

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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June 14, 2010

The Honorable Thomas P. D'Agostino
Administrator
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0701

Dear Mr. D'Agostino:

The Defense Nuclear Facilities Safety Board (Board) is concerned that activity-level work planning by the Nuclear Materials Technology Program (NMTP) at Lawrence Livermore National Laboratory (LLNL) is not being used effectively to ensure worker safety. Work packages lack specificity and fail to link work tasks to specific hazards and necessary controls. These deficiencies result in vulnerabilities in ensuring worker safety and potential vulnerabilities in adequately complying with the safety basis at LLNL defense nuclear facilities. The Board reached these conclusions based on a review conducted by its staff to assess NMTP's implementation of Integrated Safety Management at the activity level (see enclosure). This review focused on the processes used by NMTP to develop Operational Safety Plans (OSPs) and Work Permits for the Superblock facility and Work Permits for the Radioactive and Hazardous Waste Management (RHWM) facility.

The staff evaluated the NMTP work planning and control processes against the National Nuclear Security Administration (NNSA) document *Activity Level Work Planning and Control Processes: Attributes, Best Practices, and Guidance for Effective Incorporation of Integrated Safety Management and Quality Assurance* dated January 2006. NNSA issued this document in response to the Board's Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*. Work packages reviewed by the Board's staff did not reflect the guidance in the document, particularly in the areas of defining the scope of work and performing hazard analyses. These work packages did not define work activities and boundaries in sufficient detail to allow work planning teams to determine the job steps necessary to complete the work—prerequisites before hazards can be identified, appropriate controls can be established, and adequate work instructions can be developed. As a result of vague work instructions, the safety of many operations relies too heavily on the workers' knowledge and experience and can be compromised.

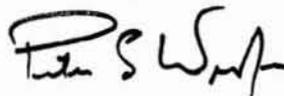
The staff's review also revealed that, contrary to your memorandum to all site office managers dated January 23, 2006, in response to the Board's Recommendation 2004-1, the Livermore Site Office has not institutionalized the Criteria and Review Approach Documents you prescribed. As a result, the site office does not conduct focused reviews of activity-level

work planning utilizing subject matter experts, instead solely relying on routine field observations by facility representatives. Because of the lack of focused reviews, the site office has been ineffective in identifying weaknesses in the work planning and control processes, although it recognizes that this area requires attention and has recently begun taking action to improve its work planning oversight activities. Site office initiatives include a stated intent to use the prescribed Criteria and Review Approach Documents to assess work planning and control, assignment of the site office's Senior Technical Safety Advisor to manage the oversight of work planning, and an update to the database used to facilitate oversight activities.

The Board recognizes that NNSA is working in concert with the Office of Environmental Management and the Energy Facility Contractors Group to take an active role in improving work planning and control throughout its operations. All defense nuclear facilities would benefit greatly if the outcomes of this effort included a Department of Energy (DOE) technical standard for work planning and control and a guide supporting DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*. To be effective, this guide would need to include a Criteria and Review Approach Document for critical work activities. DOE identified the need for such a guide in Commitment 5 of the Implementation Plan for Recommendation 2004-1, but this need has yet to be met. Oversight of work planning and control across the complex is suffering as a result, as identified in the Board's letters to NNSA regarding work planning and control at the Y-12 National Security Complex and at Los Alamos National Laboratory, and its letters to Environmental Management regarding work planning and control at the Idaho Cleanup Project at the Idaho National Laboratory and the Hanford Tank Farms.

Based on the above observations, and pursuant to 42 U.S.C. § 2286b(d), the Board requests a report within 90 days of receipt of this letter outlining actions taken or planned by NNSA, the Livermore Site Office, and NMTP to address the deficiencies in work planning and control detailed in the enclosed report.

Sincerely,



Peter S. Winokur, Ph.D.
Chairman

Enclosure

c: The Honorable Inés R. Triay
Mr. Glenn S. Podonsky
Ms. Alice C. Williams
Mrs. Mari-Jo Campagnone

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

April 27, 2010

MEMORANDUM FOR: T. J. Dwyer, Technical Director

COPIES: Board Members

FROM: R. Verhaagen

SUBJECT: Activity-Level Work Planning, Lawrence Livermore National Laboratory

This report documents a review by the staff of the Defense Nuclear Facilities Safety Board (Board) of the activity-level work planning and control activities of the Nuclear Materials Technology Program (NMTP) at Lawrence Livermore National Laboratory (LLNL) defense nuclear facilities. This review was conducted by members of the Board's staff J. Anderson, R. Arnold, J. MacSleyne, J. Plaue, and R. Verhaagen, and assisted by outside expert D. Volgenau. The staff reviewed the implementation of Integrated Safety Management (ISM) in the planning and control of activity-level work to evaluate whether work packages include appropriate controls for worker protection. The staff evaluated NMTP's work planning and control processes against the National Nuclear Security Administration (NNSA) document *Activity Level Work Planning and Control Processes: Attributes, Best Practices, and Guidance for Effective Incorporation of Integrated Safety Management and Quality Assurance* (NNSA document) dated January 23, 2006. NNSA issued this document in response to the Board's Recommendation 2004-1, *Oversight of Complex, High-Hazard Nuclear Operations*. The staff concluded that NMTP is not fully leveraging this document to develop or evaluate the implementing mechanisms for work planning.

In addition to reviewing the adequacy of the overall work planning and control processes used by NMTP, the staff's review focused on the processes used to develop Work Permits and Operational Safety Plans (OSPs) for the Superblock facility and Work Permits for the Radioactive and Hazardous Waste Management (RHWM) facility. The staff also evaluated the effectiveness of the Livermore Site Office's (LSO) oversight of the work planning and control processes.

Observations. The staff identified weaknesses in the work planning and control processes for the Superblock facility involving the content of the governing facility-level directives for developing OSPs and Work Permits and the directives' execution. The institutional directives used to plan work lack specificity. For example, while the *Superblock Work Control Manual* states that OSPs are not procedures, it does not specify, or provide criteria

with which to determine, when a work package requires a detailed work instruction or procedure. As a result, NMTP uses OSPs in lieu of written instructions even when the hazards are significant enough to warrant work instructions or procedures. These weaknesses translate into work packages with inadequate written direction to ensure the safe performance of work. Specifically:

- The resulting work packages are not sufficiently detailed, hazards associated with specific tasks are not clearly identified, and appropriate controls for the hazards are not clearly documented.
- Programmatic work performed in the Plutonium Facility is not generally controlled by procedure, but relies heavily on the fissile material handler's knowledge of the scope of the operation, the activities to be performed, and the associated hazards.

The staff believes this lack of written instruction results in an overreliance on correct worker interpretation, and thus leads to a vulnerability in ensuring worker safety and a potential vulnerability in adequately complying with the safety basis.

Superblock observations—The staff reviewed a 36-page OSP developed for the performance of 13 separate recovery laboratory operations in eight different workstations in a single laboratory room. According to the *Superblock Work Control Manual*, OSPs are designed to identify the controls for ongoing facility or programmatic work activities that involve the handling of nuclear and other hazardous materials or the operation of hazardous equipment. These activities normally would have an effect on facility or programmatic operations and require an in-depth hazard analysis. This OSP contained only a broad description of what work could be performed at each workstation, did not include or reference any work instructions/procedures, and did not tie specific hazard controls to specific tasks. It did not specify which chemicals were to be used for a given wet chemistry activity or restrict any combination of these chemicals from use in any workstation.

An example of a specific deficiency of concern is the table in this OSP that identifies more than 24 hazardous chemicals. This table also lists the industrial hygiene hazards associated with each chemical but does not clearly specify the controls for each of these hazards. The OSP does not identify which chemicals are incompatible and thus does not specify the controls necessary to ensure that incompatible chemicals are not combined. Inadequate controls and restrictions were specified for one chemical that had been evaluated for use through the Unreviewed Safety Question Determination (USQD) process on November 12, 2008. The staff noted that the OSP failed to document specific assumptions made in the USQD, including a referenced chemical procedure. When the Board's staff asked management and workers what prevents them from combining incompatible chemicals or from violating the USQD, they responded that they rely on workers' training and qualification rather than written work instructions. This approach is clearly inconsistent with the standards-based approach expected for nuclear operations and required per the *LLNL Institution-Wide Work Control Process Requirements Document* and the January 2006 NNSA document.

A brief review of additional OSPs revealed similar issues. NMTP recently upgraded the OSP process to include a task table that links hazards to general tasks. While this table represents an improvement, it is only being implemented when revising existing or developing new OSPs, and there is still no clear process for analyzing and controlling hazards specific to an individual task. NMTP intends to transition the OSPs to the institutional task-based Integration Work Sheet; however, a precise plan and schedule for this transition have not been formalized.

A Work Permit used to move, open, inventory, and repack legacy items from an unused hood in the Tritium Facility contained similar deficiencies. This work was determined to require a comprehensive work package and a full Work Permit. Direction in the *Superblock Work Control Manual* for planning this type of work is very broad, and training for responsible individuals does not adequately compensate for this shortfall. As a result, the work scope for this task was not adequately bounded, and the work instructions developed failed to meet the requirements of the *Superblock Work Control Manual*. Additionally, when the approved work in the hood was complete, the responsible individual formally requested to expand the scope of the work through the feedback and improvement form to process additional items located in an adjacent room. Facility management approved this change in scope because the responsible individual indicated that no new hazards had been introduced. However, one item clearly marked as containing uranium and requiring uranium controls was authorized for processing when uranium had not been identified as a hazard, and required controls had not been verified. This occurred as a direct result of expanding the scope without a corresponding formal analysis of the hazards involved by the responsible individual or the approving authority.

RHWM observations—The Work Permit process for RHWM was recently revamped in response to work planning deficiencies that resulted in a glovebox explosion. These changes bring the RHWM work planning and control processes more in line with the *LLNL Institution-Wide Work Control Process Requirements Document* and the January 2006 NNSA document. The changes are invoked through a standing order, with the intent of combining the work control directives for the Superblock and RHWM facilities into a single set of directives. The staff notes that this an opportune time to align all NMTP work practices with the LLNL site-wide directives and NNSA guidance and offers the following observations to assist in this endeavor.

General Work Planning and Control. The Board's staff found that the *LLNL Institution-Wide Work Control Process Requirements Document* contained many of the requirements in the January 2006 NNSA document. The former document was also evaluated as satisfactory in a February 2010 ISM system verification final report issued by NNSA with the assistance of the Department of Energy Office of Independent Oversight, within the Office of Health, Safety and Security. The staff found that the *Superblock Work Control Manual* and the *OSP Development and Implementation Procedure* do not flow down from this document and in some important respects conflict directly with its requirements.

For instance, the *Superblock Work Control Manual* fails to provide specific instructions for adequately defining the scope of work or performing hazard analyses. Instead, it gives overarching guidance and general information on how these work planning elements should be

accomplished. This approach relies on well-trained work planning teams. However, NMTP representatives could not demonstrate that work planning team members were appropriately trained and qualified in the activity-level work planning process or explain how their training aligns with their identified functions within that process.

These weaknesses in the NMTP work planning directives lead directly to the following observations, which reveal that ISM is not fully integrated into work planning and control at the activity level.

Define the Scope of Work—The OSPs and Work Permits reviewed by the staff failed to describe the scope of work in sufficient detail to allow the work planning process to identify hazards associated with the work. In the case of OSPs, this is because the NMTP document *OSP Development and Implementation Procedure* explicitly directs the work planner to “state what is to be done but not how the work will be done” when developing OSP work statements. The OSPs reviewed by the staff were too broad and encompassed too many different operations to be effective as a work control tool. In the case of Work Permits, the *Superblock Work Control Manual* lacks sufficient direction on how to adequately define the scope of work. The result is that the scope of work is poorly defined, as in the case of the Tritium Facility Work Permit discussed above. The required 1-hour self-study module on the *Superblock Work Control Manual* does not compensate for the lack of direction in the planning directives.

Analyze the Hazards, and Develop and Implement Controls—Because the scope of work is not adequately defined, the hazard analysis process used in the Superblock cannot systematically and thoroughly identify, analyze, and document the hazards to allow for proper identification of needed controls. In an effort to improve the hazard analysis process, NMTP recently revised the OSP process to tie hazards to given tasks. This represents an improvement in the process; however, work tasks, rather than general activities, must be clearly defined so specific hazards and controls can be tied to their execution. The general controls, for instance, do not identify the types of chemicals that are to be used in a given process. Rather, this is a decision strictly made by the worker.

The *Superblock Work Control Manual* gives a very broad description of how hazard analyses should be conducted. As a result, NMTP relies strongly on the knowledge of members of the work planning team in the conduct of hazard analyses. It is not evident that training exists to support these individuals or to clarify the expectations for how hazard analyses should be conducted. For example, the manual defines roles for the responsible individual, Facility Safety Officer, and Environment Safety and Health Team that include the identification, verification, or validation of hazards. However, there is no required training that corresponds to these roles for the responsible individual or the Facility Safety Officer. Further, the 8-hour hazard analysis course for the Environment Safety and Health disciplines has not been offered since November 2007. A review of several training records of Facility Safety Officers, Work Control Managers, Facility Managers, and responsible individuals revealed that none had attended this or any other formal hazard analysis training. NMTP is in the process of reinstating this training.

Perform Work Safely within Controls—As noted, NMTP relies heavily on worker knowledge and training to compensate for the lack of specificity in work packages, particularly OSPs. The *Superblock Work Control Manual* provides only general guidance on when work instructions should be developed and does not specify criteria for determining when they are required. Work Permits and OSPs identify the training required of personnel working under their auspices, and written tests are given to ensure that workers understand the OSPs. The fissile material handlers certified to work under the OSPs are highly skilled, highly trained, and experienced. Discussions during the staff's review consistently revealed that this is used as a justification for not having more specificity in work packages and for a lack of supplemental work instructions. NMTP is clearly relying on an expert-based system for the performance of activity-level work, an approach that is inconsistent with both the *LLNL Institution-Wide Work Control Process Requirements Document* and the January 2006 NNSA document.

Feedback and Continuous Improvement—NMTP requires that feedback and improvement forms be filled out before Work Permits are completed. As a result, feedback is collected, and Work Permits are often revised based on worker input. This approach has been effective in improving the specific Work Permits that require change. However, it is not without its vulnerabilities, as illustrated by the change made to the Work Permit for the Tritium Facility that expanded the scope of work without a thorough evaluation of newly introduced hazards. Additionally, there is no clear mechanism in place to apply these lessons learned in the planning of new work. A searchable database of these lessons learned would be useful for work planners, ensuring that those lessons are effectively fed back into the early stages of the work planning process.

NNSA Oversight. LSO oversight has not been effective in identifying the inadequacies in NMTP's activity-level work planning. Oversight of work planning and control is performed primarily by facility representatives observing the conduct of work in the field. These talented facility representatives would benefit greatly if other subject matter experts on the LSO staff became directly involved in oversight of work planning, including more frequent observations in the field. This greater involvement would necessitate changes in management expectations for subject matter experts to maintain their facility access and increase their field presence. Additional benefits would come from adopting the NNSA-prescribed Criteria and Review Approach Documents in the January 2006 document and from conducting training in how to evaluate work planning and control effectively for all personnel involved in oversight of this critical area.

LSO recently revised its oversight model for work planning and control in the Superblock. The changes include a stated intent to institutionalize the January 2006 NNSA document, a revised tracking system for issues related to work control by ISM core function, and assignment of responsibility for managing oversight of work planning and control to LSO's Senior Technical Safety Advisor. These changes appear to be reasonable steps toward improvement. However, the most significant and challenging change LSO needs to make is to require NMTP to incorporate ISM into the work planning and control process by relying on a standards-based approach as outlined in the *LLNL Institution-Wide Work Control Process*

Requirements Document and the January 2006 NNSA document, and to verify that this important change has been implemented.