: Separations Process Research Unit (SPRU)

Plant Area: H2

System/Building/Equipment: H2 Enclosure Construction

Facility Function: Environmental Restoration Operations

Corrective Action 01:

Target Completion Date:03/26/2013	**Actual Completion Date:**03/26/2013

Conduct root cause analysis and define corrective actions.

Lessons(s) Learned:
(1)Inspect electrical tools prior to use.
(2)Evaluate your working conditions prior to commencing tasks.
(3)Use proper PPE for the task at hand/working conditions.
(4)Be aware of changing conditions.

HQ Keywords:
07D--Electrical Systems - Electrical Wiring
08A--OSHA Reportable/Industrial Hygiene - Electrical Shock
11G--Other - Subcontractor
12C--EH Categories - Electrical Safety
14L--Quality Assurance - No QA Deficiency

HQ Summary: On February 11, 2013, a subcontracted worker received a mild shock to his fingers while disconnecting a drill power cord from a lead cord. The worker was using the portable heavy duty drill with a magnetic base to drill holes in structural steel. The work conditions were damp and water from snow melt was present and dripping from the structure. The worker reported the shock to his work group supervisor. The worker was taken to the project health services provider, for medical evaluation and released back to work later that day. A critique was conducted.

Similar OR Report Number: 1. None

Facility Manager:

Name	HALL, DAVID M
Phone	(865) 253-1655
Title	ESH&Q MANAGER

Originator:

Name	HALL, DAVID M
Phone	(865) 253-1655
Title	ESH&Q MANAGER

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/11/2013	14:12 (ETZ)	Shift Manager	URS
02/11/2013	14:15 (ETZ)	Operations Manager	URS
02/11/2013	14:30 (ETZ)	ESH Manager	URS
02/11/2013	15:48 (ETZ)	Facility Representative	DOE SPRU

Authorized Classifier(AC):

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2)Report Number: EM--PPPO-FBP-PORTSDD-2013-0005 **After 2003 Redesign**

Secretarial Office: Environmental Management

Lab/Site/Org: Portsmouth Gaseous Diffusion Plant

Facility Name: Portsmouth Decontamination and Decommissioning

Subject/Title: Electrician Received Static Electrical Shock While Testing an Isolated Electrical Transformer

Date/Time Discovered: 02/07/2013 09:40 (ETZ)

Date/Time Categorized: 02/07/2013 11:40 (ETZ)

Report Type: Final

Report Dates:

Notification	02/07/2013	19:03 (ETZ)
Initial Update	03/26/2013	08:08 (ETZ)
Latest Update	04/17/2013	08:08 (ETZ)
Final	04/23/2013	07:34 (ETZ)

Significance Category: 2

Reporting Criteria: 2E(1) - Any unexpected or unintended personal contact (burn, injury, etc.) with an electrical hazardous energy source (e.g., live electrical power circuit, etc.).

Cause Codes: A3B2C01 - Human Performance Less Than Adequate (LTA); Rule Based Error; Strong rule incorrectly chosen over other rules
-->couplet - A6B1C03 - Training deficiency; No Training Provided; Work incorrectly considered “skill-of-the-craft”
A6B1C03 - Training deficiency; No Training Provided; Work incorrectly considered “skill-of-the-craft”
A3B3C03 - Human Performance Less Than Adequate (LTA); Knowledge Based Error; Individual justified action by focusing on biased evidence
-->couplet - A4B3C08 - Management Problem; Work Organization & Planning LTA; Job scoping did not identify special circumstances and/or conditions
A4B5C09 - Management Problem; Change Management LTA; Change-related documents not developed or revised

	A3B3C04 - Human Performance Less Than Adequate (LTA); Knowledge Based Error; LTA review based on assumption that process will not change -->couplet - A4B5C12 - Management Problem; Change Management LTA; Change not identifiable during task A4B2C07 - Management Problem; Resource Management LTA; Means not provided for assuring adequate availability of appropriate materials / tools A4B3C11 - Management Problem; Work Organization & Planning LTA; Inadequate work package preparation A4B1C07 - Management Problem; Management Methods Less Than Adequate (LTA); Responsibility of personnel not well defined or personnel not held accountable A4B1C03 - Management Problem; Management Methods Less Than Adequate (LTA); Management direction created insufficient awareness of the impact of actions on safety / reliability A4B1C01 - Management Problem; Management Methods Less Than Adequate (LTA); Management policy guidance / expectations not well-defined, understood or enforced
ISM:	1) Define the Scope of Work 2) Analyze the Hazards 3) Develop and Implement Hazard Controls 4) Perform Work Within Controls
Subcontractor Involved:	No
Occurrence Description:	On February 7, 2013, three electricians and two engineers were performing an insulation resistance test at the X-6644 High Pressure Fire Water (HPFW) Pumphouse substation to complete a testing evolution which started several days earlier. One test lead was attached to ground, and the other test lead was attached to bus/cable A Phase. The Megohmmeter (megger) was turned on, applying 5000 volts DC to the test points. The megger was turned off, the electrician moved the test lead to B Phase, and the test repeated. The megger was again turned off and the electrician went to move the test lead to C Phase. When he touched the lead, he felt a shock, and backed away from the equipment, refusing to continue. About 20 minutes later, he asked to be taken to the X-760 Medical Facility. Subsequently, the electrician was transported by air ambulance to a regional hospital for further evaluation. The electrical shock was documented in problem report FBP-PR-FY13-1204. A second problem report was submitted to document the offsite transport of the individual. Maintenance initiated an extent of condition and a safety pause to identify obsolete or damaged equipment. In addition, they took tools and test equipment out of service if the manufacturer’s user manuals were not available.
Cause Description:	A3B2C01 - A3 Human Performance, B2 Rule Based Error, C01 Strong rule incorrectly chosen over other rules. Couplet Code: A6B1C03 - A6

Training Deficiency, B1 No Training Provided, C03 Work incorrectly skill-of-the-craft

The Direct Cause was the electrician making contact with terminals and the cabinet connected to a stored energy source. The materials and configuration of the high voltage cables constituted a capacitor that became charged by the megger during testing. By touching the cabinet, the electrician completed a circuit to ground allowing the discharge of the energy on the cable. The electrician had performed similar testing without receiving a similar type shock in the past.

Root Cause -- A4B1C01 - A4 Management Problem, B1 Management Methods Less Than Adequate, C01 Management policy guidance /expectations not well-defined, understood or enforced

The Root Cause of this accident was determined to be Management failure to develop and enforce standards for work performance documents resulting in less than adequate work packages / procedures, and job performance. The work package level of detail for scope description, work instructions, hazard evaluation, and hazard controls was insufficient to enable preparation of a high quality work package. The scope provided was broad and was intended to cover numerous options for cleaning, testing and performing a PM on the substation based on verbal direction.

Contributing Causes
A6B1C03 - A6 Training Deficiency, B1 No Training Provided, C03 Work incorrectly skill-of-the-craft.
The work team did not fully understand the limitations of the Megohmmeter being utilized. They erroneously believed the test instrument provided automatic discharge of the energy introduced to the cable under test.

A3B3C03 - A3 Human Performance LTA, B3 Knowledge Based Error, C03 Individual justified action by action by focusing on biased evidence COUPLED WITH A4B3C08 - A4 Management Problem, B3 Work Organization & Planning LTA, C08 Job scoping did not identify special circumstances and / conditions.
Personnel did not utilize available instructions provided with the instrument to ensure proper use. Vendor directions on proper use of the test instrument were available in the lid of the Megohmmeter. If these instructions had been followed, complete discharge of the energy in the cable would have occurred.

A4B5C09 - A4 Management Problem, B5 Change Management LTA, C09 Change-related documents not developed or revised. The Cable Insulation Testing procedure was not utilized for a work evolution involving cable testing. The procedure was written for testing to 2500v DC and the

engineer requested testing at 5000v DC. A request was not made to revise the procedure for use during the cable testing evolution. Instead, skill-of-the-craft and past use history was relied upon.

A3B3C04 - A3 Human Performance LTA, B3 Knowledge Based Error, C04 LTA review based on assumption that process will not change COUPLED WITH A4B5C12 -A4 Management Methods LTA, B5 Change Management LTA, C12 Change not identifiable during task.
Due to the configuration of the circuit, approximately one mile of cable was being tested. During work performance, the work team failed to recognize the amount of stored energy created by meggering this length of shielded cable, thus exposing workers to an unidentified electrical shock hazard.

A4B2C07 - A4 Management Problem, B2 Resource Management LTA, C07 Means not provided for assuring adequate availability of appropriate materials / tools. Tools necessary to perform work were not staged in the work area. Specifically, a grounding stick was not at the job site when work started. It was later retrieved from the shop, after the electrician received the shock, and used to ensure full discharge of the cable prior to completion of C phase testing.

A4B3C11 - A4 Management Problem, B3 Work Organization & Planning LTA, C11 Inadequate work package preparation. A change in work scope occurred but was not recognized by personnel. A work package originally prepared to clean, inspect, and test transformer and bus was also used to test approximately one mile of shielded cable.

A4B1C07 - A4 Management Problem, B1 Management Methods LTA, C07 Responsibility of personnel not well defined or personnel held accountable. Documentation of topics discussed during the pre-job briefing was not all inclusive. Based on the lack of annotations on the pre-job briefing forms, there is a potential that key information related to hazards and hazard controls was not relayed to workers.

A4B1C03 - A4 Management Problem, B1 Management Methods LTA, C03 Management direction created insufficient awareness of impact of actions on safety / reliability.
Available procedures, manufacturers user manuals and/or manufacturers instructions are not being relied upon when performing work. The benefits of using procedures or referring to manufacturers supplied reference material to avoid unanalyzed or unexpected outcomes for frequently performed work tasks may not be fully recognized.

The investigation also identified other weaknesses and opportunities associated with this incident:
-- Failure to recognize the impacts of hazards encountered during routine

tasks
-- Equipment in use on plant site is not always equipped with automatic safety features or meets current standards due to its age.
-- Inclusion of lessons learned applicable to the task being planned needs improved in the Work Package.
-- Workforce is not displaying enough of a questioning attitude to develop a mature ISMS mindset.
-- Not all electrical test equipment used by Maintenance is included in a program to ensure it remains in good condition.

Operating Conditions: Normal Operations

Activity Category: Maintenance

Immediate Action(s):
- A pause was initiated on the work related to the X-6644 Fire Water Pump House.
- The electrician was transported to the X-760 Medical Trailer for evaluation and then transported to a regional medical center by medical helicopter.
- Work involving Megohmmeters or any voltage inducing equipment has been paused until further notice. Prior to using other equipment either a procedure or instruction manual from the vendor must be reviewed for precautions and safe operations. This requirement excludes common hand tools.
- A fact finding meeting was conducted at 12:00PM on 02/07/2013.
- A Problem Report was initiated.
- An Occurrence Report was initiated.

FM Evaluation: Based on the findings of the investigation, the following conclusions were reached:

- Inclusion of a lengthy general site electrical work JHA that discussed hazards and controls not applicable to inspecting, cleaning and testing a substation and was missing the PPE and Tools Section due to a software glitch.
- The walk down checklist failed to mention the need for a megger, Ross meter, or grounding stick.
- The walk down checklist failed to identify any applicable Lessons Learned.
- The written instructions made no mention of meggering activities and were generically written to follow verbal directions from an electrical engineer.
- Although the written instructions called for the use of calibrated tools, the megger which was utilized had not been calibrated or function checked for more than 12 years.
- Job Field Instructions were not requested to clearly define what activities the engineer was going to request.
-There were no references to procedures that could have been used, revised to use for this particular work evolution, or provide an outline for task specific work instructions.

-- FBP-SM-PRO-00778, Transformer Insulation Testing
-- FBP-SM-PRO-00761, Cable Insulation Testing, A very general scope of work, coupled with reliance on verbal directions from Engineering, resulted in a work document that left numerous opportunities for failure.

This event was evaluated using the Electrical Severity Measurement Tool.
Factors
- Electrical Hazard Factor: 10
- Environmental Factor: 0
- Shock Proximity Factor: 10
- Arc Flash Proximity Factor: 0
- Thermal Proximity Factor: 0
- Injury Factor: 3

Electrical Severity (ES) = (Electrical Hazard Factor) x (1 + Environment Factor + Shock Proximity1 Factor + Arc Flash Proximity1 Factor + Thermal Proximity1 Factor) x (Injury Factor)

ES = 10 x (1+0+10+0+0) x 3 = 330 (Medium Significance)

DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	Maintenance and Utility Operations
Plant Area:	Map Grid H-3
System/Building/Equipment:	X-6644 Fire Water Pump House Substation
Facility Function:	Environmental Restoration Operations
Corrective Action 01:	**Target Completion Date:**03/29/2013 **Tracking ID:**982 Develop Crew Briefing on stored electrical energy. (A3B2C01, A6B1C03) (Site Maintenance, Infrastructure, D&D Projects)
Corrective Action 02:	**Target Completion Date:**04/12/2013 **Tracking ID:**983 Flowdown crew briefing on stored electrical energy to target audience. (A3B2C01, A6B1C03) (Environmental Restoration)
Corrective Action 03:	**Target Completion Date:**04/12/2013 **Tracking ID:**984 Flowdown crew briefing on stored electrical energy to target audience. (A3B2C01, A6B1C03) (Nuclear Safety and Engineering)
Corrective Action 04:	**Target Completion Date:**04/12/2013 **Tracking ID:**985 Flowdown crew briefing on stored electrical energy to target audience. (A3B2C01, A6B1C03) (Site Maintenance, Infrastructure, D&D Projects)

Corrective Action 05:

Target Completion Date:04/12/2013	**Tracking ID:**986

Flowdown crew briefing on stored electrical energy to target audience. (A3B2C01, A6B1C03) (Waste Management)

Corrective Action 06:

Target Completion Date:04/12/2013	**Tracking ID:**987

Flowdown crew briefing on stored electrical energy to target audience (A3B2C01, A6B1C03) (Nuclear Operations)

Corrective Action 07:

Target Completion Date:04/12/2013	**Tracking ID:**988

Flowdown crew briefing on stored electrical energy to target audience. (A3B2C01, A6B1C03) (Environmental, Safety, Health, & Quality)

Corrective Action 08:

Target Completion Date:04/12/2013	**Tracking ID:**989

Flowdown crew briefing on stored electrical energy to target audience (A3B2C01, A6B1C03) (Facility Stabilization & Deactivation)

Corrective Action 09:

Target Completion Date:04/30/2013	**Tracking ID:**990

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Environmental Remediation)

Corrective Action 10:

Target Completion Date:04/30/2013	**Tracking ID:**991

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Nuclear Safety & Engineering)

Corrective Action 11:

Target Completion Date:03/19/2013	**Tracking ID:**992

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Site Maintenance, Infrastructure, D&D Projects)

Corrective Action 12:

Target Completion Date:04/30/2013	**Tracking ID:**993

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Waste Management)

Corrective Action 13:

Target Completion Date:04/30/2013	**Tracking ID:**994

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA,

and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Nuclear Operations)

Corrective Action 14:

Target Completion Date:04/30/2013	**Tracking ID:**995

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Environmental, Safety, Health, & Quality)

Corrective Action 15:

Target Completion Date:04/30/2013	**Tracking ID:**996

Develop communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI. (A4B1C01, A3B3C03, A4B3C08, A4B5C09, A4B2C07, A4B3C11, A4B3C03, A4B1C03) (Facility Stabilization & Deactivation)

Corrective Action 16:

Target Completion Date:05/31/2013	**Tracking ID:**997

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience. (A4B1C01, A4B2C07, A4B1C03) (Environmental Remediation)

Corrective Action 17:

Target Completion Date:05/31/2013	**Tracking ID:**998

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience. (A4B1C01, A4B2C07, A4B1C03) (Nuclear Safety & Engineering)

Corrective Action 18:

Target Completion Date:03/18/2013	**Tracking ID:**999

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience. (A4B1C01, A4B2C07, A4B1C03) (Site Maintenance, Infrastructure, D&D Projects)

Corrective Action 19:

Target Completion Date:05/31/2013	**Tracking ID:**1000

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience. (A4B1C01, A4B2C07, A4B1C03) (Waste Management)

Corrective Action 20:

Target Completion Date:05/31/2013	**Tracking ID:**1001

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience.

(A4B1C01, A4B2C07, A4B1C03) (Nuclear Operations)

Corrective Action 21:

Target Completion Date:05/31/2013	**Tracking ID:**1002

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience. (A4B1C01, A4B2C07, A4B1C03) (Environmental, Safety, Health, & Quality)

Corrective Action 22:

Target Completion Date:05/31/2013	**Tracking ID:**1003

Conduct briefing on communication on acceptable level of detail for work packages to ensure inclusion of specific scope, hazards, controls, a task-specific JHA, and applicable procedures/JFI to target audience. (A4B1C01, A4B2C07, A4B1C03) (Facility Stabilization & Deactivation)

Corrective Action 23:

Target Completion Date:04/19/2013	**Tracking ID:**1004

Issue Lessons Learned on this event and issue plant wide to Managers /supervision. (A4B1C01) (Environmental, Safety, Health, & Quality)

Corrective Action 24:

Target Completion Date:03/19/2013	**Tracking ID:**1005

Establish review panel(s) for moderate and high hazard work packages prior to work performance. (A4B1C01, A4B1C03) (Site Maintenance, Infrastructure, D&D Projects)

Corrective Action 25:

Target Completion Date:02/21/2013	**Tracking ID:**1006

Conduct briefing with SI&M Maintenance Managers on management expectations for conducting work safely. (A4B1C01) (Site Infrastructure & Maintenance)

Corrective Action 26:

Target Completion Date:04/30/2013	**Tracking ID:**1007

Conduct a Rolling Safety Pause in SI&M maintenance / utilities shops/cages. (A4B1C01) (Site Maintenance, Infrastructure, D&D Projects)

Corrective Action 27:

Target Completion Date:04/30/2013	**Tracking ID:**1008

Verify copies of manufacturers operating instructions are available for all test equipment on plant site. (A4B1C01, A3B3C03, A4B3C08, A4B2C07) (Site Infrastructure & Maintenance)

Corrective Action 28:

Target Completion Date:05/31/2013	**Tracking ID:**1009

Revise electrical safety training (initial and refresher) to include lessons-learned from electrical incidents and use of test instruments. (A6B1C03) (Training)

Corrective Action 29:

Target Completion Date:04/30/2013	**Tracking ID:**1010

Develop or revise a megger procedure that pertains to equipment utilized on site. (A4B5C09) (Site Infrastructure & Maintenance)

Corrective Action 30:

Target Completion Date:07/31/2013	**Tracking ID:**1011

Develop and present lateral thinking training.
- What-If scenarios
- Practice team and communication skills
- Use a devils advocate
- Practical drills (A3B3C04, A4B5C12) (Environmental, Safety, Health, & Quality)

Corrective Action 31:

Target Completion Date:07/31/2013	**Tracking ID:**1012

Present Safety Leadership Training Phase 2 to Managers / Supervisors and Safety Awareness Training to all workers. (A3B3C04, A4B5C12) (Environmental, Safety, Health, & Quality)

Corrective Action 32:

Target Completion Date:04/19/2013	**Tracking ID:**1013

Provide management expectations on how to conduct and present quality pre-job briefings. (A4B1C07) (Nuclear Safety & Engineering)

Corrective Action 33:

Target Completion Date:06/27/2013	**Tracking ID:**1014

Audit for improved quality (via review of pre-job briefing forms for improvement in level of detail provided and attendance at pre-job briefings) (A4B1C07) (Nuclear Safety & Engineering)

Corrective Action 34:

Target Completion Date:04/19/2013	**Tracking ID:**1046

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Environmental Restoration)

Corrective Action 35:

Target Completion Date:04/19/2013	**Tracking ID:**1047

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Nuclear Safety and Engineering)

Corrective Action 36:

Target Completion Date:04/19/2013	**Tracking ID:**1048

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Nuclear Safety and Engineering)

Corrective Action 37:

Target Completion Date:04/19/2013	**Tracking ID:**1049

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Waste Management)

Corrective Action 38:

Target Completion Date:04/19/2013	**Tracking ID:**1050

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Nuclear Operations)

Corrective Action 39:

Target Completion Date:04/19/2013	**Tracking ID:**1051

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Environmental, Safety, Health, & Quality)

Corrective Action 40:

Target Completion Date:04/19/2013	**Tracking ID:**1052

Evaluate and upgrade electrical test instruments as needed. Examples – replace meggers with auto discharge type, and obtain approved grounding sticks. (A4B2C07) (Facility Stabilization & Deactivation)

Corrective Action 41:

Target Completion Date:03/20/2014	**Tracking ID:**1057

Perform final effectiveness review. (Facility Stabilization & Deactivation)

Lessons(s) Learned: A Lessons Learned Bulletin is being developed and will be communicated as part of the Corrective Action Plan for this report.

HQ Keywords:
01A--Inadequate Conduct of Operations - Inadequate Conduct of Operations (miscellaneous)
01F--Inadequate Conduct of Operations - Training Deficiency
01G--Inadequate Conduct of Operations - Inadequate Procedure
01M--Inadequate Conduct of Operations - Inadequate Job Planning (Electrical)
01P--Inadequate Conduct of Operations - Inadequate Oral Communication
01R--Inadequate Conduct of Operations - Management issues
08A--OSHA Reportable/Industrial Hygiene - Electrical Shock
08D--OSHA Reportable/Industrial Hygiene - Injury
12H--EH Categories - Injuries Requiring Medical Treatment Other Than First Aid
14B--Quality Assurance - Training and Qualification Deficiency
14D--Quality Assurance - Documents and Records Deficiency
14E--Quality Assurance - Work Process Deficiency

HQ Summary: On February 7, 2013, while testing an isolated electrical transformer system in the X-6644, Fire Water Pump House Substation, a Fluor B&W electrician received a static electrical shock while using testing instrumentation on the systems high-voltage lines although the substation was isolated. The electrician had just checked the cable using a Megohmmeter and was transferring leads before the static energy had fully dissipated. The worker was transported to site Medical Services and was taken by medical helicopter to a regional hospital for assessment. At this time he is reported in good condition. Work involving Megohmmeters or any voltage inducing equipment has been paused until further notice. An independent investigation team is being formed to perform causal analysis and develop corrective actions.

Similar OR Report Number: 1. N/A

Facility Manager:

Name	Dennis Carr
Phone	(740) 897-3532
Title	Fluor-B&W/Portsmouth Site Project Director

Originator:

Name	Cade, Mark D.
Phone	(740) 897-4062
Title	SENIOR QUALITY ASSURANCE SPECIALIST

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/07/2013	11:32 (ETZ)	Fred Hughes	FBPPORTS
02/07/2013	11:59 (ETZ)	Dee Powel	DOEPORTS
02/07/2013	12:10 (ETZ)	Bill Murphy	DOEPPPO
02/07/2013	13:04 (ETZ)	Dennis Carr	FBPPORTS

Authorized Classifier(AC): Doug Fogel Date: 04/16/2013

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3)Report Number: EM--PPPO-FBP-PORTSDD-2013-0006 **After 2003 Redesign**
Secretarial Office: Environmental Management
Lab/Site/Org: Portsmouth Gaseous Diffusion Plant
Facility Name: Portsmouth Decontamination and Decommissioning
Subject/Title: Electrical Conduit found to be Energized
Date/Time Discovered: 02/13/2013 09:24 (ETZ)
Date/Time Categorized: 02/13/2013 13:30 (ETZ)
Report Type: Final
Report Dates:

Notification	02/14/2013	12:05 (ETZ)
Initial Update	02/21/2013	10:47 (ETZ)
Latest Update	04/01/2013	17:47 (ETZ)
Final	04/01/2013	17:47 (ETZ)

Significance Category: 3
Reporting Criteria: 2E(2) - Any unexpected discovery of an uncontrolled electrical hazardous energy source (e.g., live electrical power circuit, etc.). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.

Cause Codes: A1B2C06 - Design/Engineering Problem; Design output LTA; Drawing, specification or data error
A1B2C08 - Design/Engineering Problem; Design output LTA; Errors not detectable
A2B6C01 - Equipment/ material problem; Defective, Failed or Contaminated; Defective or failed part

ISM: 2) Analyze the Hazards
3) Develop and Implement Hazard Controls
5) Provide Feedback and Continuous Improvement

Subcontractor Involved: No

Occurrence Description: An instrument mechanic was performing a scheduled change of a Criticality Accident Alarm System (CAAS) cluster. The change involves disconnecting electrical connections to the cluster being changed, removing the old cluster, installing the new cluster and reconnecting the electrical connections. The CAAS cluster sits above an electric heater. After the new cluster was installed, the employee was re-connecting the heater cable to the cluster termination cabinet and contacted the outside of an electrical conduit with his elbow and experienced a tingling sensation in his left wrist, but no apparent injury or burn. A voltage check made on the outside of two conduits connected to the cluster termination cabinet revealed a voltage differential of 100 VAC. CAAS work was suspended, the Plant Shift Superintendent was notified, and the employee was taken to the plant medical facility as a precaution. The employee was evaluated at the site medical facility and returned to work without restriction. A boundary was established around the cluster location.

Cause Description: A subsequent investigation determined that (1) the cluster termination cabinet and conduit were not properly grounded, and (2) insulation on one of the circuit conductors failed. This resulted in the 120 VAC phase conductor inside the connector making contact with the metal connector housing. The result of these two conditions caused the cluster termination cabinet and the conduit to become electrically charged when the heater was plugged in and thereby causing the technician to receive a slight electrical shock. It was also noted during inspection of the heater, the Amphenol (copyright) connector on the end of the heater power cord had loosened and the end of the wire insulation showed signs of damage likely incurred at time of original heater assembly.

A review of the CAAS design drawings confirmed that neither the cluster termination cabinet nor the nitrogen horn cabinet include any provisions for grounding the enclosures. This may be due to the fact that all or most of the original CAAS installations were mounted directly on the steel building columns or attached to the steel framework and were therefore grounded to the building metal. When later CAAS installations were mounted on concrete columns and block walls, and not tied to the building steel, the lack of a compliant equipment grounding conductor was not identified or included in the installation. This resulted in the failure of the circuit overcurrent protective device from operating as designed.

A1B2C06 -- Design / Engineering Problem; Design Output LTA; Drawings, specification, or data error
A proper grounding criterion was not included on the engineering drawings used during installation of the new CAAS cabinets.

A1B2C08 -- Design/Engineering Problem, Design Output LTA, Error not Detectable.
Configuration of the ground fault path prevented the overcurrent

protection device from operating correctly (e.g. tripping the circuit breaker) which should have interrupted the circuit.

A2B6C01 -- Equipment/Material Problem, Defective, Failed, or Contaminated, Defective or Failed Part coupled with A1B4C03 - Design / Engineering Problem, Design / Installation Verification LTA, Independent Inspection of Design / Installation LTA
Inspection of the wire insulation indicated damage likely having occurred during heater assembly and failed to be identified by an inspection or oversight process.

Electrical Maintenance has inspected all CAAS unit locations to evaluate the extent of conditions. Repairs will be driven by the corrective actions listed below and completed through the Work Control process.

Operating Conditions: Normal Operations

Activity Category: Normal Operations (other than Activities specifically listed in this Category)

Immediate Action(s):
--Employee immediately stopped work.
--Supervisor was immediately notified.
--CAAS work was suspended.
--The Plant Shift Superintendent was notified.
--Employee was taken to the plant medical facility and released to return to work without restriction.
--A boundary was established around the cluster location.
--FBP Management and on-site DOE was notified.
--A Problem Report was initiated.
--An Occurrence Report was initiated.
--Maintenance performed an analysis, replaced defective part and put the cluster back into operation.
--A Fact Finding meeting was held.

FM Evaluation: Maintenance performed an analysis, replaced defective part and put the cluster back into operation. During the evaluation, it was determined additional investigation was needed to prevent recurrence.

This event was evaluated using the Electrical Severity Measurement Tool.
Factors
Electrical Hazard Factor: 10
Environmental Factor: 0
Shock Proximity Factor: 10
Arc Flash Proximity Factor: 0
Thermal Proximity Factor: 0
Injury Factor: 3

Electrical Severity (ES) = (Electrical Hazard Factor) x (1 + Environment Factor + Shock Proximity Factor + Arc Flash Proximity Factor + Thermal

	Proximity Factor) x (Injury Factor) ES = 10 x (1+0+10+0+0) x 3 = 330 (Medium Significance)
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	Site Maintenance, Infrastructure & D&D Projects
Plant Area:	E5
System/Building/Equipment:	X-333 -- Criticality Accident Alarm System (CAAS)
Facility Function:	Environmental Restoration Operations
Corrective Action 01:	**Target Completion Date:**05/30/2013 **Tracking ID:**1036 Provide design criteria for permanent grounding configuration for CAAS cabinets. (A1B2C06)
Corrective Action 02:	**Target Completion Date:**01/31/2014 **Tracking ID:**1037 Install permanent grounding per engineering design during scheduled CAAS Surveillances. (A1B2C08)
Corrective Action 03:	**Target Completion Date:**04/30/2013 **Tracking ID:**1038 Revise procedure and/or CAAS Surveillance Work Package to include inspection of the Amphenol (copyright) Connector integrity. (A2B6C01 and A1B4C03)
Corrective Action 04:	**Target Completion Date:**02/14/2013 **Tracking ID:**1039 Conduct Extent of Condition to identify all CAAS Units with similar grounding issues.
Lessons(s) Learned:	Providing an effective ground fault path is essential to proper operation of electrical safety components and ensuring worker safety. Attention to detail when assembling electrical components will minimize risk of equipment failure that could lead to worker injury.
HQ Keywords:	01B--Inadequate Conduct of Operations - Loss of Configuration Management/Control 01G--Inadequate Conduct of Operations - Inadequate Procedure 07D--Electrical Systems - Electrical Wiring 08A--OSHA Reportable/Industrial Hygiene - Electrical Shock 11F--Other - Inadequate Design 12C--EH Categories - Electrical Safety 14D--Quality Assurance - Documents and Records Deficiency 14E--Quality Assurance - Work Process Deficiency 14F--Quality Assurance - Design Deficiency

HQ Summary: On February 13, 2013, an instrument mechanic received a minor electrical shock while changing out a Criticality Accident Alarm System (CAAS) cluster. He experienced a tingling sensation in his left wrist when his elbow touched the outside of an electrical conduit while re-connecting a heater cable to the cluster termination cabinet. There was no apparent injury or burn. A voltage check on the outside of two conduits connected to the cluster termination cabinet revealed a voltage differential of 100 VAC. A boundary was established around the cluster location. The instrument mechanic was evaluated at the site medical facility and returned to work without restriction. Maintenance performed an analysis, replaced a defective part, and put the cluster back into operation.

Similar OR Report Number: 1. None noted.

Facility Manager:

Name	Dennis Carr
Phone	(740) 897-3532
Title	Fluor-B&W/Portsmouth Site Project Director

Originator:

Name	Cade, Mark D.
Phone	(740) 897-4062
Title	SENIOR QUALITY ASSURANCE SPECIALIST

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/13/2013	13:30 (ETZ)	Dennis Carr	PORTSFBP
02/13/2013	13:31 (ETZ)	Fred Hughes	PORTSFBP
02/13/2013	15:20 (ETZ)	Tony Takacs	DOEPORTS

Authorized Classifier(AC): Gary K. Salyers Date: 02/21/2013

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4)Report Number: EM--PPPO-FBP-PORTSDD-2013-0008 **After 2003 Redesign**
Secretarial Office: Environmental Management
Lab/Site/Org: Portsmouth Gaseous Diffusion Plant
Facility Name: Portsmouth Decontamination and Decommissioning
Subject/Title: Near Miss -- X-608 Exploratory Excavation Contacts Electrical Wires
Date/Time Discovered: 02/18/2013 13:30 (ETZ)
Date/Time Categorized: 02/19/2013 12:53 (ETZ)
Report Type: Update
Report Dates:

Notification	02/19/2013	18:42 (ETZ)
Initial Update	03/27/2013	14:35 (ETZ)
Latest Update	04/30/2013	11:03 (ETZ)
Final		

Significance Category:	3
Reporting Criteria:	10(3) - A near miss to an otherwise ORPS reportable event, where something physically happened that was unexpected or unintended, or where no or only one barrier prevented an event from having a reportable consequence. The significance category assigned to the near miss must be based on an evaluation of the potential risks and extent of personnel exposure to the hazard. (1 of 3 criteria - This is a SC 3 occurrence)
Cause Codes:	
ISM:	2) Analyze the Hazards 3) Develop and Implement Hazard Controls 4) Perform Work Within Controls
Subcontractor Involved:	No
Occurrence Description:	On 02/18/13, at 1330 hours during an exploratory excavation at the X-608A well-field, a backhoe bucket contacted two underground power cables, slightly damaging the cables (insulation was damaged and exposing bare wire). The cables were believed to be de-energized under a Lock-Out/Tag-Out issued for the purpose of protecting personnel during this excavation. There was no evidence of electrical arcing at the site of the two damaged cables, supporting the position they were, in fact, de-energized. An Excavation Permit and sub site survey were previously performed which noted the presence of these cables in the area, but did not specify an exact location. A third unidentified underground power cable was also discovered in the excavation and was not damaged during this incident. This third cable was believed to be de-energized but was not verified through the LOTO process.
Cause Description:	
Operating Conditions:	Well field -- 2 miles from the Portsmouth Site consisting of open fields
Activity Category:	Construction
Immediate Action(s):	--Implemented pause on all excavations across the site. --The site of the excavation was marked and backfilled in order to prevent cables from being exposed and the excavation left open overnight in an uncontrolled area. --A Problem Report was submitted. --An Occurrence Report was initiated. --A Fact finding meeting was conducted. --Compensatory measures were identified and are being implemented.
FM Evaluation:	04/30/2013 -- The investigation of this incident is ongoing; additional time is required for its completion and development of an approved corrective action plan. The final report will be submitted on or before June 14, 2013. 03/27/2013 -- Extending final ORPS entry date to 4/30/2013. Investigation is ongoing. Additional time is necessary to complete development of causal analysis report and corrective action plan.

	02/19/2013 -- Yes – compensatory actions will be implemented prior to restart of excavation activities. Further immediate corrective actions have been identified and are being implemented.
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	Yes. Before Further Operation? Yes By Whom: Greg Wilkett. By When: 06/14/2013
Division or Project:	Site Maintenance, Infrastructure, D&D
Plant Area:	Offsite
System/Building/Equipment:	X-608 Well-Field
Facility Function:	Environmental Restoration Operations
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01B--Inadequate Conduct of Operations - Loss of Configuration Management/Control 07D--Electrical Systems - Electrical Wiring 08F--OSHA Reportable/Industrial Hygiene - Industrial Operations Issues 08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical) 12G--EH Categories - Industrial Operations 14D--Quality Assurance - Documents and Records Deficiency 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On February 18, 2013, during an exploratory excavation at the X-608A well-field, a backhoe bucket contacted two underground power cables, slightly damaging the cables (insulation was damaged and exposing bare wire). The cables were believed to be de-energized under a Lockout/Tagout (LOTO). There was no evidence of electrical arcing at the site of the two damaged cables, supporting the position they were, in fact, de-energized. An Excavation Permit and sub site survey were previously performed which noted the presence of these cables in the area, but did not specify an exact location. A third unidentified underground power cable was also discovered in the excavation and was not damaged during this incident. This third cable was believed to be de-energized but was not verified through the LOTO process. Work on all excavations across the site was paused.
Similar OR Report Number:	
Facility Manager:	

Name	Dennis Carr
Phone	(740) 897-3532
Title	Fluor-B&W/Portsmouth Site Project Director

Originator:

Name	BOOK, JACKIE
Phone	(740) 897-2569
Title	QUALITY PROGRAMS COORDINATOR

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/19/2013	14:30 (ETZ)	Fred Hughes	PORTSFBP
02/19/2013	14:37 (ETZ)	Tony Takacs	DOEPORTS
02/19/2013	16:28 (ETZ)	Dennis Carr	PORTSFBP
02/19/2013	16:55 (ETZ)	Bill Murphie	DOEPPPO

Authorized Classifier(AC): Doug Fogel Date: 04/30/2013

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5)Report Number: EM-RL--CPRC-SNF-2013-0002 **After 2003 Redesign**

Secretarial Office: Environmental Management

Lab/Site/Org: Hanford Site

Facility Name: Spent Nuclear Fuels Project

Subject/Title: Improper Selection of an Eight Criteria Checklist Versus Tagout Authorization Form During Preparation for Lockout/Tagout at K West Basin

Date/Time Discovered: 02/13/2013 14:25 (PTZ)

Date/Time Categorized: 02/13/2013 14:25 (PTZ)

Report Type: Notification/Final

Report Dates:

Notification	02/14/2013	18:49 (ETZ)
Initial Update	02/14/2013	18:49 (ETZ)
Latest Update	02/14/2013	18:49 (ETZ)
Final	02/14/2013	18:49 (ETZ)
Revision 1	02/19/2013	15:42 (ETZ)

Significance Category: 4

Reporting Criteria: 2E(3) - Any failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout, hazardous energy control program).

Cause Codes:

ISM: 2) Analyze the Hazards

Subcontractor Involved: No

Occurrence Description: On 2/11/13, while performing a pre-job walk-down of the approved 8 criteria checklist to troubleshoot a potential wiring issue, it was identified that the single-point isolation designated as part of the preparation of the 8 criteria checklist may not be adequate to justify the use of the 8 criteria

	checklist. This was deemed a reportable occurrence following the evaluation of the information gathered from the pre-job briefing and reviewed on 2/13/13.
Cause Description:	
Operating Conditions:	Pre-job walk down was underway to verify lockout tagout for a potential wiring issue.
Activity Category:	Normal Operations (other than Activities specifically listed in this Category)
Immediate Action(s):	The walk down was stopped. The event was investigated, and a critique was scheduled.
FM Evaluation:	The facility was confirmed to be in a safe configuration with no hazard present to workers, the facility, or the environment.
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	CHPRC/D&D/100K Area
Plant Area:	100K Area
System/Building/Equipment:	Lockout/Tagout at 105KW Basin
Facility Function:	Nuclear Waste Operations/Disposal
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 12I--EH Categories - Lockout/Tagout (Electrical or Mechanical) 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On February 11, 2013, personnel performing a pre-job walk-down of an approved 8 criteria checklist to troubleshoot a potential wiring issue, identified that the single-point isolation designated as part of the preparation of the 8 criteria checklist may not be adequate to justify the use of the 8 criteria checklist. The walk down was stopped. The event was investigated, and a critique was scheduled.
Similar OR Report Number:	1. None.

Facility Manager:

Name	J. D. Mathews
Phone	(509) 373-4598
Title	Director, STP 100K Operations

Originator:

Name	FEIL, RHONDA K
Phone	(509) 373-4551

Title	ADMINISTRATIVE SPECIALIST

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/13/2013	14:25 (PTZ)	J. D. Mathews	CPRC/D&D
02/13/2013	14:25 (PTZ)	D. H. Splett	RL/OOD

Authorized Classifier(AC):

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6)Report Number: NA--LASO-LANL-PHYSTECH-2013-0004 **After 2003 Redesign**
Secretarial Office: National Nuclear Security Administration
Lab/Site/Org: Los Alamos National Laboratory
Facility Name: Physical and Technical Supt.
Subject/Title: Electrical Work Performed Without Required Personal Protective Equipment
Date/Time Discovered: 02/12/2013 16:00 (MTZ)
Date/Time Categorized: 02/12/2013 16:15 (MTZ)
Report Type: Notification/Final
Report Dates:

Notification	02/14/2013	18:44 (ETZ)
Initial Update	02/14/2013	18:44 (ETZ)
Latest Update	02/14/2013	18:44 (ETZ)
Final	02/14/2013	18:44 (ETZ)

Significance Category: 4
Reporting Criteria: 2E(3) - Any failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout, hazardous energy control program).

Cause Codes:
ISM: 2) Analyze the Hazards
Subcontractor Involved: No
Occurrence Description: MANAGEMENT SYNOPSIS

On February 8, 2013, at 1400, at Technical Area 3 Building 440, while Maintenance and Site Services (MSS) electricians were responding to an emergency work ticket, the MSS electrical supervisor observed an electrician (E1) performing electrical work without personal protective equipment (PPE). MSS electricians were responding to an unplanned shut down of a heating, ventilation, and air-conditioning (HVAC) unit that supports the building's computer room.

E1 began troubleshooting the electrical disconnect with a volt-meter without wearing the required PPE. The MSS electrical supervisor directed

	a pause work and removed the worker from the area. The MSS supervisor assigned another electrician (E2) to the task. The supervisor verified that E2 had appropriate PPE and E2 resumed with troubleshooting task. The cause of the unplanned shut down of the HVAC unit was determined to be due to a freeze stat which was replaced and the HVAC unit was placed back in service. On February 12, 2013, at 1600, the Utilities and Institutional (UI) Facilities Operations Director (FOD) became aware of the event and categorized the event as Group 2, subgroup 2E, Hazardous Electrical Energy Control (3), significance category 4. On February 13, 2013, at 1530, a critique was convened and initial categorization remained.
Cause Description:	
Operating Conditions:	Normal
Activity Category:	Normal Operations (other than Activities specifically listed in this Category)
Immediate Action(s):	1) Maintenance and Site Services Supervisor removed worker from the area.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	Maintenance and Site Services
Plant Area:	TA-3 Building 440
System/Building/Equipment:	TA-3 Building 440 HVAC Unit
Facility Function:	Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01E--Inadequate Conduct of Operations - Operations Procedure Noncompliance 01M--Inadequate Conduct of Operations - Inadequate Job Planning (Electrical) 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 12C--EH Categories - Electrical Safety 14E--Quality Assurance - Work Process Deficiency
HQ Summary:	On February 8, 2013, a Maintenance and Site Services (MSS) electrical supervisor observed an electrician begin troubleshooting an electrical disconnect with a voltmeter without wearing the required personal

protective equipment. MSS electricians were responding to an unplanned shut down of a heating, ventilation, and air-conditioning (HVAC) unit that supports the building's computer room. The supervisor removed the electrician from the area. A critique was conducted.

Similar OR Report Number:

Facility Manager:

Name	Pete Rice
Phone	(505) 231-5833
Title	UI Deputy Facilities Operations Director

Originator:

Name	GARCIA, CELINA H
Phone	(505) 606-1815
Title	OCCURRENCE INVESTIGATOR

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/12/2013	17:30 (MTZ)	NOTIFICATION LINE	NNSA

Authorized Classifier(AC): Kimberli Tanner Date: 02/14/2013

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7)Report Number: NA--LASO-LANL-TA55-2013-0006 **After 2003 Redesign**

Secretarial Office: National Nuclear Security Administration

Lab/Site/Org: Los Alamos National Laboratory

Facility Name: Plutonium Proc & Handling Fac

Subject/Title: Unexpected Discovery of Electrical Hazardous Energy; Employee Saw an Arc When Flex Conduit Feeding a Light Fixture was Moved

Date/Time Discovered: 02/22/2013 13:40 (MTZ)

Date/Time Categorized: 02/22/2013 14:45 (MTZ)

Report Type: Final

Report Dates:

Notification	02/26/2013	15:51 (ETZ)
Initial Update	04/04/2013	16:08 (ETZ)
Latest Update	05/14/2013	14:24 (ETZ)
Final	05/14/2013	14:24 (ETZ)

Significance Category: 3

Reporting Criteria: 10(2) - An event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern for that facility or other facilities or activities in the DOE complex.
The significance category assigned to the management concern should be based on an evaluation of the potential risks and impact on safe operations.

(1 of 4 criteria - This is a SC 3 occurrence)

Cause Codes: A2B1C02 - Equipment/ material problem; Calibration for Instruments Less Than Adequate (LTA); Equip. found outside acceptance criteria
A3B1C03 - Human Performance Less Than Adequate (LTA); Skill Based Errors; Incorrect performance due to mental lapse
-->couplet - NA
A4B1C01 - Management Problem; Management Methods Less Than Adequate (LTA); Management policy guidance / expectations not well-defined, understood or enforced

ISM: 4) Perform Work Within Controls

Subcontractor Involved: Yes
Yearout Mechanical Inc. & Pueblo Electric

Occurrence Description: MANAGEMENT SYNOPSIS: On Friday, February 22, 2013, at approximately 1340, at Technical Area 55, Building 400 (TA-55-400), a Yearout Mechanical Inc., employee (E1) working above the ceiling in preparation for plumbing work noticed an arc at an electrical junction box when a flexible conduit attached to the box moved. The flexible electrical conduit was under a piece of plywood that had been placed over several ceiling supports for use as a work platform. The conduit moved while E1 was on the platform. Inspection of the flexible conduit after the incident indicated there was no slack in the conduit and it was attached to the junction box at a sharp angle. E1 was not affected by the arc and the circuit breaker did not trip. The TA55 Facilities Operations Director (FOD) and the Radiological Lab Utility Office Building (RLUOB) Operations Manager were notified and the event was declared ORPS reportable, Significance Category 3.

BACKGROUND: The plumbing activities related to the relocation of a safety shower in the first floor laboratories of TA55-400 were planned to take place February 22, 2013. Part of this task involved activities in the ceiling. A plywood platform was put in place to span the ceiling on which to work. A second worker with Yearout (E2) was holding the ladder used to access the ceiling. The Yearout Foreman was also present in the room along with the required LANL personnel escort. E1 was prepping the insulation prior to the demolition required for the shower relocation. E1 noticed an arc at a nearby junction box at the joint where the flexible conduit was attached to the box. He immediately paused work and informed E2, who asked if he was unharmed. E1 had no contact with the arc, was unharmed, and exited the above ceiling area. Notifications to the Foreman and LANL personnel, including the building Operations Center (OC), were made immediately.

A LANL Electrical Safety Officer (ESO) reported to the scene to review the site and ensure safe configuration. She noted the related breaker had not tripped. The flexible conduit had been installed at a sharp angle to the

junction box with no slack and was not secured within in a foot of the connection. This flexible conduit and junction box had been installed some months prior by the subcontractor Pueblo Electric, who were no longer working on this building and project. The circuit breaker for the conduit was identified, de-energized, and locked and tagged out.

A critique was held on Monday, February 25, 2013, at which time the ORPS categorization was reviewed and the categorization from February 22 held. A second ESO was on hand to review the findings of the LANL electrical severity tool. The RLUOB ESOs believe that when E1 moved on the plywood, which was laid across the flexible conduit, the metal clad (MC) cable in the junction box connector moved, which caused a short circuit. Then E1 saw the arc flash and his natural startle response caused slight movement on the plywood, and hence slight movement of the flexible conduit, which in turn caused the MC cable to move, which cleared the fault before the breaker could trip. According to the second ESO, the arc was mostly contained in the 277 volt junction box and the connection with only a small amount of discoloration on the outside of the MC cable. The LANL Chief ESO categorized this event as zero on the electrical severity tool based on the distance of E1 from the arc and the fact the arc was mostly contained. Additionally, E1 was on wood, a non-conductive material.

Cause Description:

ISM SUMMARY: In this event, the connection of the flexible conduit to the junction box was completed at a sharp angle, with no slack, and without securing the conduit within one foot of the connection, indicating that Step 4 Perform Work Within Controls could use strengthening.

The FOD assessed the need for an Extent of Condition (EOC) in accordance with DOE Order 232.2 and determined that one was not warranted for this event.

INVESTIGATIVE METHODOLOGY:

Causal analysis and the DOE Causal Analysis Tree as described in the DOE Occurrence Reporting Causal Analysis Guide (DOE G 231.1-2) were used to identify the causes for this event. Apparent causes are identified as the most probable causes of an event or condition that management has the control to fix and for which effective recommendations for corrective actions can be generated.

CAUSAL ANALYSIS:

Apparent Direct Cause:
The small arc occurred when the flexible conduit to the junction box, which was under E1 and his plywood platform, moved [A2B1C02 equipment found outside acceptable criteria].

	Apparent Root Cause: The junction box and flexible conduit were installed by the subcontractor Pueblo Electric several weeks prior to this event. The flexible conduit was installed with no slack and at a sharp angle [A3B1C03 Incorrect performance due to mental lapse]. Apparent Contributory Causes: If it were necessary to install the flexible conduit at a sharp angle and with no slack, the conduit could have been secured within one foot of the connection, greatly decreasing the possibility for such an event [A3B1C03 Incorrect performance due to mental lapse]. The inspections of the installation did not catch and correct this situation [A4B1C01 Management follow-up or monitoring of activities did not identify problem].
Operating Conditions:	Plumbing activities for safety shower relocation
Activity Category:	Construction
Immediate Action(s):	1) Work was paused. 2) The TA-55-400 OC was notified. 3) The circuit breaker for the conduit was identified, de-energized, and locked and tagged out. 4) The event was declared ORPS reportable on February 22, 2013. 5) A critique was held on Monday, February 25, 2013, the first working day after the event. 6) The Electrical Hazard Factor (EHF) and the Electrical Shock (ES) are zero according to the electrical severity tool calculations. 7) Recatergorize as 10 #2 SC based on electrical severity of zero. Based on zero ranking the ORPS categorization is incorrectly identified.
FM Evaluation:	Minor impact on facility operations.
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	TA55-RLW
Plant Area:	TA-55
System/Building/Equipment:	TA-55-400
Facility Function:	Plutonium Processing and Handling
Corrective Action 01:	**Target Completion Date:**05/14/2013 / **Actual Completion Date:**05/14/2013 REVISION OR EXTENSION OF THIS ACTION REQUIRES FACILITY OPERATIONS DIRECTOR APPROVAL.

Title: Remove plywood and replace metal clad conductor for light
Action: Perform plywood removal and replace light to light conductor that was damaged
Deliverable: Proof of removal and conductor replacement
Responsible Organization: MSS-RLW
Target Due Date: 6/1/13

See PFITS Issue 2013-597 for action closure and objective evidence.

This action addresses cause code(s) A2B1C02, A3B1C03

NOTE: This action has been closed in ORPS based on the documented completion of the Performance Feedback Improvement Tracking entry.

Corrective Action 02:

Target Completion Date:05/14/2013	**Actual Completion Date:**05/14/2013

REVISION OR EXTENSION OF THIS ACTION REQUIRES FACILITY OPERATIONS DIRECTOR APPROVAL.

Title: Standard IWD language for work in overhead areas of RLUOB
Action: Evaluate adding standard IWD language for work in overhead areas of RLUOB describing layout of metal clad electrical conductors and precautions to be taken
Deliverable: Standard IWD language being added to RLUOB IWD for these overhead areas
Responsible Organization: MSS-RLW
Target Due Date: 6/1/13

See PFITS Issue 2013-597 for action closure and objective evidence.

This action addresses cause code(s) A4B1C01

NOTE: This action has been closed in ORPS based on the documented completion of the Performance Feedback Improvement Tracking entry.

Lessons(s) Learned: NA

HQ Keywords:
01S--Inadequate Conduct of Operations - Incorrect/Inadequate Installation
07D--Electrical Systems - Electrical Wiring
08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical)
11G--Other - Subcontractor
12C--EH Categories - Electrical Safety
14E--Quality Assurance - Work Process Deficiency
14G--Quality Assurance - Procurement Deficiency

HQ Summary: On February 22, 2013, a subcontractor noticed an arc at an electrical junction box when a flexible conduit attached to the box moved while working above the ceiling in preparation for water pipe layout at Technical Area 55, Building 400 (TA-55-400). The flexible electrical conduit was

under a piece of plywood the subcontractor placed as a work platform and moved while he was on the platform. There was no slack in the conduit and it was attached to the junction box at a sharp angle. The subcontractor was not affected by the arc and the circuit breaker did not trip. The circuit breaker for the conduit was identified, de-energized, and locked and tagged out.

Similar OR Report Number: 1. DP-ALO-AO-BWP-PANTEX-2003-0005

Facility Manager:

Name	Charles Tesch
Phone	(505) 606-0576
Title	Operations Manger

Originator:

Name	VOSS, SUSAN J
Phone	(505) 667-5979
Title	OCCURRENCE INVESTIGATOR

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/22/2013	15:20 (MTZ)	Ron Fontana	LAFO/FR

Authorized Classifier(AC): Susan J. Voss Date: 05/14/2013

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8)Report Number: NA--LSO-LLNL-LLNL-2013-0006 **After 2003 Redesign**
Secretarial Office: National Nuclear Security Administration
Lab/Site/Org: Lawrence Livermore National Lab.
Facility Name: Lawrence Livermore Nat. Lab. (BOP)
Subject/Title: Wire repaired without LOTO on tripped breaker in Building 490
Date/Time Discovered: 02/27/2013 10:00 (PTZ)
Date/Time Categorized: 02/27/2013 12:00 (PTZ)
Report Type: Notification/Final
Report Dates:

Notification	02/28/2013	19:33 (ETZ)
Initial Update	02/28/2013	19:33 (ETZ)
Latest Update	02/28/2013	19:33 (ETZ)
Final	02/28/2013	19:33 (ETZ)

Significance Category: 4
Reporting Criteria: 2E(3) - Any failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout, hazardous energy control program).

Cause Codes:
ISM: 3) Develop and Implement Hazard Controls

Subcontractor Involved:	Yes Gowan
Occurrence Description:	On 2/27/13 a subcontractor was removing a compression fitting on the outside of a 208/120 junction box in B490 R1444. A live insulated wire with no splicing was inadvertently pinched by a tool which caused the breaker to trip. The repair was performed to the wire while the breaker was tripped but without LOTO control on the circuit being repaired. NIF&PS Management was informed, work was paused and an investigation initiated. This occurrence report is being tracked in LLNL's Issues Tracking System, reference Assessment No. 35762.
Cause Description:	
Operating Conditions:	Normal
Activity Category:	Normal Operations (other than Activities specifically listed in this Category)
Immediate Action(s):	Work was paused and an investigation initiated.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	NIF & PS
Plant Area:	Site 200
System/Building/Equipment:	N/A
Facility Function:	Laboratory - Research & Development
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical) 08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance 08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical) 11G--Other - Subcontractor 12I--EH Categories - Lockout/Tagout (Electrical or Mechanical) 14E--Quality Assurance - Work Process Deficiency 14G--Quality Assurance - Procurement Deficiency
HQ Summary:	On February 27, 2013, a subcontractor repaired a wire after a breaker tripped without implementing lockout/tagout control of the circuit in B490 R1444. The subcontractor repaired the wire after inadvertently pinching the energized wire with a tool when he removed a compression fitting on the outside of a 208/120 junction box, causing the breaker to trip.

Management paused work and initiated an investigation.

Similar OR Report Number:

Facility Manager:

Name	Valerie Roberts
Phone	(925) 424-3662
Title	NIF&PS Deputy Principal Associate Director

Originator:

Name	LUDWIG, MARK E.
Phone	(925) 422-6964
Title	OCCURRENCE REPORTING OFFICER

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/27/2013	12:10 (PTZ)	Joel Bowers	LEDO
02/27/2013	12:17 (PTZ)	Tracey Simpson	ESH TL

Authorized Classifier(AC): Lydia Hunt Date: 02/27/2013

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9)Report Number: NA--YSO-BWXT-Y12SITE-2013-0006 **After 2003 Redesign**
Secretarial Office: National Nuclear Security Administration
Lab/Site/Org: Y12 National Security Complex
Facility Name: Y-12 Site
Subject/Title: Exceeding Job Scope Results in Work Outside of Lockout/Tagout Control
Date/Time Discovered: 02/12/2013 09:05 (ETZ)
Date/Time Categorized: 02/12/2013 10:05 (ETZ)
Report Type: Final
Report Dates:

Notification	02/14/2013	15:36 (ETZ)
Initial Update	03/27/2013	13:51 (ETZ)
Latest Update	03/27/2013	13:51 (ETZ)
Final	03/27/2013	13:51 (ETZ)

Significance Category: 3
Reporting Criteria: 2E(2) - Any unexpected discovery of an uncontrolled electrical hazardous energy source (e.g., live electrical power circuit, etc.). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.

Cause Codes: A3B3C03 - Human Performance Less Than Adequate (LTA); Knowledge Based Error; Individual justified action by focusing on biased evidence -->couplet - NA
A4B1C01 - Management Problem; Management Methods Less Than Adequate (LTA); Management policy guidance / expectations not well-

defined, understood or enforced
A5B2C08 - Communications Less Than Adequate (LTA); Written Communication Content LTA; Incomplete / situation not covered

ISM: 2) Analyze the Hazards
4) Perform Work Within Controls

Subcontractor Involved: No

Occurrence Description: On February 12, 2013 an investigation team including NNSA Production Office Electrical Subject Matter Expert, Atomic Trades and Labor Council Safety Representative, Y-12 Electrical Inspector, Y-12 Electrical Authority Having Jurisdiction (AHJ), Y-12 Electrical Engineering Representative, Y-12 Photography, and Y-12 Electricians were sent to investigate the cause of unexpected voltage presence being found in a receptacle from a recently released Lockout/Tagout (LOTO). The investigation team determined that an electrician had inadvertently put a previously cut nonmetallic sheathed cable (e.g. Romex) from a different job into the junction box being utilized for the newly installed receptacle in question. The cable ends were terminated with wire nuts and fed by a breaker that was turned off, but not covered by the LOTO.

Background:
On December 19, 2012 a work order was created to replace electrical receptacles in an office space area being upgraded with new work stations. Since there were neither verified drawings nor an approved method to verify energy sources, the work package was reviewed by the Senior Review Board (SRB) and a deliberate method to verify hazardous energy before starting work was approved. This SRB approved LOTO method was applied on January 30, 2013, and work activities began to replace the electrical receptacles. The electricians performed absence of voltage checks at each appropriate interval established by site procedures and were not in contact with hazardous energy while performing any work. This job was worked periodically with multiple electrical craft personnel until activities to replace receptacles were completed on February 7, 2013.

On February 7, 2013, the LOTO permit was being released while performing a post work test (PWT) activity when the electrician performing the PWT experienced problems identifying the power source for one of the newly installed receptacles. The worker stopped the PWT, ensured that the circuits were left in a safe position, and notified his supervisor of a potential problem as well as the need for additional manpower and equipment to investigate the issue. The worker was time constrained due to a previously scheduled walkdown. The supervisor planned for work to resume the following work day with additional personnel.

On February 11, 2013, the PWT was resumed and the anomaly with the receptacle and circuit was confirmed. Work was suspended and a Work Team Investigation (WTI) was convened to review the work progression.

The WTI identified two possible scenarios that included a failed breaker or the inadvertent use of a 110-volt circuit not previously included or identified in the LOTO. An additional work package was developed to investigate the two possible scenarios identified by the WTI on February 12, 2013. An investigation team carried out this work package and determined the source of power was not a part of the original LOTO.

Cause Description: A Why Staircase model was utilized to facilitate the analysis.

What is the immediate problem?
A newly installed receptacle could not be identified for labeling by cycling the circuit breakers associated with the work package LOTO.

Why?
The receptacle was being powered from a circuit breaker that was not listed in the scope of the approved job LOTO.

Why?
One of the electricians connected the receptacle wiring to a power cable that was lying on the suspended ceiling that was not included in the original LOTO scope.

Why?
The cable was adjacent to other cables that were a part of the LOTO scope and had been isolated and left on the ceiling grid for reconnection when the new receptacles were installed. It was the same size and color as the LOTO isolated cables, and the end was capped with wire nuts in the same manner.

Why was the wrong cable selected?
None of the cables were labeled or otherwise marked to indicate the circuit breaker they were connected to.

Why?
The electrician did not believe there was a need to mark the cables because they were going to be reconnected to the new receptacles and the existence of other similar cables in the area was not realized.

Proof Check: Would correcting the final "Why" have eliminated the problem?
Had the cables been labeled or marked when they were disconnected, they would have been identified as the cables to use when they were reconnected to the new receptacles. If a cable had been discovered that was not marked, it would not have been used because it was not a part of the LOTO that supported the work activity.

Causes identified:
A3-B3-C03; Human Performance LTA (less than adequate); Individual

	justified action by focusing on biased evidence (electrician did not expect additional loose cables in the ceiling). A4-B1-C01; Management Problem; Management policy guidance / expectations not well-defined, understood or enforced (marking of cables or circuits removed for reuse during the same work activity has not been required). A5-B2-C08; Communications LTA; Incomplete / situation not covered (no written guidance in the work control process as to when marking is required). Extent of Conditions (EOC) Review: The EOC review determined that this condition could occur anywhere FI&S performs electrical work at the Y-12 Site. A change in the work control program is needed to ensure corrective actions are enduring.
Operating Conditions:	The facility was operating normally.
Activity Category:	Maintenance
Immediate Action(s):	- Work Suspended - Appropriate Notification Made
FM Evaluation:	When the LOTO was performed for this renovation activity, the circuits were correctly identified and controlled at the power panel with locking devices. The electricians who performed the LOTO and initial electrical demolition did not see the need to label the disconnected cables that were capped with wire nuts and temporarily left lying on the ceiling grid above the work area. They planned to reuse them to feed the newly installed receptacles once the old conduit was removed and the new receptacles were installed at the required locations. The complete work activity took place over the course of a week and different electrical personnel worked on the job at various times. Because the area above the suspended ceiling is a limited access area to reduce potential exposure to hazardous substances, the presence of the additional unmarked cable was not noted by the electricians when the circuits were reconnected at the end of the work activity. By instituting a labeling requirement for this type of activity through the work order/work instruction process, circuits for reuse will be clearly identified and an event similar to this one can be avoided. As a best management practice, all the circuits in the subject electrical panel will be traced and labeled during the next scheduled building outage. All circuit terminations will be verified to be in appropriate junction boxes, or junction boxes will be added where needed.
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	FI&S

Plant Area: Property Protection

System/Building/Equipment: Bldg 9737

Facility Function: Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)

Corrective Action 01:

Target Completion Date:04/04/2013	**Tracking ID:**003

Review the need to enhance work package detail content as it relates to the removal and replacement of electrical components. This should include making "one-line" sketches, labeling circuits and terminated wiring, and providing additional guidance on the level of project details.

Closure Evidence: The results of the review and any action taken to revise the work control program.

Causes Addressed: A4-B1-C01; A5-B2-C08
NOTE: This Action was completed but has been included to capture closure evidence. The work package planner template was revised to include marking requirements written into the work package on 02/24/2013.

Corrective Action 02:

Target Completion Date:04/04/2013	**Tracking ID:**004

Determine if all FIS electricians are current in the "2011 NEC code requirement" update class. If any are found not current, schedule them for the next available class.

Closure Evidence: The results of the review and confirmation that any electricians found deficient have been scheduled to attend the class.

Cause Addressed: A3-B3-C03, A4-B1-C01
NOTE: This Action was completed but has been included to capture closure evidence. The NEC 2011 code update is a part of the 2012 site "HEAT" training and all electricians were confirmed to be current.

Corrective Action 03:

Target Completion Date:05/23/2013	**Tracking ID:**005

Prepare and execute a work package for the subject electrical panel to: 1) verify terminations are in junction boxes, 2) circuits are traced back to breaker and appropriately labeled, and 3) as-found conditions photographed.

Closure Evidence: A copy of the first page of the completed Work Order showing the work has been completed (TECO status).

Cause Addressed: A4-B1-C01

Corrective Action 04:

Target Completion Date:05/23/2013	**Tracking ID:**006

Prepare and distribute a Y-12 Site Lessons Learned (LL) discussing the conditions leading up to this incident and the good work practices of

labeling circuits and wiring when removing from service, making "one-line" sketches of current and planned installation configurations, and the importance of documenting work completed at the end of each shift so the next assigned craft will know what job tasks have been completed and what still needs to be worked.

Closure Evidence: A copy of the issued LL showing site-wide distribution.

Cause Addressed: A3-B3-C03

Corrective Action 05:

Target Completion Date:09/12/2013	**Tracking ID:**090

Evaluate the effectiveness of the response actions taken by reviewing a sample of planned work packages that include electrical work to determine if: circuit and/or terminated wiring labeling is addressed; the need for "one-line" sketches has been evaluated; the level of project detail is sufficient. If possible, review in-progress work and interview electrical personnel to ascertain their knowledge of the need for labeling circuits and terminated wiring when they are being removed as part of an activity.

Closure Evidence: The results of the evaluation including packages reviewed, personnel interviewed, and the disposition of any follow-on concerns identified.

Lessons(s) Learned:

When performing a demolition activity where electrical circuits are planned for reuse, the circuits/cables need to be labeled at the termination points to ensure they are readily identifiable when they are later selected for reconnection.

HQ Keywords:

01A--Inadequate Conduct of Operations - Inadequate Conduct of Operations (miscellaneous)
01B--Inadequate Conduct of Operations - Loss of Configuration Management/Control
01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical)
01M--Inadequate Conduct of Operations - Inadequate Job Planning (Electrical)
01Q--Inadequate Conduct of Operations - Personnel error
01R--Inadequate Conduct of Operations - Management issues
08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance
12I--EH Categories - Lockout/Tagout (Electrical or Mechanical)
14D--Quality Assurance - Documents and Records Deficiency
14E--Quality Assurance - Work Process Deficiency

HQ Summary:

On February 12, 2013 an investigation team was formed to investigate the cause of unexpected voltage found in a receptacle from a recently released Lockout/Tagout (LOTO) to replace electrical receptacles. After the receptacles had been replaced, the LOTO permit was released. During a post work test, an electrician experienced problems identifying the power source for one of the newly installed receptacles. The investigation team determined that an electrician had inadvertently put a previously cut

nonmetallic sheathed cable from a different job into the junction box being used for the newly installed receptacle in question. The cable ends were terminated with wire nuts and fed by a circuit breaker that was turned off, but not covered by the LOTO. The work was suspended.

Similar OR Report Number: 1. None identified

Facility Manager:

Name	R. A. Jago, Jr.
Phone	(865) 576-2428
Title	Section Mgr, FI&S Security/East Maintenance Center

Originator:

Name	BRYNESTAD, ASTRID
Phone	(865) 574-1566
Title	OCCURRENCE REPORTING ADMINISTRATOR

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/12/2013	10:05 (ETZ)	DA Taylor	FI&S
02/12/2013	10:05 (ETZ)	LR Bauer	VP FI&S
02/12/2013	10:15 (ETZ)	TR Payne	Y12 PSS
02/12/2013	10:24 (ETZ)	Duty Fac Rep	NPO

Authorized Classifier(AC): J.A. Nations Date: 03/26/2013

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10)Report Number: SC--BSO-LBL-ALS-2013-0001 **After 2003 Redesign**

Secretarial Office: Science

Lab/Site/Org: Lawrence Berkeley National Laboratory

Facility Name: Advanced Light Source Division

Subject/Title: Vendor LOTO Procedure Violation During Equipment Inspection - No Exposure, No Injuries

Date/Time Discovered: 02/19/2013 12:00 (PTZ)

Date/Time Categorized: 02/20/2013 12:59 (PTZ)

Report Type: Notification/Final

Report Dates:

Notification	02/22/2013	13:31 (ETZ)
Initial Update	02/22/2013	13:31 (ETZ)
Latest Update	02/22/2013	13:31 (ETZ)
Final	02/22/2013	13:31 (ETZ)

Significance Category: 4

Reporting Criteria: 2E(3) - Any failure to follow a prescribed hazardous energy control process (e.g., lockout/tagout, hazardous energy control program).

Cause Codes:

ISM: 4) Perform Work Within Controls

Subcontractor Involved: Yes
Emerson Reliability Services

Occurrence Description: On 02/19/2013, while performing electrical equipment inspections in Building 6-1000, a vendor electrician violated the Lab's LOTO procedure. The actual LOTO process was performed correctly and safely per ALS procedures and there were no exposures or injuries.

The vendor Emerson Reliability Services' electrician was performing equipment inspection in Building 6 as part of the Lab's NRTL (Nationally Recognized Testing Laboratory) program activities. The initial priority was to inspect the Superbend Magnets and the QFA Power Supply. This required following specific ALS (Advanced Light Source) procedures to lock out/tag out four different circuit breakers, in addition to the LBNL level requirements through his supervisor. The vendor electrician worked with the ALS LOTO Coordinator from approximately 1030 hours to noon to perform the LOTO. Upon completing the LOTO, the electrician began performing equipment inspections.

At approximately 1500 hours, the vendor supervisor called to inform ALS staff that the vendor LOTO permits were now complete and that the electrician could begin performing the work. After discussions among Lab personnel, it became evident that, while all needed LOTO steps were performed correctly, safely and according to ALS procedure, a required Lab procedural step, the vendor LOTO permit, was not in place when LOTO was performed. This constituted a violation of the LBNL LOTO procedure.

Cause Description:

Operating Conditions: Indoors, Lighted, Dry

Activity Category: Inspection/Monitoring

Immediate Action(s): - The EHSS electric safety personnel, the vendor electrician, and ALS LOTO coordinator discussed and verified that the LOTO was performed safely and according to ALS procedure.

- The vendor performed the LOTO permit's final steps.

FM Evaluation: - Formally, the vendor electrician was working under an EHSS (Environment/Health/Safety/Security) Division SJHA (Subcontractor Job Hazard Analysis) and received work instruction and oversight from EHSS Division staff.

- ALS was in a long shut-down with many different maintenance and installation projects. This vendor's work had to be coordinated with overall LOTO status at the facility. Procedurally, this meant the vendor was working directly with the ALS LOTO coordinator to follow ALS'

procedures.

DOE Facility Representative Input:

DOE Program Manager Input:

Further Evaluation is Required: No

Division or Project: Advanced Light Source (ALS)

Plant Area: B6-1000

System/Building/Equipment: B6 Storage Ring Power Supplies Sectors 4,8,12

Facility Function: Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)

Corrective Action:

Lessons(s) Learned:

HQ Keywords: 01K--Inadequate Conduct of Operations - Lockout/Tagout Noncompliance (Electrical)
08H--OSHA Reportable/Industrial Hygiene - Safety Noncompliance
11G--Other - Subcontractor
12I--EH Categories - Lockout/Tagout (Electrical or Mechanical)
14E--Quality Assurance - Work Process Deficiency
14G--Quality Assurance - Procurement Deficiency

HQ Summary: On February 19, 2013, a subcontractor electrician implemented an Advanced Light Source (ALS) lockout/tagout (LOTO) but did not establish a subcontractor LOTO permit as required by Laboratory procedures while performing equipment inspections during Nationally Recognized Testing Laboratory (NRTL) program activities in Building 6-1000. The actual LOTO process was performed correctly and safely per ALS procedures; there were no exposures or injuries.

Similar OR Report Number:

Facility Manager:

Name	Roger Falcone
Phone	(510) 486-6692
Title	Division Director

Originator:

Name	MOU, FLORENCE P.
Phone	(510) 486-7872
Title	SENIOR ADMINISTRATOR

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/20/2013	14:12 (PTZ)	Mary Gross	BSO

02/20/2013	14:12 (PTZ)	Kevin Hartnett	BSO

Authorized Classifier(AC):

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11)Report Number: SC--SSO-SU-SLAC-2013-0003 **After 2003 Redesign**
Secretarial Office: Science
Lab/Site/Org: Stanford Linear Accelerator Center
Facility Name: Stanford Linear Accelerator Center
Subject/Title: Mild Electrical Shock When Employee Touches Ungrounded Conduit
Date/Time Discovered: 02/25/2013 18:30 (PTZ)
Date/Time Categorized: 02/27/2013 16:45 (PTZ)
Report Type: Notification/Final
Report Dates:

Notification	03/01/2013	15:05 (ETZ)
Initial Update	03/01/2013	15:05 (ETZ)
Latest Update	03/01/2013	15:05 (ETZ)
Final	03/01/2013	15:05 (ETZ)

Significance Category: 4
Reporting Criteria: 10(2) - An event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern for that facility or other facilities or activities in the DOE complex.
The significance category assigned to the management concern should be based on an evaluation of the potential risks and impact on safe operations. (1 of 4 criteria - This is a SC 4 occurrence)

Cause Codes:
ISM: 6) N/A (Not applicable to ISM Core Functions as determined by management review.)
Subcontractor Involved: No
Occurrence Description: At approximately 18:30 on February 25, 2013, an employee received a mild electrical shock when he touched an ungrounded electrical conduit associated with a 277 volt lighting circuit in Building 24, Room 102. The employee was speaking with a second employee at the time and noticed a tingling feeling in his fingers as he touched the conduit. The second employee, an electrical worker, determined that the conduit was floating at about 120 volts above ground. The second employee notified the Facilities electricians, who de-energized and locked out the circuit.

Initial investigation determined that the conduit was not properly bonded to the grounded light fixture and was ungrounded. The circuit (1960s vintage installation) does not include a separate equipment grounding conductor. If properly installed the conduit would provide a low impedance return path for ground fault current. In addition, one of the

	wires inside the conduit was found to have a nick in the insulation, which allowed the energized conductor to contact the ungrounded conduit. These two deficiencies allowed the conduit to be energized without tripping the upstream breaker. The conduit was painted which may explain why the employee felt a tingling sensation rather than an outright shock when he touched the energized conduit.
Cause Description:	
Operating Conditions:	Does not apply.
Activity Category:	Normal Operations (other than Activities specifically listed in this Category)
Immediate Action(s):	Facilities electricians de-energized and locked out the circuit.
FM Evaluation:	
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	Facilities
Plant Area:	B024
System/Building/Equipment:	B024
Facility Function:	Accelerators
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	07D--Electrical Systems - Electrical Wiring 08A--OSHA Reportable/Industrial Hygiene - Electrical Shock 12C--EH Categories - Electrical Safety 14L--Quality Assurance - No QA Deficiency
HQ Summary:	On February 25, 2013, an employee received a mild electrical shock when he touched an ungrounded electrical conduit associated with a 277 volt lighting circuit in Building 24. The employee was speaking with a second employee at the time and noticed a tingling feeling in his fingers as he touched the conduit. The second employee, an electrical worker, determined that the conduit was floating at about 120-volts above ground. The second employee notified the Facilities electricians, who de-energized and locked out the circuit. Initial investigation determined that the conduit was not properly bonded to the grounded light fixture.
Similar OR Report Number:	
Facility Manager:	

Name	SHERIN, BRIAN J
Phone	(650) 926-5082
Title	DEPT HEAD CHEMICAL & GENERAL SAFETY

Originator:

Name	WEIBEL, MARC A.
Phone	(650) 926-4264
Title	WPC/EHS ASSURANCE MANAGER

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/26/2013	12:00 (PTZ)	Jim Healy	SLAC
02/27/2013	17:00 (PTZ)	SSO Duty Officer	SSO

Authorized Classifier(AC):

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12)Report Number: SC-ORO--ORNL-X10BOPLANT-2013-0002 **After 2003 Redesign**
Secretarial Office: Science
Lab/Site/Org: Oak Ridge National Laboratory
Facility Name: X-10 General Op. & Landlord Activity
Subject/Title: Worker Severs Energized 110 Volt Extension Cord
Date/Time Discovered: 02/04/2013 10:10 (ETZ)
Date/Time Categorized: 02/04/2013 11:40 (ETZ)
Report Type: Final
Report Dates:

Notification	02/06/2013	13:26 (ETZ)
Initial Update	03/21/2013	10:23 (ETZ)
Latest Update	04/19/2013	13:20 (ETZ)
Final	04/19/2013	13:20 (ETZ)

Significance Category: 3
Reporting Criteria: 2E(2) - Any unexpected discovery of an uncontrolled electrical hazardous energy source (e.g., live electrical power circuit, etc.). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.

Cause Codes: A3B1C03 - Human Performance Less Than Adequate (LTA); Skill Based Errors; Incorrect performance due to mental lapse
-->couplet - NA
ISM: 4) Perform Work Within Controls
Subcontractor Involved: No
Occurrence Description: On February 4, 2013, workers reconfiguring a hot cell were removing high-density polyethylene (HDPE) pneumatic tubing from under a platform in the hot cell. The worker inadvertently severed an energized 110 volt extension cord utilized for the lighting circuit resulting in a spark and a trip of the breaker feeding this circuit.

With the exception of two lighting extension cords, all energized sources in this hot cell had been locked and tagged out prior to any work beginning. The lighting extension cords were fed through the same hot cell penetration as the bundle of HDPE pneumatic tubing, and were similar in color and composition. The lighting extension cord had been flagged as energized.

The lighting conditions under the platform and the similar color of the pneumatic tubing to the electrical cord made it more difficult to distinguish between the two. The worker did not realize that he was cutting the electrical cord until an electrical spark occurred.

The Laboratory Shift Superintendent was notified and the event was categorized as a SC3, 2E(2) "Hazardous Electrical Energy Control, Unexpected Electrical Hazard."

There were no injuries to personnel, or environment, health and safety impacts as a result of this event. The work was being performed in accordance with all applicable work control processes and permits.

UPDATE Report:
March 21, 2013
See Section 23 - "Evaluation (by Facility Manager/Designee)" of this report for a description of the extension for ORPS Final Report.

Cause Description:

DOE O 232.2, Attachment 5, Causal Analysis Tree Rev. 1 was used to determine the cause of the event. The following addresses a summary of the analysis, causal factor, and corrective actions.

Review of the event did not identify any deviation from the Work Package, RWP, or the LOTO permit. There had been 70 successful entries into the area and the 13th for the worker that cut the extension cord.

The worker was knowledgeable that the line he was to cut was in proximity to an energized extension cord which was similar in appearance. He also knew that the energized extension cord was marked. The worker did not verify the lines before making the cut resulting in the extension cord being cut.

In evaluating the hazard mitigation in place, it was felt that the necessary planning and protective measures were in place, including the flagging of the cord directly above the worker's head. Additional portable light sources were available to the worker as needed, but were not used. The worker acknowledged that a lack of attention on his part resulted in the inadvertent cut of the cord and he immediately reported it to his supervision.

A3B1C03: A3 - Human Performance, B1 - Skill Based Error, C03 - Incorrect performance due to mental lapse

	Corrective actions Number 1 through 5 address the cause of this event.
Operating Conditions:	Normal
Activity Category:	Normal Operations (other than Activities specifically listed in this Category)
Immediate Action(s):	All work was stopped and the workers immediately left the area. The extension cords were unplugged. A critique was held in the early afternoon of February 4, 2013.
FM Evaluation:	UPDATE: March 21, 2013 The Final ORPS Report date is being extended to 04/19/2013 (29 Days). This extension is required to provide a thorough analysis of the event, provide for further management review, and development of a comprehensive issue management response. UPDATE: Submittal of Final ORPS Report SC-ORO--ORNL-X10BOPLANT-2013-0002
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	No
Division or Project:	Nonreactor Nuclear Facilities Division
Plant Area:	Bldg. 4501
System/Building/Equipment:	Building 4501, Cell D
Facility Function:	Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)

Corrective Action 01:

Target Completion Date:02/08/2013	**Actual Completion Date:**02/08/2013

Remove the through wall extension cord and utilize extension cords through the man door.

Corrective Action 02:

Target Completion Date:02/08/2013	**Actual Completion Date:**02/08/2013

Add supplemental lighting below platform.

Corrective Action 03:

Target Completion Date:02/08/2013	**Actual Completion Date:**02/08/2013

Add supplemental marking to other lines that were designated to remain in

the cell.

Corrective Action 04:

Target Completion Date:02/15/2013	**Actual Completion Date:**02/15/2013

Remove remaining non-energized electrical components with qualified electrical workers.

Corrective Action 05:

Target Completion Date:02/08/2013	**Actual Completion Date:**02/08/2013

Perform another Pre-job briefing with all involved workers prior to resuming work.

Lessons(s) Learned: Workers need to remain cognizant of all hazards associated with reconfiguring hot cells, including ensuring sufficient lighting is in place prior to the start of work.

HQ Keywords: 01A--Inadequate Conduct of Operations - Inadequate Conduct of Operations (miscellaneous)
01N--Inadequate Conduct of Operations - Inadequate Job Planning (Other)
01O--Inadequate Conduct of Operations - Inadequate Maintenance
01Q--Inadequate Conduct of Operations - Personnel error
07D--Electrical Systems - Electrical Wiring
08J--OSHA Reportable/Industrial Hygiene - Near Miss (Electrical)
12C--EH Categories - Electrical Safety
14E--Quality Assurance - Work Process Deficiency

HQ Summary: On February 4, 2013, a worker inadvertently severed an energized 110-volt extension cord utilized for the lighting circuit resulting in a spark and a trip of the breaker feeding this circuit. Workers reconfiguring a hot cell were removing high-density polyethylene (HDPE) pneumatic tubing from under a platform in the hot cell. The lighting extension cords were fed through the same hot cell penetration as the bundle of HDPE pneumatic tubing, and were similar in color and composition. The lighting extension cord had been flagged as energized. All work was stopped and he extension cords were unplugged.

Similar OR Report Number: 1. SC-ORO--ORNL-X10UTILITY-2010-0001

Facility Manager:

Name	Stephen J. Layendecker
Phone	(865) 576-3834
Title	Complex Facility Manager

Originator:

Name	PEHRSON, PAUL B.
Phone	(865) 576-7929
Title	OCCURRENCE REPORTING MANAGER

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization

02/04/2013	11:34 (ETZ)	Lab Shift Superintendent	ORNL LSS
02/04/2013	12:16 (ETZ)	Michele Branton	DOE ORNL
02/04/2013	12:16 (ETZ)	Johnny Moore	DOE ORNL

Authorized Classifier(AC):

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13)Report Number: SC-ORO--ORNL-X10BOPLANT-2013-0003 **After 2003 Redesign**
Secretarial Office: Science
Lab/Site/Org: Oak Ridge National Laboratory
Facility Name: X-10 General Op. & Landlord Activity
Subject/Title: De-energized Electrical Line Removed during Excavation
Date/Time Discovered: 02/12/2013 09:30 (ETZ)
Date/Time Categorized: 02/27/2013 14:24 (ETZ)
Report Type: Update
Report Dates:

Notification	03/01/2013	15:05 (ETZ)
Initial Update	04/11/2013	09:03 (ETZ)
Latest Update	04/11/2013	09:03 (ETZ)
Final		

Significance Category: 3
Reporting Criteria: 2E(2) - Any unexpected discovery of an uncontrolled electrical hazardous energy source (e.g., live electrical power circuit, etc.). This criterion does not include discoveries made by zero-energy checks and other precautionary investigations made before work is authorized to begin.

Cause Codes:
ISM:
Subcontractor Involved: Yes
National Resource Management

Occurrence Description: On February 12, 2013, during construction of an electrical vault, a de-energized 277 volt electrical circuit was removed while demolishing a duct bank. The electrical line fed bollard lights near the North Hill parking lot. The lighting circuit was controlled by a photocell sensor. Because of the photocell sensor, the electrical line was only energized at night or in low light conditions. The construction activities occurred during daylight hours so the electrical line was not energized.

The workers were working under an approved excavation permit. Prior to any construction activities, the utilities were field located and no energized circuits were identified.

On February 25, 2013, line management was informed bollard lighting was not operating. Trouble shooting revealed that the circuit supplying the bollard lighting had been removed during the demolition of the duct bank.

	On February 27, 2013, following the investigation, line management determined the circuit removed was not properly reflected on appropriate drawings and therefore was removed instead of relocated. The Laboratory Shift Superintendent was notified and the event was categorized as SC(3), 2E(2), "Hazardous Electrical Energy Control" event. There were no injuries to personnel, or environment, health and safety impacts as a result of this event. UPDATE Report: April 11, 2013 See section 23 - Evaluation (by Facility Manager/Designee) for a description of the extension for the Final Report.
Cause Description:	
Operating Conditions:	Normal
Activity Category:	Construction
Immediate Action(s):	Electrical circuit was placed in a safe condition Investigation was initiated
FM Evaluation:	ORNL Management is evaluating the circumstances around the event, will implement actions as appropriate, and share any resulting lessons learned. UPDATE: April 11, 2013 The Final Report date is being extended to 6/4/2013. This extension is required to provide a thorough analysis of the event, provide for further management review, and development of a comprehensive issue management response.
DOE Facility Representative Input:	
DOE Program Manager Input:	
Further Evaluation is Required:	Yes. Before Further Operation? No By Whom: Hurtis Hodges By When: 06/04/2013
Division or Project:	Facilities Development Division
Plant Area:	Central Campus
System/Building/Equipment:	Building 4011
Facility Function:	Balance of Plant - Infrastructure (Other Functions not specifically listed in this Category)
Corrective Action:	
Lessons(s) Learned:	
HQ Keywords:	01B--Inadequate Conduct of Operations - Loss of Configuration

Management/Control
01M--Inadequate Conduct of Operations - Inadequate Job Planning (Electrical)
11G--Other - Subcontractor
12C--EH Categories - Electrical Safety
14D--Quality Assurance - Documents and Records Deficiency
14E--Quality Assurance - Work Process Deficiency

HQ Summary: On February 25, 2013, line management was informed bollard lighting was not operating. On February 12, during construction of an electrical vault, a de-energized 277-volt electrical circuit was removed while demolishing a duct bank. The electrical line fed bollard lights near the North Hill parking lot. The lighting circuit was controlled by a photocell sensor. Because of the photocell sensor, the electrical line was only energized at night or in low light conditions. The construction activities occurred during daylight hours so the electrical line was not energized. On February 27, following the investigation, line management determined the circuit removed was not properly reflected on appropriate drawings and therefore was removed instead of relocated. The electrical circuit was placed in a safe condition and an investigation was initiated.

Similar OR Report Number: 1. NA--LASO-LANL-HEMACHPRES-2008-0002

Facility Manager:

Name	Hurtis Hodges
Phone	(865) 576-3582
Title	Director, Facilities Development Division

Originator:

Name	BAXTER, CHARLES PHIL
Phone	(865) 576-8361
Title	SSR PROGRAM AND EVENT REPORTING MGR

HQ OC Notification:

Date	Time	Person Notified	Organization
NA	NA	NA	NA

Other Notifications:

Date	Time	Person Notified	Organization
02/27/2013	14:24 (ETZ)	Lab. Shift Superintendent	ORNL LSS
02/27/2013	15:14 (ETZ)	Michele Branton	DOE ORNL
02/27/2013	15:14 (ETZ)	Johnny Moore	DOE ORNL

Authorized Classifier(AC):