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Los Alamos
NATIONAL LABORATORY

Nuclear Criticality Safety Aspects of Emergency Response at the Los Alamos National Laboratory

Emergency response at Los Alamos National Laboratory (LANL) is handled through a graded approach depending on the specific emergency situation. LANL maintains a comprehensive capability to respond to events ranging from minor facility events (alerts) through major community events (general emergencies), including criticality accidents. Criticality safety and emergency response apply to all activities involving significant quantities of fissile material at LANL, primarily at Technical Area 18 (TA-18, the Los Alamos Critical Experiments Facility) and Technical Area 55 (TA-55, the Plutonium Facility). This discussion focuses on response to a criticality accident at TA-55; the approach at TA-18 is comparable.

LANL operates with an Emergency Management Plan that assists in emergency planning, preparedness, and response. This plan establishes the organization, responsibilities, interfaces, actions, and training for emergency response personnel across the Laboratory. Each facility in turn operates with a facility-specific emergency plan that establishes the same elements at that level. TA-55 operates with an extensive emergency response plan based on its operations, associated hazards, and accident scenarios. As required by the Department of Energy and the State of New Mexico, LANL and TA-55 respond to emergencies using the Incident Command System. The following outlines elements of the Incident Command System applicable to criticality accident response.

Given the potential for a criticality accident, TA-55 maintains a criticality safety program which includes required training, engineered and administrative controls, appropriate dosimetry, and authorization basis-required criticality alarm system. If this system alarms, the TA-55 Emergency Response Plan requires a number of immediate actions:

- Evacuation of the plutonium facility itself (PF-4) and all support buildings (except the Operations Center unless indicated by high radiation readings).
- Assembly of evacuated personnel (those from PF-4 in a separate area).
- Establishment of Facility Incident Command.
- Notification of Emergency Management and Response (EM&R), the Laboratory's institutional level emergency response organization.

Assembly of PF-4 workers is a priority activity, given the potential for a criticality accident to cause injury and radiation exposure. Radiation protection personnel manage the assembly area with the following specific priorities:

- Accountability – security badges are read to make sure everyone who entered PF-4 exited and assembled; if not, emergency rescue must be considered.
- Exposure – criticality accident dosimetry is quickly read to determine whether anyone received a significant exposure; straightforward calculations determine appropriate, graded response (including immediate medical care).
- Contamination – personnel are monitored to appropriately isolate and control contamination.

- Information – information regarding the accident itself, facility conditions, or victims is communicated to Facility Incident Command immediately.
- Resource prioritization – those responsible for further emergency response activities (including radiological control personnel, Emergency Response Team (ERT) personnel, and managers) are processed with priority so they are freed up for other duties, including ensuring safe assembly areas, characterizing radiation concerns, and assisting with rescue and facility recovery.

The TA-55 Facility Incident Command (FIC) assembles, establishes control of the emergency response, assigns responsibilities, and plans and executes local, tactical response to the emergency. In the case of a criticality emergency, FIC will include at least the following:

- Facility Incident Commander
- Staff, to include Safety Officer, Communications Officer, and Recorder
- Facility Team Leader, representing the physical facility and Operations Center
- Personnel Accountability Officer
- Programmatic Operations Team Leader
- ERT Liaison
- Radiological Protection Officer
- Nuclear Materials Safeguards and Security Officer

Each of these FIC members has appropriate qualifications, training, and procedural requirements to drive their respective actions in such events.

The TA-55 ERT is a team comprised of resident workers that provides a rapid response capability for incidents such as chemical spills, fires and medical emergencies. During criticality events, ERT personnel may be deployed by FIC to help with injured personnel and rescue operations. Each ERT member has annual refresher training that includes a module on criticality safety. This module reviews basic concepts and the factors affecting criticality safety. In addition, many ERT members have taken the criticality safety training class provided at LACEF. This two-day class covers safety basics, physics fundamentals, practical criticality controls, administrative practices and class participation in critical experiments.

The EM&R organization responds according to the nature of the emergency, with the following actions, according to the LANL Emergency Management Plan:

- An Emergency Manager responds to TA-55 and assumes the position of the Incident Commander after a briefing by FIC personnel.
- The Incident Commander assesses the situation, identifies the hazards, categorizes and classifies the emergency, and directs emergency response.
- If appropriate, the LANL Emergency Operations Center (EOC) is activated to provide additional support and institutional focus.
- The EM&R staff coordinates a broad range of additional emergency response resources and making any needed notifications to other Laboratory and external organizations.

Emergency Managers typically have attended a criticality safety course at LACEF.

In the event of a perceived criticality accident, the EM&R organization will contact the Los Alamos Fire Department (LAFD) and the Criticality Safety Group. Both LAFD and criticality safety personnel will respond to TA-55, reporting directly to the Incident Commander. Criticality safety personnel advise the Incident Commander about radiation levels that may be encountered by emergency responders based on all current information, including available radiation measurements and operational information. If the EOC is activated, other criticality safety personnel report there along with other necessary environment, safety, and health personnel.

If an early re-entry is necessary (presumably to rescue injured personnel who did not evacuate) Incident Command will direct the response with the following considerations:

- Analyze and minimize all known risks.
- Select a rescue team, typically consisting of two firefighters and a resident of the facility. The facility resident (which could be radiological control, ERT, facility, or programmatic personnel) will have radiation-monitoring equipment and will be familiar with the facility and associated risks.
- The re-entry will be deliberately planned, to include objectives, hold points, and selected route of entry to minimize the overall risk to the rescuers.
- All appropriate support personnel will be coordinated and staged to ensure rescue is successful and safe.

Firefighters train extensively on personnel rescue and attend specific training on radiological controls and risk.

In summary, formal and comprehensive planning and procedures govern emergency response at LANL. Response personnel are assigned clear roles and responsibilities, are appropriately trained and qualified to carry out those responsibilities, and are authorized to perform this work. This capability has been practiced and demonstrated so that the Laboratory is prepared to respond to a criticality accident if it were to occur.