

**OE-3: 2014-04**

**October 2014**

## **Explosives Safety**

### **PURPOSE**

This Operating Experience Level 3 (OE-3) document provides information about a safety concern related to explosives stored or handled at Department of Energy (DOE) facilities.

### **BACKGROUND**

There were 86 explosives-related events reported to the Occurrence Reporting and Processing System (ORPS) during the past 3 ½ years, primarily in Significance Categories 3 and 4. Reported concerns range from explosive material transfer and accountability to fires, inadequate work planning, and injury.

Six recent DOE events demonstrate the importance of procedural compliance during explosives-handling operations and stopping work whenever unexpected conditions develop.

On June 4, 2014, at Pantex, 10 grams of a non-high-explosive energetic material were discovered on a table in an “explosive facility.” A critique was held, and it was determined that the material had originated in a connecting facility and was included in its inventory. Because the material was properly packaged, it did not pose an imminent danger. It was placed in an appropriate storage bin, the manual inventories for each facility were updated, and a move was planned in the trackable material move system. Inventory reconciliation was performed in both locations. (ORPS Report NA--PS-BWP-PANTEX-2014-0038)

On May 22, 2014, at Sandia National Laboratories (SNL), three legacy thermal battery components were found during a planned and authorized Lean 6 Sigma activity. The components, which were

not in inventory, were found in a “flammable storage” cabinet designated for thermal battery storage. However, because there was a lack of knowledge and information on the batteries, they should have been stored inside ammo cans in “explosive storage.” An explosives handler immediately placed the components in ammo cans, stored them properly, and researched product specifications. Analysis determined that two of the three components were, indeed, “live.” An Extent of Condition (EOC) review was immediately performed in other labs, and similar legacy components were identified and evaluated. (ORPS Report NA--SS-SNL-2000-2014-0004)

On April 10, 2014, at Los Alamos National Laboratory (LANL), multiple small fires in brush and trees resulted from explosives testing activities. Los Alamos Fire Department personnel were on site to assist and extinguished the fires in less than 2 hours. Brush and wildfires can quickly go out of control in an area where humidity is low, natural materials are tinder-dry, and wildfires are reported as early as March. Offsite dangers of explosives testing should be considered during the work planning stage in order to obtain additional offsite resources if necessary. (ORPS Report NA--LASO-LANL-FIRGNHELAB-2014-0004)

On April 9, 2014, at Lawrence Livermore National Laboratory (LLNL), the Facility Representative observed a surge protector power strip being used inappropriately in an explosives work room in the High Explosives (HE) Applications Facility. The power strip had not been evaluated for use in an HE work room as required by the Facility Safety Plan. Such equipment is not uniformly recognized as a hazard that requires review, and personnel

obtain whatever is readily available to serve the function. The strip was evaluated and replaced, and an EOC review was implemented. (ORPS Report NA--LSO-LLNL-LLNL-2014-0012)

On March 27, 2014, at LLNL, workers discovered approximately a dozen less-than-dime-sized fragments of unexploded LX-14, a secondary HE, in the fenced-off and access-controlled parking lot of the Building 851 firing bunker. The HE was believed to have been dispersed during an experiment (shot) on the outside firing table the previous afternoon. The parking lot is controlled so no vehicles or personnel are present during the time of a shot. However, vehicles had entered the lot after the shot, and there was a concern that they may have driven away with HE fragments in their tire treads. The LLNL Explosives Safety subject matter expert deemed this scenario extremely unlikely because HE is soft, crumbles easily, and the fragments were too small to stick in tire treads. Future shots will be planned with a full understanding of where unconsumed material might land, which in this case was outside the 70-foot radius previously believed to be the limit. (ORPS Report NA--LSO-LLNL-LLNL-2014-0008)

The most serious event – an ORPS Significance Category 2 event – occurred December 11, 2013, at SNL during an explosives test that involved transmitting radiofrequency (RF) energy to a wireless receiver device that was connected to a battery, a capacitor, C4 explosive, and an exploding bridgewire detonator containing 78 mg of pentaerythritol tetranitrate, a highly explosive organic compound belonging to the same chemical family as nitroglycerin. During the test, communication was lost so the test was terminated. The technician believed the detonator was not armed. The technician then disconnected, inspected, and moved the parts to a prep stand where he disassembled the device that included the detonator. At that point, the detonator initiated, injuring the technician's hand below the little finger. He was taken to the local hospital where he received stitches but did not require surgery. The subsequent investigation determined that (1) the device was not properly

designed and tested; (2) the device should have been treated as "unsafe" while engineered safety protocols were being confirmed; (3) design and testing teams did not act in a systematic and comprehensive manner to develop and deploy adequate layers of defense against unrecognized hazards; and (4) a diverse workforce has varying levels of safety practice maturity that must be recognized and addressed. (NA--SS-SNL-5000-2013-0005)

## CORRECTIVE ACTIONS

Sites that filed ORPS reports cited in this OE-3 took the corrective actions (CA) described below.

- Pantex: The material was placed in an approved storage bin, inventories for both facilities were updated, and a move was planned in the trackable material move system. As a precaution, material inventory reconciliation was performed in both facilities.
- SNL: An explosive handler immediately placed the legacy units into ammo cans and stored them in an approved explosive storage cabinet. Knowledgeable operators performed a pre-screen of all objects in the room, and an EOC review was ordered for other site laboratories where similar legacy components may be stored.
- LANL: The Weapons Facility Operations management established an overnight fire watch and personnel conducted thermal imaging of the affected area during the night.
- LLNL: The power strip was removed and an EOC was performed. LLNL will remind workers that power strips and surge protectors are electrical equipment requiring appropriate review and approval for use in explosives operations areas. The Facility Safety Plan is being revised to more specifically state the requirements for electrical equipment in those areas.
- LLNL: Upon discovery of the HE in the parking lot, vehicle movement was prohibited until the HE was dispositioned and vehicles that had

come in post-shot were inspected. The shot work permit task list was revised to include a step to inspect the parking lots for scattered material whenever there is a shot, no matter what the anticipated results are. The Facility Safety Plan was also modified to include a requirement to inspect the parking lot for scattered material before allowing vehicles to re-enter.

- SNL: The investigation resulted in recommendations for corrective actions that would address “safe by design” intent, improve work planning and control, and the disparities in workforce safety practices/maturity.

## CONCLUSION

These occurrences serve as reminders of the need for strict procedural compliance and a questioning attitude when dealing with explosive materials. All contractors must comply with the requirements in DOE-Standard-1212, *Explosives Safety*, per 10 Code of Federal Regulations 851. During planning and implementation of work, the question, “What if,” should be asked. When legacy items are unexpectedly encountered, it should never be assumed that they are correctly stored. Individuals should stop work and seek guidance. Designers/developers must communicate and coordinate to ensure adequate layers of defense are in place to make devices as safe as possible. Management should recognize that the workforce has varying levels of maturity in understanding safety practices. Training/pre-job briefings/work planning must be tailored to address those differences, without making assumptions that could jeopardize worker safety. Increased worker involvement and buy-in may prevent recurrence.

## REFERENCES

NA--PS-BWP-PANTEX-2014-0038, *Improper Transfer of Non-High-Explosive Energetic Material*

NA--SS-SNL-2000-2014-0004, *Legacy Thermal Battery Components Found during 6S Activity*

NA--LASO-LANL-FIRGNHELAB-2014-0004, *Small Brush Fires Resulted from Firing Site Activities*

NA--LSO-LLNL-LLNL-2014-0012, *Management Concern: Inappropriate Use of Power Strip in High Explosives Application Facility*

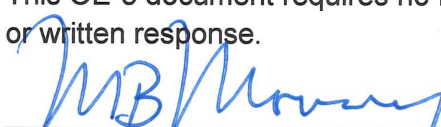
NA--LSO-LLNL-LLNL-2014-0008, *Management Concern: Small Fragments of High Explosives Dispersed into Parking Lot at B851*

NA--SS-SNL-5000-2013-0005, *Unexpected Initiation of Detonator at Explosives Testing Site 9920*

DOE-Standard-1212, *Explosives Safety*

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This OE-3 document requires no follow-up report or written response.

  
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