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## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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February 22, 2002

The Honorable Everet H. Beckner  
Deputy Administrator for Defense Programs  
Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585-0104

Dear Dr. Beckner:

The Department of Energy (DOE) issued DOE Order 420.1, *Facility Safety*, and related guidance, DOE G 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for Use with DOE O 420.1, Facility Safety*, to provide design requirements and guidance for nuclear facilities. DOE G 420.1-1 describes a methodology for selecting industry codes and standards and identifies discipline-specific codes and standards for safety-class and safety-significant structures, systems and components. While DOE G 420.1-1 is guidance, the Contractor Requirements Document for DOE Order 420.1 states:

Guidance associated with this document are not mandatory requirements. The guidance provided in implementation guides and standards referenced therein are acceptable methods to satisfy the requirements of this document. Alternative methods that satisfy the requirements of this document are also acceptable. Any implementation method selected must be justified to ensure that an adequate level of safety commensurate with the identified hazards is achieved.

Thus, the expectation is that each contractor implementing DOE Order 420.1 will either adopt the implementation guide associated with the Order, or propose and technically justify an alternative approach to meeting the requirements of the Order.

Implementation of DOE Order 420.1 and the guidance referenced by the Order is particularly important at sites designing new facilities or major upgrades. The identification of appropriate quality assurance requirements is needed to assure that functional, operational, and reliability requirements of safety-class and safety-significant structures, systems and components can be achieved. Provisions of the referenced codes and standards usually serve as the bases of quality assurance plans.

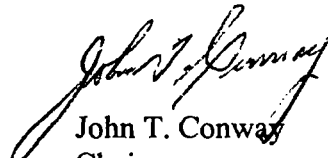
However, the enclosed report prepared by the staff of the Defense Nuclear Facilities Safety Board (Board), states that DOE does not appear to be aggressively pursuing implementation of these documents at Los Alamos National Laboratory, and the target

date for implementation has now slipped to summer 2002. In addition, the Board's staff has observed during a separate review that DOE G 420.1-1 has not been implemented at Sandia National Laboratories.

Therefore, pursuant to 42 U.S.C. 2286b(d), the Board requests that DOE provide a report within 60 days of receipt of this letter that addresses the following items:

- The status of implementation of DOE Order 420.1 at each National Nuclear Security Administration site having defense nuclear facilities.
- For those sites that do not use the implementation guides and standards referenced in DOE Order 420.1, a description of the alternative methods being employed.

Sincerely,



John T. Conway  
Chairman

c: Mr. Rick Glass  
Mr. Mark B. Whitaker, Jr.

Enclosure

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

## Staff Issue Report

December 20, 2001

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

**COPIES:** Board Members

**FROM:** J. Blackman and A. Jordan

**SUBJECT:** Design Requirements and Guidance and Status of Quality Assurance Improvement, Los Alamos National Laboratory

This report presents observations of the staff of the Defense Nuclear Facilities Safety Board (Board) regarding the incorporation of design requirements and guidance into the Department of Energy's (DOE) contract with the University of California (UC) for the operation of Los Alamos National Laboratory (LANL), and into the laboratory's internal design requirements. The report also presents the staff's observations on quality assurance (QA) at LANL. These observations are based in part on an on-site visit by staff members J. Blackman, A. Jordan, C. Keilers, R. Rosen, and J. Shackelford.

**Design Requirements and Guidance.** In a letter dated September 22, 1999, the Board noted that the DOE/UC contract for the operation of LANL did not address the design of safety-class and safety-significant electrical and instrumentation and control systems, as well as other important topics. The Board stated that upgrades to LANL's standards are needed to ensure compliance with established and proven industry design practices for safety systems. Recent difficulty with component qualification for the Technical Area-55 (TA-55) Fire Protection Yard Main Replacement Project is an example of the safety problems caused by this lack of design requirements.

On March 23, 2000, DOE issued DOE G 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for Use with DOE O 420.1, Facility Safety*. This document provides a methodology for selecting industry codes and standards for nuclear safety aspects of nonreactor nuclear facility design. It also identifies discipline-specific codes and standards to be used for safety-class and safety-significant structures, systems, and components (SSCs) in the following categories: structural, ventilation, process equipment, mechanical handling equipment, electrical, instrumentation and control, and alarm systems.

Compliance with the related DOE Order, DOE O 420.1, *Facility Safety*, is required by the DOE/UC contract, with a few exceptions. The Order states that the guidance in the document does not represent mandatory requirements. However, if the guidance is not incorporated as requirements, alternative methods that provide adequate levels of safety commensurate with the identified hazards must be identified and justified. LANL has neither incorporated DOE G 420.1-1 in the contract nor identified alternative methods.

In a letter to the Board dated January 9, 2001, DOE's National Nuclear Security Administration (NNSA) stated that the Los Alamos Area Office (LAAO) has been coordinating the task of incorporating site-wide requirements for electrical, instrumentation and control, lightning protection, and fire protection systems into the contract. The enclosure to that letter stated that incorporation of electrical and instrumentation and control standards into the LANL Engineering Manual was tentatively scheduled for May 16, 2001.

The Board's staff found in its recent visit, however, that LAAO has not acted to formalize the guidance contained in DOE G 420.1-1 or any alternatives as requirements. This is the case even though several recent technical issues could have been avoided if the guidance had been formalized in LANL's Laboratory Implementation Requirements (LIRs) or the LANL Engineering Manual and then followed. For example, difficulties in the recent design and procurement activities for the Fire Protection Yard Main Replacement Project at TA-55 illustrate how appropriate implementation of DOE G 420.1-1 could have resulted in completing those activities more quickly and less expensively. DOE G 420.1-1 states: "Safety SSCs and their associated support systems must be designed, fabricated, erected, and tested to standards and quality requirements commensurate with their importance to safety."

On a related subject, the order provides requirements designed to avoid single-point failure, a topic that required further development at LANL following a review by the Board's staff. The order also contains a methodology for developing QA requirements appropriate to safety-class or safety-significant SSCs. During the review by the Board's staff of procurement requirements for the safety-significant high-density polyethylene (HDPE) piping system, the staff and LANL agreed that commercial-grade quality could be specified, supplemented by additional quality requirements. Selection of the additional requirements would be based on the need to ensure the reliability of pertinent safety functions for the plastic piping. This approach is consistent with accepted practices of the nuclear power industry and DOE O 420.1 and DOE G 420.1-1. Following several discussions and exchanges of technical comments, LANL developed an appropriate rationale and methodology for specifying the supplemental requirements. The laboratory prepared detailed specifications for the procurement and installation of HDPE piping to meet the commercial-grade and supplemental requirements.

LANL understands the need to incorporate the guidance of DOE G 420.1-1 into LANL procedures and has initiated a program to incorporate the guidance into the LANL Engineering Manual, which is now mandatory for all the laboratory's projects. However, the target completion dates for incorporation of the DOE G 420.1-1 guidance or justified alternatives in the LANL Engineering Manual have slipped to the following:

- Mechanical—February 2002
- Electrical—July 2002
- Instrumentation and control—September 2002
- Fire protection—September 2002

While other guidance referenced by DOE O 420.1 was not specifically discussed during the staff's review, it also needs to be incorporated into the LANL Engineering Manual.

**Quality Assurance Improvement.** The Board's staff reviewed the laboratory's QA improvement activities. Both NNSA and LANL have acknowledged that significant QA problems exist at the laboratory.

*Oversite of LANL Quality Assurance Improvement by LAAO*—Partly as a result of a letter from the Board dated January 22, 2001, LAAO has recognized the importance of QA and the need to supplement its expertise in this area. Consequently, LAAO has hired a knowledgeable consultant to assess QA at the laboratory and to advise LAAO and LANL on how to incorporate QA into various practices in an easily executable manner.

*Quality Assurance Improvements at LANL*—In October 2000, LANL acknowledged to DOE that the laboratory's institutional QA program was deficient. LANL indicated that a better QA program had previously been in place, but had been diluted and lost emphasis as the result of a variety of factors, including past laboratory reorganizations and personnel changes. LANL recently performed a self-assessment of its QA program and expects to issue a report on its findings shortly, along with proposed corrective actions.

LANL has appropriately identified a senior manager, the Associate Director of Operations, as champion for quality. He has stated that he plans to appoint a Senior Quality Officer; create an Operation Assurance organization; and establish a Quality Assurance Council to assist in upgrading internal policies, standards, and procedures.

LANL recently issued an LIR, *Procurement Quality*, effective October 1, 2001. This LIR is a high-level document that represents a good initial step toward improving QA related to procurement. The requirements of this LIR are to be implemented for purchases for Hazard Category 2 and 3 nuclear facilities no later than February 2002. The systems and support tools required by this LIR are currently being developed or modified and are expected to be available by January 31, 2002.

Even though a formal program has not been fully established at the institutional level, individual organizational units at the laboratory are developing and implementing their own QA programs. However, there appeared to be little communication among the various organizations with respect to the standardization of QA approaches. As a result, the disparate individual programs are likely to be at variance with the institutional program now under development. Examples include the TA-55 Plutonium Facility, operated by the Nuclear Materials Technology division, and the DynEx project. The staff observed that certain advantages could be gained if these independent efforts were viewed as pilot initiatives. The results of the pilot efforts could then be integrated with the institutional program, with the goal of achieving a final product that incorporates both top-down and bottom-up perspectives.