

August 7, 2003

The Honorable Linton Brooks  
Administrator  
National Nuclear Security Administration  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0701

Dear Ambassador Brooks:

The staff of the Defense Nuclear Facilities Safety Board (Board) has reviewed the incorporation of safety into work planning at the Los Alamos National Laboratory (LANL). LANL categorizes its work as either facility (i.e., involved in creating a new facility or maintaining, or altering an existing facility) or nonfacility, which includes research and development.

The Hazard Control Plan is the central document LANL requires for identifying hazards, describing controls, and authorizing work. For nonfacility work the Board observed that LANL requirements are implemented in quite different ways in different divisions and at times do not result in complete identification of significant hazards and practical controls in the Hazard Control Plan. LANL requirements do not necessarily lead to an adequate involvement of subject matter experts, including engineers, in design. Hazards judged to have moderately low frequencies of occurrence may not be subject to an appropriate safety review. An accident on January 8, 2002, involving chlorine dioxide in nonfacility work demonstrated the need for improvements in work planning requirements. Only minor changes have been made in work planning requirements so far.

The Board notes that the facility work under subcontract from LANL to a new support services contractor is undergoing a transition and shows promise of significant improvement. Changes in senior management also appear to be facilitating changes in work planning. Finally, the Board understands that LANL's new director has chartered and chairs a Nuclear Safety Executive Board. The enclosed issue report is forwarded for your use and his, as appropriate, in revising LANL's work planning requirements.

Sincerely,

John T. Conway  
Chairman

c: The Honorable Beverly Ann Cook  
Admiral George Pete Nanos  
Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

June 17, 2003

**MEMORANDUM FOR:** J. K. Fortenberry, Technical Director

**COPIES:** Board Members

**FROM:** V. Anderson

**SUBJECT:** Work Planning and Practices at Los Alamos National Laboratory

This report documents a review of requirements and practices related to activity-level work planning at Los Alamos National Laboratory (LANL). This review was conducted by members of the staff of the Defense Nuclear Facilities Safety Board (Board) D. Burnfield, A. Jordan, W. Von Holle, and V. Anderson, assisted by outside expert D. Volgenau.

Work planning is defined by the Department of Energy (DOE) in DOE Guide 540.4-1B, *Integrated Safety Management System Guide*, as: “The process of planning a defined task or activity. Addressing safety as an integral part of work planning includes execution of the safety-related functions in preparation for performance of a scope of work. These functions include (1) definition of the scope of work; (2) formal analysis of the hazards bringing to bear in an integrated manner specialists in both environmental, safety and health (ES&H) and engineering, depending on the specific hazards identified; (3) identification of resulting safety controls including safety structures, systems and components, and other safety-related commitments to address the hazards; and (4) approval of the safety controls.” Tasks and activities can range from the relatively simply and routine to those complex enough to benefit from project management as a means of assuring that safety is addressed.

LANL distinguishes between “facility work,” which it defines as “any combination of engineering, procurement, erection, installation, assembly, disassembly, or fabrication activities involved in creating a new facility or in maintaining, altering, adding to, decontaminating, decommissioning, or rehabilitating and existing facility” and “nonfacility work,” which includes, but is not limited to, research and development (R&D). The review focused on the general aspects of work planning for facility and nonfacility work. LANL uses separate institutional processes, directed through Laboratory Implementing Requirements (LIRs), to plan facility and nonfacility work.

**Work Planning Process for Facility Work.** The Board’s staff reviewed several completed work packages for facility work. The staff found that some were cumbersome, not task-specific, and did not clearly identify controls for hazards.

The LIRs governing the conduct of facility work and maintenance skill-of-the-craft work have

not been updated since 1999. The work planning process has changed, but these changes have been implemented through various notices not intended to have long-term standing, such as a December 2000 notice requiring operational safety meetings and in-the-field training. More permanent, institutionally consistent direction in work planning improvements, such as a change to the LIRs for work planning, would solidify the process laboratory-wide.

There is a new subcontractor, KSL Services Joint Venture, for facility work. Several of its new staff members have proven records in improving work practices at other sites in the defense nuclear complex. Based on presentations by subcontractor personnel, they appear to understand that such improvements are necessary and are in the process of developing corrective actions.

**Work Planning Process for Nonfacility Work.** Nonfacility work encompasses a broad spectrum of activities ranging from simple to highly complex, and worker familiarity with these activities ranges from a great deal of experience to none at all in the case of new activities. LIRs entitled *Safe Work Practices* and *Documentation of Safe Work Practices* are intended to define the safety documentation required for all nonfacility work. The key document required is a Hazard Control Plan (HCP).

*Adequacy of Hazard Control Plans and Their Implementation*—According to LIR, *Safe Work Practices*, an HCP at a minimum “defines the work, identifies the hazards associated with the work, and describes the controls needed to reduce the risk posed by the work to an acceptable level.” An HCP is intended to communicate effectively the hazard control system for a defined activity; however, the staff’s review of the HCPs revealed that they do not always document the hazards and controls adequately. For example, HCPs for Technical Area (TA)-8-23 radiography operations with radioactive materials were reviewed. These HCPs did not identify the hazard of lightning, although the work instructions did discuss lightning protection. In addition, the control listed for nuclear criticality was simply to avoid the presence of a critical mass of fissile material in the building, while, in practice, a less restrictive limit was used to protect against criticality.

The observed deficiencies in HCPs may be, in part, due to the limited training in performing hazard analyses given to personnel writing the HCPs. The Board’s staff found that required HCP training is only four hours long, and refresher training is not required.

The practices related to implementation of controls could also be improved. For example, in work performed for the Advanced Test Line for Actinide Separations, workers do not generally review the controls immediately prior to beginning work. On a positive note, workers did report that there is an effective system in place allowing them to stop work should a potentially unsafe or unclear situation arise.

*Engineering in the Design of Nonfacility Work*—The LIR *Engineering Standards* provides requirements and guidance for the identification of codes and standards for the design of systems for

nonfacility work. However, there is no link from the safe work practices LIRs to *Engineering Standards*, so a researcher developing a process might not know that *Engineering Standards* exists. *Engineering Standards* states that it shall be implemented for programmatic work, which is typically nonfacility work, but then states that none of its requirements shall apply to programmatic work unless prior consensus approval has been obtained from programmatic groups. Making such requirements optional in all cases precludes consistent, high-quality implementation at LANL. For some nonfacility work, requiring codes and standards listed in *Engineering Standards* would improve the safety, reliability, and operability of the equipment.

*Level and Timing of Reviews Required*—The safe work practices LIRs and Laboratory Implementation Guides (LIGs) specify different levels of subject matter experts (SMEs) review based on “initial risk,” which is determined by referring to a table that considers both the potential severity of the consequences of identified hazards and the likelihood of such consequences. For work categorized as having high initial risk, the LIR requires that the HCP be submitted to the ES&H SMEs and independent peer(s) for concurrence, while work categorized as having a medium initial risk requires only consultation with either ES&H SMEs or independent peer(s). No SME or peer reviews are required for lower-risk activities. There are no requirements for the timing of reviews. HCPs are required to be completed and approved prior to the start of experimental work, not following design and prior to fabrication and assembly of experimental equipment.

This approach presents several difficulties. For example, determinations of the likelihood of consequences are subjective in nature. Only limited guidance is provided on how to determine likelihood in the context of nonfacility work at LANL, and in some cases, there may be little supportable basis for making such a determination. Therefore, the risk ranking is subjective. In fact, as discussed with LANL personnel in February 2002, several authors of HCPs interviewed by the Board’s staff in conjunction with a review of the January 2002 accident involving chlorine dioxide were uncertain about how to assign risks.

In addition, the limited guidance on likelihood determination that does exist leads to the assignment of relatively low risks. For example, the guidance can be interpreted as stating that if the probability of death is roughly 1 in 1,000 or less, this risk is “medium,” meaning only consultation with either an ES&H SME or an independent peer is required; concurrence is not necessary. A better approach would be to determine the need for reviews based on the potential consequences of hazards, ignoring likelihood if the event is considered credible.

Involving only ES&H SMEs and independent peers, as implied by the LIR, excludes other SMEs, such as engineers and crafts, who can make valuable contributions.

**Observations Common to Facility and Nonfacility Work.** An effective system to capture laboratory-wide lessons learned from the work planning and execution process does not appear to exist at LANL for either facility or nonfacility work. This has probably resulted primarily from not having someone clearly assigned this responsibility for the laboratory as a whole and from not closing

out work packages in a timely manner.

**LANL Initiatives to Improve Work Planning.** As a result of LANL's investigation of the chlorine dioxide accident of January 2002 and in response to a review by DOE's Office of Independent Oversight and Performance Assurance, LANL has been reviewing the way it incorporates safety into work planning for nonfacility work. The Safe Work Practices Improvement Focus Team established in October 2002, and a Hazard Consolidation Team has been reviewing requirements and field practices. As a result of recommendations from these teams, minor changes were made to the LIRs on safe work practices in February 2003, but these changes did not fully address the issues described above.

Subsequent to the on-site review by the Board's staff, the Safe Work Practices Improvement Focus Team issued its report. The team's report cited many of the same issues the Board's staff has observed: laboratory safe work practices are not always fully implemented; the decision to utilize SMEs is incorrectly based on risk, not hazard; and personnel in a position to approve HCPs are not required to have the requisite knowledge, skills, and abilities. The report also discussed the usefulness of requiring a summary chart of hazards and their relation to controls in HCPs, among other recommendations. The Board's staff is concerned that the implementation plan proposed by the team appears to be cumbersome, leading to a concern that important changes will not be made quickly.

The new director of the laboratory has chartered and chairs a Nuclear Safety Executive Board (NSEB). The purpose of the NSEB is "to strengthen the Laboratory's nuclear safety posture by elevating to the attention of senior executive management the details of issues that have or could have nuclear safety implications." It is hoped that with the additional high-level attention to worker protection provided by the NSEB, work planning will improve.

During the staff's review, it was apparent that both line managers and workers were enthusiastic regarding the potential for positive change in the work planning and execution processes portended by the recent improvement initiatives. As previously noted, the new site maintenance contractor appears to be working with LANL to significantly improve the facility work planning process.