Operating Experience Summary

U.S. Department of Energy
Office of Health, Safety and Security
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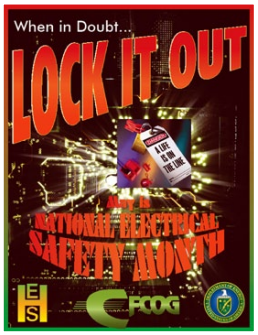

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1 May is Electrical Safety Month at DOE

May is National Electrical Safety Month and the following article describes DOE's participation, including specific electrical safety-related material that is being developed for use by DOE sites. In addition to the material discussed in the article, electrical training videos will be posted as the "Video of the Week" on the Operating Experience Wiki at http://operatingexperience.doe-hss.wikispaces.net/.

Please be sure to watch the videos, in addition to reading the article. When you are done reading the article, we encourage you to visit the Operating Experience Summary *Blog at http://oesummary.wordpress.com and rate the article in terms of value to you and provide a comment on the article itself and/or identify topics that would be of interest to you for future articles.*

The electrical industry established May as National Electrical Safety Month many years ago, and, according to the Electrical Safety Foundation International (ESFI), May is the time to begin year-round electrical safety awareness efforts. This year, the Department of Energy (DOE), through the efforts of the Energy Facility Contractors Group (EFCOG), is planning to participate by focusing on hazardous energy control throughout the month. DOE's only other Complex-wide participation in National Electrical Safety Month was in 2004, when the Deputy Secretary of Energy designated May as the Department's Electrical Safety Month to promote electrical safety across the Complex, increase awareness of the risks of workplace electrical hazards, and encourage Complex-wide dissemination of related lessons learned and best practices. Since then, numerous DOE sites and laboratories have continued the Electrical Safety Month theme with their own individual campaigns.

In 2010, a sharp increase in electrical safety events beginning in 2009 caught the interest of the EFCOG Electrical Safety Subgroup (EFCOG ESS), so the subgroup chartered a Hazardous Energy Control (HEC) subcommittee to analyze the events. The subcommittee's efforts ultimately resulted in the May 2011 Electrical Safety Month campaign for the DOE Complex.

Since lockout/tagout (LOTO) issues were identified as a recurring problem by the HEC subcommittee, they chose the slogan "When in Doubt – Lock it Out" for the campaign, with a focus on improving worker safety through increased awareness and training. The following products have been developed for this year's campaign and will be made available, along with instructions for celebrating Electrical Safety Month, through the Electrical Safety Month website at http://www.efcog.org/wg/esh_es/electrical_safety_month.htm.

Video: The EFCOG Environmental Safety and Health Working Group chair has put together a short video announcing May as Electrical Safety Month.

Training: Members of the HEC subcommittee developed short training modules, geared towards tailgate meetings and pre-job briefings, to help remind workers of safety requirements and approved work practices. Supervisors, team leaders, or job foremen at each site can present one of the following training modules to their electrical workers during each week in May.

- **Week 1:** When in Doubt – Lock it Out
- **Week 2:** Establishing an Electrically Safe Work Condition
- **Week 3:** Verify or Die – Verification Methods and Techniques/Importance of Verification
- **Week 4:** Work Area Boundaries – Limited Approach Boundary
- **Week 5:** Working on Energized Equipment – Energized Work Justification

Posters: Two posters were developed for posting across the Complex in support of this year's campaign. They are shown in Figures 1-1 and 1-2.

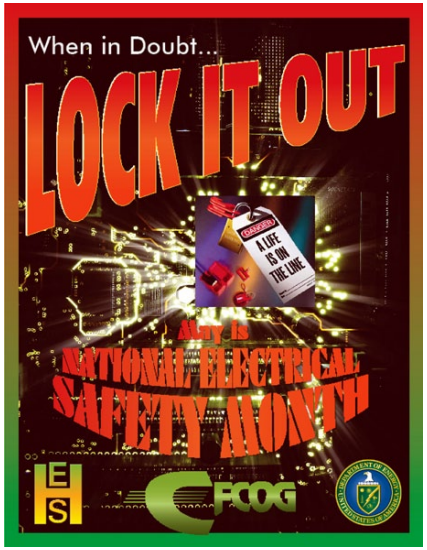

Figure 1-1. EFCOG "Lock it Out" poster

Figure 1-2. EFCOG "Verify or Die" poster

Additional electrical safety training and briefing materials, specific to administrative, non-electrical, and electrical workers, are available at http://efcog.org/wg/esh_es/Electrical_Safety_Training/elecsafetytng.htm.

Additional Information Available

To increase awareness of electrical safety issues outside the workplace, ESFI sponsors National Electrical Safety Month each May to remind the public about electrical hazards at home, work, school, and play. This year's campaign challenges people across the country to evaluate the electrical safety of their homes and learn more about their electrical systems and devices in the process. ESFI is focusing on electrical safety in a different area of the home each week during the month of May. For more information on ESFI's 2011 campaign, visit their website at http://www.esfi.org/index.cfm/cdid/11694/pid/10262.

Why is Participation/Learning Important?

These types of annual safety campaigns are important because education and awareness are central to the control of electrical hazards and the prevention of injuries. Persistent problems with hazardous energy control underscore the need for improvement in human performance. Prevention strategies should include thorough job planning, effective conduct of operations, continuing electrical safety training, and communication of management's expectations for procedural compliance. Simply put—apply lockouts when necessary, minimize or eliminate energized work whenever possible, treat every exposed piece of equipment as energized until proven it is not, and WHEN IN DOUBT – LOCK IT OUT.

KEYWORDS: Hazardous energy control, lockout/tagout, LOTO, electrical safety, energized, verification, boundaries, electrical safety month

ISM CORE FUNCTIONS: Analyze the Hazards, Develop and Implement Controls, Perform Work within Controls, Provide Feedback and Continuous Improvement

Radiological Contamination During Demolition of Building at the Separations Process Research Unit

2

The following article provides information from a Type B Accident Investigation on a significant radiological contamination event at the Separations Process Research Unit during demolition of a site building. It was determined that the demolition of the evaporator system components in an open air environment, relying mostly on a fixative to "lock down" contamination, was the direct cause of the accident. The Board identified two root causes and 20 contributing causes for the event.

Six lessons learned on this event are also identified. The full lessons learned are available from the Department of Energy (DOE) Corporate Lessons Learned Database at http://www.hss.doe.gov/CSA/Analysis/DOEll/index.asp.

After reading the article, we encourage you to visit the Operating Experience Summary *Blog at* http://oesummary.wordpress.com *and rate the article in terms of value to you and provide a comment on the article itself and/or identify topics that would be of interest to you for future articles.*

On September 29, 2010, at the Separations Process Research Unit (SPRU) in Niskayuna, New York, a radioactive contamination event occurred during open-air demolition of a site building. Initially, a Radiation Control Technician (RCT) found low levels of contamination on workers' shoes and contamination was also found on property adjacent to the work activities. Several days later, while investigating the initial contamination event, RCTs found significant amounts of contamination along the entire east side of the building and determined that there was an uncontrolled spread of radioactive contamination at the site.

Because the event was of greater magnitude and significance than first believed, the Office of Environmental Management initiated a Type B investigation. The Type B Accident Investigation Report is available at http://www.hss.doe.gov/csa/csp/aip/docs/accidents/typeb/Type_B_AI_Report_SPRU.pdf. (ORPS Report EM---WGI-G2H2-2010-0001)

SPRU was operated from 1950 to 1953 as a pilot plant to research chemical processes to extract uranium and plutonium from irradiated uranium, and the research operations resulted in high radiation and high contamination areas. The SPRU facilities and land areas are currently undergoing decontamination and decommissioning, which includes deactivation, demolition, and removal of the SPRU nuclear facilities; cleanup and environmental restoration of the underlying and surrounding contaminated soil; and decontamination of the piping tunnel connecting the SPRU facilities to other operating facilities.

The Event

On the day of the event, three wrecking crew equipment operators were working on the building demolition, while a fourth worker sprayed water for dust suppression. As one equipment operator worked to remove two evaporator condensers and condenser columns from the east evaporator cell, a second equipment operator was removing the separator column from the west evaporator cell (Figure 2-1). The third equipment operator was loading demolition debris into containers. When the demolition crew took a lunch break, the water spray operator and an equipment operator heard the frisker alarming. They summoned an RCT, who discovered contaminated dust on the frisker and removed it. The RCT also found 11,000 disintegrations per minute (dpm) contamination on the bottom of the boots of each of the four equipment operators. No other personnel contamination was identified, and the event was determined to be non-reportable.

Figure 2-1. Work on reducing flash column

Radiological surveys outside the demolition area and air sampler checks indicated elevated background radiation readings in the area. By the evening of September 29, 2010, RCTs had identified numerous areas of contamination on the grounds and on roofs in a 100-square-yard area near the SPRU site. Contamination levels in the debris piles measured up to 500,000 dpm/per 100 cm^2 beta/gamma and 11,000 dpm/100 cm^2 alpha; a swipe on the excavator shear measured 16,000 dpm/100 cm^2 beta/gamma. The limits for posting contamination areas for beta-gamma emitters in Title 10 of the Code of Federal Regulations, Part 835 (10 CFR 835), Appendix D, are 1,000 dpm/100 cm^2 for removable contamination and 5,000 dpm/100 cm^2 for total fixed plus removable contamination, so these levels reached at least 100 times the allowable limits. A subsequent record 7-inch rainfall from Tropical Storm Nicole exacerbated both the extent of the contamination and the ability to identify contamination locations.

Accident Investigation Board Findings

Workers performed the demolition task in an open air environment, relying on a fixative to "lock down" contamination on equipment and components in combination with misting during demolition. The Board identified this open air demolition of the evaporator system components as the direct cause of the accident. They concluded that there was an over-reliance on the effectiveness of applying fixative to control contamination during demolition and prevent the spread of contamination off-site. The Board also determined that the fixative was not applied to the flash column or separator columns that workers were removing when the event occurred. Figure 2-2 shows the incomplete application of the blue fixative.

The Board identified two root causes for the accident: (1) the radiological hazards for the work task were not fully understood, characterized, or controlled and (2) the work process did not ensure that the facility met conditions necessary to proceed with the work. Column removal was never added to the Plan of the Day or discussed, so appropriate safety barriers and hold points were not in place. The Radiological Work Permit (RWP) did not adequately describe the scope of work and did not require

Figure 2-2. Incomplete application of fixative (blue)

RCT coverage when removing the columns, a task (i.e., opening processing equipment containing radioactive materials) that typically would require an RCT survey. A contamination survey taken on September 16, 2010, showed that the evaporator components being removed and downsized on September 29 came from an area with contamination levels over 900,000 dpm beta/gamma[2] on the floor. This should have been a clear indication that RCT coverage would be required. The Board also learned that, although the RWP required an RCT to perform periodic surveys, they had not been performed. Because there were no surveys, supervisors could not update work crews on radiological conditions as work progressed, even though it was essential for them to have a clear understanding of any restrictions.

The Board identified 20 contributing causes for the event, among them work package and procedure issues. Detailed steps developed from the work scope lacked the necessary level of rigor and detail to ensure that the work would be executed as described in the project plans and technical basis documents. When the Board reviewed work documents, they found that phrases such as "as needed," "as applicable," "if necessary," and "as appropriate" were widely used in the detailed work steps; including, for example, "decontamination/removal of piping, if required" and "decontamination of process system components, if required."

Several workers provided the Board information about perceived production pressure and indicated that there was an atmosphere of fear that kept workers from speaking up about their concerns. The Board concluded that open discussion about the work between the work force and management should be encouraged, so that a questioning attitude would be developed within the workforce and any worker concerns about planned work could be resolved before work proceeds. The Board indicated that management should clarify that there would be no retribution when workers executed their stop work authority.

Judgments of Need

The Judgments of Need (JON) included ensuring that contamination control techniques are well defined and executed as specified in work control documents; implementing improvements that demonstrate competence and rigor, specifically as applied to the characterization and control of radioactive contamination; and establishing a work planning and authorization process that ensures review, approval, and authorization by cognizant management and subject matter experts. The Board also stated that management needs to cultivate an atmosphere of open communication and acceptance of employee feedback regarding work processes and safety concerns.

For specific accident investigation results and the associated actions to be taken, please go to the Type B Accident Investigation Report at http://www.hss.doe.gov/csa/csp/aip/docs/accidents/typeb/Type_B_AI_Report_SPRU.pdf.

The following lessons learned on this event have been entered into the Department of Energy (DOE) Corporate Lessons Learned Database.

1. *Perceived Schedule Pressure Affects Worker Involvement* (Lessons Learned ID: PMLL-2011-SPRU-ARRA-H2-0002)

   Lessons Learned Statement: Encourage an atmosphere of open communication and acceptance of employee feedback regarding work processes and safety concerns. Perceived schedule pressure by workers caused a reluctance to bring up issues that might slow progress. This resulted in lost opportunities to control the spread of contamination to offsite areas during demolition activities.

2. *Ineffective Work Control Practices* (Lessons Learned ID: PMLL-2011-SPRU-ARRA-H2-0003)

   Lessons Learned Statement: Implement work control processes that ensure the work is reviewed by the appropriate Subject Matter Expert (SME) before proceeding.

Work activities that are conducted without being adequately reviewed by SMEs and/or discussed with workers before work execution can lead to unexpected results. The removal and size-reduction of contaminated equipment during demolition activities, which led to the contamination event outside the boundaries of the SPRU project, was partially due to not following work control processes that could have prevented the occurrence.

3. *Need for a Strong Conduct of Operations Program* (Lessons Learned ID: PMLL-2011-SPRU-ARRA-H2-0004)

   Lessons Learned Statement: Encourage a strong Conduct of Operations (CONOPs) work environment. Transient construction workers cannot be expected to exhibit rigorous safety culture behaviors without clear expectations and constant supervision by managers with strong CONOPs backgrounds. Clear and comprehensive work planning, radiological controls, adherence to work planning documents as written (e.g., hold points), and safety-focused supervision are necessary to ensure work activities are conducted safely to prevent the spread of contamination.

4. *Excessive Flexibility in Work Planning Documents Can Be Detrimental* (Lessons Learned ID: PMLL-2011-SPRU-ARRA-H2-0005)

   Lessons Learned Statement: Discourage the frequent use of terminology such as: (1) as required, (2) as needed, and (3) as necessary in work control documents. Excessive flexibility incorporated into work documents can cause an over-reliance in individual decision making instead of providing the necessary detail to ensure steps are accomplished as planned. This contributed to the unplanned offsite release of radiological contamination due to releasing work too far in advance with no subsequent discussion in the Plan of the Day meeting regarding the specific work to be conducted.

5. *Need for Effective Management Oversight* (Lessons Learned ID: PMLL-2011-SPRU-ARRA-H2-0006)

   Lessons Learned Statement: Provide effective and independent oversight during management activities. Contractor self-assessments and DOE assessments need to be thorough and critical. Recent assessments of the Radiological Protection Program did not identify significant weaknesses prior to the contamination event.

6. *Insufficient Period for Field Observations Could Impact ISMS Verification Results* (Lessons Learned ID: PMLL-2011-SPRU-ARRA-H2-0007)

   Lessons Learned Statement: Devote sufficient time to field observations during Phase II ISMS reviews. A condensed period of 5 days for field observations, interviews and inquiry, and report writing may not be adequate to obtain the best result. Team members reported that evening hours, especially late in the week, were required to complete the report and that this aggressive time frame impacted their ability to conduct a factual accuracy review.

You can access the full lessons learned from this event by going to the DOE Lessons Learned database at http://www.hss.doe.gov/CSA/Analysis/DOEll/index.asp.

KEYWORDS: Type B Accident Investigation, radioactive contamination, demolition, evaporator cell, flash column, fixative, lessons learned

ISM CORE FUNCTIONS: Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls

The Office of Health, Safety and Security (HSS), Office of Analysis publishes the *Operating Experience Summary* to promote safety throughout the Department of Energy (DOE) complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, HSS relies on preliminary information such as daily operations reports, notification reports, and conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the Summary, please bring this to the attention of Mr. Stephen Domotor, (301) 903-1018, or e-mail address stephen.domotor@hq.doe.gov, so we may issue a correction. If you have difficulty accessing the Summary on the Web (http://www.hss.energy.gov/csa/analysis/oesummary/index.html), please contact the Information Center, (800) 473-4375, for assistance. We would like to hear from you regarding how we can make our products better and more useful. Please forward any comments to Mr. Domotor at the e-mail address above.

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