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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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January 22, 2001

Mr. Richard E. Glass
Manager
Albuquerque Operation Office
Department of Energy
Pennsylvania and H Street
Kirtland Air Force Base
Albuquerque, NM 87116

Dear Mr. Glass:

The staff of the Defense Nuclear Facilities Safety Board (Board) recently reviewed design and construction projects at Los Alamos National Laboratory (LANL). Although several of the staff's observations indicate the need for remedial actions by both the Department of Energy (DOE) and LANL, the Board is encouraged to see that the laboratory has recently taken steps to address some of these issues. As discussed in a briefing of the Board on September 12, 2000, and described in the enclosed issue report prepared by the Board's staff, LANL's establishment of a project engineering function should significantly enhance LANL's ability to properly manage the development of the safety basis during design and construction of defense nuclear facilities. While the improved organization initially addresses only projects costing less than \$500,000, LANL appears to understand the need to extend this new project engineering capability to larger projects as well.

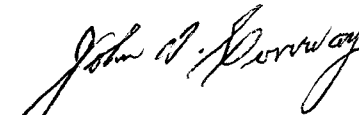
Delays have been encountered in one important project, the Fire Protection Yard Main Replacement Project at Technical Area (TA)-55, because safety design criteria were not developed early in the design process. Although solutions to several of the resulting safety-related problems have been identified, one issue still remains: the identification of quality requirements. Given the importance of fire safety to operations at TA-55, the Board believes it is essential to resolve this issue and complete this project without further delay.

The Board notes that DOE has not yet formalized agreements on the format and content of fundamental documents required for project management, including conceptual, preliminary, and final design reports. In addition, DOE has not yet required that safety design criteria, including identification of standards, be developed prior to preliminary design, as highlighted in a December 5, 1997 letter from the Board. The Board expects that in conjunction with implementing the new DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*, DOE will ensure that safety design criteria are developed early in the design stage and that the format and content of key documents are agreed upon in advance.

The Board will continue to follow the progress of specific projects at LANL as well as the more general development of project engineering and safety basis development associated with these projects. In addition, the Board requests that DOE provide a briefing on the following two topics:

- (1) The organizational relationships and responsibilities of DOE and LANL related to project execution.
- (2) DOE's review of the adequacy of LANL's implementation of the enhanced reliability requirements of DOE Order 420.1, *Facility Safety*, for procurement of safety related components.

Sincerely,



John T. Conway
Chairman

c: Mr. David E. Beck
Mr. Mark B. Whitaker, Jr.
Dr. John C. Browne

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

January 9, 2001

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: J. Blackman
A. Jordan

SUBJECT: Design and Construction Projects for Defense Nuclear Facilities,
Los Alamos National Laboratory

This report documents the results of reviews of organizational changes undertaken by Los Alamos National Laboratory (LANL) to better manage design and construction projects. Observations resulting from reviews of several design and construction projects are also presented. F. Bamdad, J. Blackman, C. Coones, A. Hadjian, A. Jordan, and D. Kupferer of the staff of the Defense Nuclear Facilities Safety Board (Board) participated in these reviews.

Development of Infrastructure for Managing the Development of Design Bases for Design and Construction of Defense Nuclear Facilities. According to the principles of Integrated Safety Management, to adequately address safety, the process of designing defense nuclear facilities needs to include early identification and analysis of hazards, as well as identification of controls required to protect the public, workers, and the environment. The design of engineered controls and the development of administrative controls must evolve as an integral part of the design process. This is a project engineering function whereby safety analysis and technical disciplines are integrated into a seamless organization charged with preparing the design and authorization basis for a project.

Two organizational changes within LANL's Facility and Waste Operations (FWO) Division offer the potential for addressing the above needs. First, the Office of Authorization Basis (OAB) within FWO was created to provide ownership and oversight of the authorization basis process at LANL. This office appears to understand the need for early analysis of hazards and is working with other laboratory organizations to enhance requirements in this regard. Second, the Systems, Engineering, and Maintenance (SEM) Group, also part of FWO, was established to provide the project engineering including the development of the design basis (technical baseline) and the implementation of the design, construction, startup, and transition to operation for minor (projects costing less than \$500 thousand) design and construction projects. Within the SEM Group is a full-time Standards Manager, whose institutional role is to steer improvements to the standards program and to author standards for each engineering discipline.

The creation of the OAB and the SEM Groups establishes a project engineering function within the laboratory that can significantly enhance the laboratory's ability to develop safety bases during the design and construction of defense nuclear facilities in a manner that will support the requirements of an authorization basis.

LANL's Project Management (PM) Division is responsible for managing larger projects and interfacing with the architect/engineering firm implementing the design. However, the staff has observed that PM does not have the engineering expertise needed to adequately manage the engineering aspects of major design and construction projects. To remedy this short fall, LANL is considering utilizing FWO to provide the project engineering expertise for PM-managed projects.

Organizational relationships and responsibilities among program management, line organizations, FWO, and PM for the management of projects have not been formalized at LANL. DOE and LANL also have not formalized working and reporting relationships. However, the Board's staff understands that Laboratory Implementation Requirements (LIRs) for the project engineering function at LANL are being revised to address these organizational responsibilities. LIRs are also being revised to address the preparation of guidance for design and construction projects.

In parallel with improving the internal LANL infrastructure for technical management of design and construction projects, actions are being taken to formalize and implement DOE's expectations of LANL. LANL and DOE Los Alamos Area Office recently incorporated most of DOE Order 420.1, *Facility Safety*, into the contract for management of the laboratory. This represents a significant step toward having adequate contractual requirements for the design of defense nuclear facilities. DOE Order 420.1 is supported by a new guide, DOE G 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for Use with DOE O 420.1, Facility Safety*. LANL's FWO Division is taking the lead in reviewing this guide for incorporation into the LANL LIR system. Actions being taken to respond to the Board's observation (in a September 22, 1999, letter) that LANL's Work Smart Standards do not address the design of safety-class and safety-significant electrical, instrumentation and control systems, are still in progress, but are expected to be completed as part of this review of DOE G 420.1-1.

Agreements need to be formalized between DOE and LANL on deliverables to be provided to DOE by the laboratory. For example, the format and content of fundamental documents such as conceptual, preliminary, and final design reports have not been formalized. In addition, DOE has not yet required that safety design criteria, including identification of standards, be developed prior to preliminary design, as highlighted in a letter from the Board dated December 5, 1997.

Specific Projects. The Board's staff reviewed several design and construction projects during various site visits. The following is a summary of the staff's significant observations.

Replacement and Upgrading of the Technical Area (TA)-55 Fire Protection Yard Main Replacement Project—LANL is carrying out the Fire Protection Yard Main Replacement Project to replace the leaking fire water loop at TA-55 and upgrade the pumphouses and water tanks that supply water to the loop, consistent with current safety requirements. The designer, Duke Engineering and Services, Inc. (DE&S), has completed most of its design work. DOE, LANL, DE&S, and the Board's staff have reviewed, discussed, and resolved most of the issues related to a number of in-process design packages.

However, the issue of how the enhanced reliability requirements of DOE Order 420.1, *Facility Safety*, will be achieved for the safety-significant fire water loop piping has not been resolved. To protect facility workers, DOE Order 420.1 requires consideration of defense in depth, including the use of conservative design margins and quality assurance for protection against the release of radioactivity. The safety-significant fire water loop must therefore be designed, and materials procured and installed using design and quality requirements which are more conservative than those followed in commercial practice. Since stress levels in the piping are generally quite low, selection of conservative design margins is not necessary for this application. However, quality requirements are still required. While DOE and LANL have agreed with the Board's staff observation that conservative procurement and installation quality requirements are needed, detailed implementing requirements have not yet been proposed.

Upgrade Project for Chemistry and Metallurgy Research (CMR) Building—Ongoing sub projects implement Technical Safety Requirements derived from a Basis for Interim Operation for the CMR facility. These sub projects are at various stages of completion and are progressing well.

Decontamination and Volume Reduction System—LANL currently has several thousand cubic meters of transuranic (TRU) waste in storage. The waste is stored in containers that are unsuitable for shipment to the Waste Isolation Pilot Plant. The Decontamination and Volume Reduction System (DVRS) is intended to prepare the waste for shipment. The project includes a 13,200 square foot confinement area with active ventilation and contamination control. In addition to the preparation of TRU waste for shipment, various processes for decontamination of metal objects are being considered.

Although construction of the building structure is 85 percent complete and the internal building systems are 24 percent complete, work on the safety analysis and the safety requirements to be considered for the facility are lagging significantly behind the facility design. In fact, it appeared until recently, that safety basis development had been decoupled from the facility design. As a result, DOE and LANL have decided to initially classify the facility as a radiological facility. This classification will not require engineered controls to be incorporated into the current design and allow completion of construction. This approach will enable treatment of about half of the waste which only contains radiological quantities of TRU materials. In parallel, LANL plans to complete a safety analysis for Hazard Category 2 and 3 operation to determine whether the DVRS can be upgraded in the future. If this is not feasible,

alternatives for treating the remaining waste will have to be developed. Given the current circumstances, this approach is reasonable. However, had the safety analysis been developed as an integral part of the design process, the current situation would not have occurred.

The Board's staff believes the institutionalization and implementation of the project engineering function discussed earlier in this report, would have prevented or minimized the problems discussed for both the fire water loop and DVRS projects.