

Criticality Safety Scenario-Based Training at Los Alamos National Laboratory

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INTRODUCTION

Imagine that it's Tuesday afternoon, approximately 2:30, when the Facility Operations Center is notified of a potential criticality limit infraction. The operations center notifies the Nuclear Criticality Safety (NCS) Division and you are one of two Criticality Safety Analysts (CSAs) who is immediately dispatched to a red-lit room that has been evacuated. How do you respond?

This was the scenario a dozen CSAs in training (CSA-ITs) were faced with during a training exercise at the Los Alamos National Laboratory (LANL). The objective of the training was to simulate a potential process deviation, requiring the CSA-ITs to demonstrate knowledge, skills, and abilities learned and developed over a two-year period as part of their formal qualification program.

Among the many benefits of this training method and approach are several best practices and lessons learned:

- The training was conducted in a “cold” laboratory—a low-risk and low-hazard environment that is easily accessed and staged for the scenario.
- The CSA-ITs can train to a potentially high-risk situation in a low-risk environment with low consequences.
- Training was conducted in accordance with the local potential process deviation response procedure.
- The scenario training is a near real-time exercise that allows expert facilitators to observe and guide as needed.
- Expert performers participate in different roles, such as oversight, guidance, and evaluators. Key players included a former criticality safety officer (CSO)/fissionable material handler (FMH) with expert knowledge of the operation and area, and a current CSO who responded to the actual event and provided firsthand insight.
- The scenario was simulated on upset conditions derived from the corporate historical process deviation database.



Fig. 1. LANL CSAs during scenario training.

DESCRIPTION OF WORK

NCS division management selected this training method in 2016 to give CSA-ITs experience and an increased level of comfort in a potential process deviation response scenario. The scenario training uses actual historical potential process deviations from LANL and simulates the scenario with as much fidelity as possible to give the CSA-ITs a sense of what a potential process deviation response looks and feels like. These situations have the potential to be quite stressful, so it is important for CSAs to remain focused and ensure safe and conservative decisions are made in determining the appropriate next action.

In a nutshell, the potential process deviation response requires that CSAs assess the situation and provide relevant technical guidance to operations and facility personnel. To do so, the CSAs must gather information regarding the specifics of the potential process deviation and determine if the situation is safe and stable. If it is safe and stable, the CSAs make appropriate recommendations to the Facility Operations Director (FOD) for follow-up actions, such as releasing the room (turning off the red lights), scheduling a fact-finding session, and performing a walkdown/visual inspection of the physical location/situation. If it is determined that the situation is *not* safe and stable, the CSAs make recommendations to either achieve safe and stable or protect life; this may include emergency

response by facility responders and the Los Alamos County Fire Department.

The training was designed and developed by a team—an instructional designer, a CSA-IT with significant CSO/FMH experience, and the NCS division leader. Scenario training participants included: NCS management, CSA qualified staff/mentors, CSA-ITs, CSOs, a professional training specialist, and a Department of Energy Los Alamos Site Office representative.

A group briefing was conducted prior to the exercise describing the objectives, safety requirements, and limitations. The group was then divided into teams of two persons. Each team completed the scenario exercise independently, interacting with other role-players and under the guidance of CSA qualified staff and mentors. Evaluators recorded their performance throughout the training. A coldwash (post-exercise critique) for all participants convened immediately after the training. One participant who had responded to the actual event provided a unique perspective about the event and the exercise.

RESULTS

The exercise was conducted in the cold glovebox laboratory at LANL's Plutonium Facility that is designed for low-risk activities such as training, demonstrations, and tours. Performance was measured and evaluated using site procedure criteria, such as:

- The responding CSA shall assess the potential process deviation against the relevant criticality safety documents to determine if the potential process deviation is in fact a criticality safety limit infraction.
- If the potential process deviation is determined to be a criticality safety limit infraction, then the responding CSA(s): shall assess the process deviation against the organizational severity index criteria to determine a recommended severity index level assignment; and shall communicate the infraction severity index assignment recommendation to the applicable operations-responsible supervisor, operations-responsible manager, and FOD.

Students who completed the training included new hires and CSA-ITs. Their feedback indicated that this was an ideal method of training because it allowed them to experience a potential process deviation firsthand without having to worry about making an error as a trainee. Further, the room looked just like those in the facility with gloveboxes similar to those found in the lab and it was a safe place for trainees to fail on their own and receive feedback from mentors afterwards. One student summed it up as "...extremely beneficial as it incorporated lessons learned from an actual process deviation. These drills help take what we have learned in training and apply it."

This is the second year of doing the scenario training. NCS Division will conduct a different scenario-based exercise annually.