



OE-3: 2012-07

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Importance of Conduct of Operations and Training for Effective Criticality Safety Programs

PURPOSE

This Operating Experience Level 3 (OE-3) document provides information on criticality safety concerns manifested through deficiencies in associated training and conduct of operations.

BACKGROUND

On August 11, 2011, at Los Alamos National Laboratory (LANL) a criticality safety occurrence was reported through the Occurrence Reporting and Processing System (ORPS). Los Alamos National Laboratory (operated by Los Alamos National Security, LANS) reported a plutonium over-mass condition in Building PF-4. A researcher, who was a certified fissionable material handler (FMH), wanted a photograph of the results of a recent plutonium casting operation. The researcher accessed material in a glovebox that he was not authorized or released to work in and violated posted criticality safety limits by taking plutonium metal rods from two separate material locations and bringing them together into one single location.

After the rods were moved, a second worker, also a certified FMH, recognized that the mass of plutonium in the new location had significantly exceeded the posted criticality safety limit. The second worker then incorrectly advised the researcher to restore the materials to their original location. ([NA--LASO-LANL-TA55-2011-0018](#)).

Several LANS criticality safety procedures and requirements were not properly implemented,

highlighting the following conduct of operations deficiencies:

- The researcher removed the plutonium rods from slip-top canisters which are an administrative control. Although the plutonium material may be transferred from one container to another per LANS criticality safety procedures, any handling or processing of the material outside of containers was outside the scope of work.
- The researcher was not authorized to perform work in this particular glovebox.
- The researcher moved four rods from one side of the glovebox to the other side so that all eight rods were in one location for photographing, creating an over-mass condition.
- The researcher moved an angle-iron-delimiter, used to ensure proper criticality spacing within the glovebox, to prop up some of the rods for photographing. By moving the delimiter, a credited engineered control was no longer in place.
- A second worker incorrectly advised the researcher to restore the plutonium rods to their original configuration instead of pausing work and moving at least 15 feet from the glovebox before starting the notification process on the occurrence. Neither worker followed LANS procedures that prohibit moving nuclear material until



the configuration is evaluated for criticality safety.

DISCUSSION

The Plutonium Facility Technical Safety Requirements (TSR) direct PF-4 to implement and maintain a criticality safety management program in accordance with LANS institutional requirements defined in LANS SD130, *Nuclear Criticality Program*.

Los Alamos Site Office (LASO) and LANS management reviewed this event and then implemented an operational pause and mandatory training.

The LASO and LANS Nuclear Criticality Safety Committee (NCSC) reviewed the event and determined that at the time of the event, PF-4 had not fully implemented the LANS institutional requirements for a criticality safety program. Furthermore, twenty-three PF-4 criticality safety infractions previously self-identified by LANS in FY 2010 were due to incomplete implementation of conduct of operations and configuration management associated with criticality safety.

During the critique of the event, LANS operators and managers expressed that they had become de-sensitized to the potential for criticality, based on their familiarity with operations and assumption that the possibility of a criticality accident is remote.

The practice of good conduct of operations comes from training to ensure everyone knows the rules, but also from operator commitment to doing things correctly: a mindset as well as knowledge base. Management can help to develop this mindset by observing operations personally and reinforcing the expectation that people follow procedures and policies, and by quickly correcting procedures that do not work or cannot be executed exactly as written.

The NCSC'S critique of the event also identified the lack of robust centralized training and evaluation of training for certified personnel; issues with the process for authorizing work (e.g., in this event the glovebox owner was not aware of the work activity); and timely and complete notifications of criticality safety occurrences.

The LANS management, in coordination with the NCSC and training personnel, completed the following corrective actions in response to this event:

- Made major revisions to procedures governing criticality safety program implementation and fissionable material transfers to clarify roles and responsibilities of glovebox work authorization and material movements in PF-4.
- Revamped the PF-4 FMH certification process, taking a centralized LANL approach incorporating classroom training with an exam, a performance demonstration, and an oral board. The new performance demonstrations and oral boards are significantly more rigorous than what was required under the old FMH certification process. All PF-4 FMHs and their supervisors are undergoing recertification using this new process.
- Documented training, qualification, and certification of PF-4 FMH personnel to meet revamped FMH certification requirements.

The LANS institutional requirements for a criticality safety program have been fully implemented in 2012. To date, in 2012 LANS has self-identified 14 low level criticality issues as a result of increased awareness and vigilance of its operators, and the increased rigor in the FMH certification program.

RECOMMENDATIONS

The following recommendations for continuous improvement in criticality safety programs at facilities with fissile material operations are provided as follows:

- Procedures governing criticality safety program implementation and fissionable material transfers should be reviewed to ensure that they are understandable, accurate, and reflect work planning and hazards specific to the activities being performed.
- Rigorous training and FMH certification programs are needed and certifications should be verified for workers performing complex operations where the consequence of human error is great. Training and certification programs for FMHs should be reviewed, considering lessons learned from this LANL criticality safety occurrence.
- Senior managers should observe operations and reinforce conduct of operations concepts. At such time they can effectively convey their expectations for a mindset of safety and operational excellence. They also gain firsthand knowledge of the quality of procedures, work planning and control documents, and personnel knowledge and execution of safe work practices.
- Management and worker vigilance and a questioning attitude should be maintained in all operations, establishing a high standard of safety and mission execution. With universally high standards, operations should not become routine where they become susceptible to low-probability but high consequence accidents.
- A checklist of considerations (e.g., fissile loading and configuration, potential hazards from movement or exposure, security, ergonomic issues, applicable emergency procedures) would help operators plan unusual operations.

CONCLUSION

This criticality safety occurrence and the corrective actions taken serve as reminders that criticality safety programs associated with site and laboratory operations depend heavily on management and worker vigilance, proper training of workers, and strict adherence to procedures.

The above recommendations on the importance of good conduct of operations practices are relevant in all work, not just what workers perceive as highly hazardous. If good work practices are followed all of the time, it is more likely that they will be followed in highly hazardous situations.

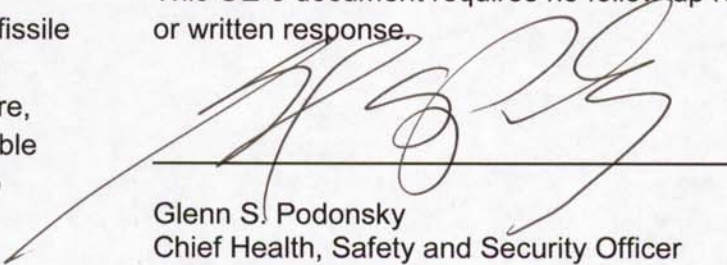
REFERENCES

- Occurrence Reporting and Processing System (ORPS) Report: NA--LASO-LANL-TA55-2011-0018, *Management Concern: Criticality Safety Issues Indicate Process and Communication Issues*.
- DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*.
- Los Alamos National Security, LLC (LANS) institutional requirements defined in SD130, *Nuclear Criticality Program*.

ADDITIONAL SOURCES OF INFORMATION

Questions regarding this OE-3 document can be directed to Nimi Rao at 301-903-2297 or nimi.rao@hq.doe.gov.

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



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