

LBL SAFETY REVIEW COMMITTEE

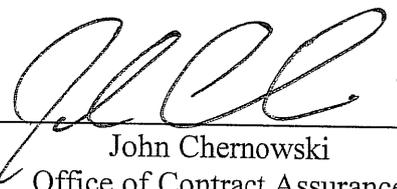
**Review of the
Management of Environment, Safety, and Health**

**Nuclear Science Division
July 2007**


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LBNL Safety Review Committee
Review of the Nuclear Science Division
Management of Environment, Safety, and Health (MESH)

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A. Executive Summary

The Safety Review Committee MESH Review of Nuclear Science Division determined that the Division has a sound and effective ES&H program that is committed to continuous improvement. To this end, several noteworthy practices are identified. The Project/ Facility Safety Review Questionnaire and NSD Walk-Around Checklist are effective tools for formalizing vital integrated safety management (ISM) activities and garnering management participation. Management also demonstrates support to the ISM program through ongoing safety communications, mostly notably the biweekly Monday Morning Meetings to which all staff is invited. However, opportunities for improvement are also evident. While the Project/ Facility Safety Review Questionnaires and NSD Walk-Around Checklists are excellent tools, process improvements will make these tools even more effective. The Division Safety Committee is another source of potential improvement, as this body lacks a meaningful charge and clear purpose. Finally, the Review notes that, although progress has been made on all four of the concerns identified in the 2004 MESH Review, these concerns all merit further attention.

B. Description of Division

The Nuclear Science Division (NSD) conducts basic research aimed at understanding the structure and interactions of nuclei and the forces of nature as manifested in nuclear matter. The Division has major programs in low energy nuclear science, including nuclear structure physics, studies of the heaviest elements, exotic nuclei and light radioactive beams, weak interactions, and nuclear reactions; relativistic heavy ion physics; nuclear theory; nuclear astrophysics and neutrino properties; data evaluation; and advanced instrumentation.

Nuclear Sciences is organized by eight major programs: Institute for Nuclear and Particle Astrophysics, Low Energy Nuclear Science, Relativistic Nuclear Collisions, 88-Inch Cyclotron, GRETINA, IceCube, ALICE, and Nuclear Theory. The Division has approximately 100 employees and 230 guests. The majority of the guests work at the 88-Inch Cyclotron on short term appointments.

The Nuclear Science Division operates the 88-Inch Cyclotron. The 88-Inch Cyclotron is the home of the Berkeley Accelerator Space Effects Facility (BASEF) and supports a local research program in nuclear science. The Division continues to exploit new opportunities to enable cutting edge science and provides for science education of the general public and students at all levels. Division staff is also located in Buildings 50, 70, 71, and 72.

The most significant hazards that NSD staff encounters are at the 88-Inch Cyclotron. These hazards include radiation hazards associated with accelerator operations, lasers, flammables

gases, electrical hazards, and hazards inherent in operating a machine shop. The laboratories for heavy element research in Building 70 include laser, chemical and radioactive hazards.

The NSD Integrated Safety Management Plan commits the following resources to the divisional ES&H program:

- 0.25 FTE Division Safety Coordinator
- 0.33 FTE Administrative Assistant
- 0.20 FTE Safety Committee Chair
- 1.00 FTE Radiological Control Technician (RCT)
- 0.10 FTE Health Physicist
- 0.20 FTE Field Support Department Division Liaison

The RCT, Health Physicist, and Field Support Department Division Liaison are provided by the EH&S Division for the 88-Inch Cyclotron.

NSD has two operating safety committees. The Division Safety Committee meets four times a year. It is chaired by the Division Safety Coordinator and includes the Division Deputy Director, representatives from each research program, and the 88-Inch Cyclotron Safety Committee chair. The 88-Inch Cyclotron Safety Committee also meets four times a year and includes representatives from Cyclotron operations staff and research groups, the Division Safety Coordinator, and the Cyclotron RCT.

C. Introduction: Description of the Appraisal Process

The objective of the MESH review is to evaluate the Division's management of environment, safety, and health in its research activities, focusing on the implementation and effectiveness of their ISM Plan. The review provides a peer research perspective on the state of ES&H in NSD.

The appraisal process included a review of the documentation provided by Nuclear Science, an opening meeting with the current and former NSD safety coordinators, staff interviews, and a walkthrough of staff workspace. The MESH review team consisted of Michael Martin, team leader from the Advanced Light Source Division, Richard Kadel from Physics Division, Derun Li for the Accelerator & Fusion Research Division, and John Chernowski from the Office of Contract Assurance.

The MESH team met with Nuclear Science staff on July 12, 2007. Current Division Safety Coordinator Marty White and Division Deputy (and former Division Safety Coordinator) Paul Fallon met with the MESH team and discussed the Division's safety programs. In addition to these individuals, the team interviewed Division Director James Symons, Claude Lyneis, Alan Poon, Heino Nitsche, Peggy McMahon, Dennis Collins, Liv Stravsetra, Jacklyn Gates, Yuen-Dat Chan, Alan Smith, Sarah Nelson, Mathis Wiedeking, and Michael Calvert. The team inspected NSD space in Buildings 70, 72, and 88.

D. Results of the MESH Appraisal

The appraisal results are organized by the five core functions of Integrated Safety Management. Findings are broken into three categories: concerns, observations, and noteworthy practices. Concerns are clear cases of practices or conditions that do not comply with regulations or LBNL policy, and/or indicate inadequate ES&H management systems within the Division. Concerns are deficiencies and must be corrected. Observations indicate room for improvement. They may be practices and conditions that are not necessarily out of compliance as observed, but could lead to non-compliance if left unaddressed. Noteworthy practices are practices and conditions that are recognized for their excellence and should be considered for lab-wide application. All findings are based on documentation review, interviews with division staff, and workspace inspections.

1. Work Planning

NSD has recently hired a new safety coordinator, which has resulted in the division safety program undergoing a transition. The new safety coordinator appears highly capable and is well accepted by division staff. In addition, all staff is familiar with the new coordinator. However, results from some routine safety activities, such as inspections and hazard review, may not yet be receiving proper follow-up. As the new safety coordinator becomes more familiar with the divisional processes, these processes will likely be more fully addressed.

Safety communications are robust, as several mechanisms are used to communicate ES&H issues to staff. Besides the aforementioned two safety committees, NSD holds an annual, mandatory all-hands meeting dedicated to safety topics. The 88-Inch also holds periodic all-hands meetings, especially in response to significant ES&H events or conditions. Finally, the Division devotes the first ten minutes of each biweekly Monday Morning Meeting, a meeting focused on science presentations, on ES&H topics.

Observation: Although NSD feels that division-wide integration is improving, safety activities at Building 88 appear to be managed separately and distinctly from the rest of the division's activities. This may be appropriate, considering the hazards inherent in the 88-Inch Cyclotron operations. However, NSD should review this model. At a minimum, significant issues at the 88-Inch Cyclotron, such as recent Radiological Work Authorization violations, should be communicated to all division staff (likely during the Monday Morning Meetings).

Noteworthy Practice: The 88-Inch Cyclotron control room has several process instructions that are posted in key locations. Each of these instruction sheets are signed and dated, an excellent practice for ensuring that posted instructions remain current.

2. Hazard Identification and Risk Analysis

Nuclear Science has two well-established mechanisms for identifying hazards and analyzing risks. The first method is that line managers representing each group are required to inspect staff

workspaces on a quarterly basis and document findings in division-tailored checklists. The second method is that principal investigators are required to review hazards inherent in their activities and complete Facility/ Project Safety Review Questionnaires annually and when hazards change.

The 2004 NSD MESH review identified one concern in Hazard Identification and Risk Analysis.

2004 Concern: Although ergonomics has been identified as a significant hazard/ risk for the Division, the systematic evaluation of workstations and other ergonomic risks appears to be progressing slowly.

Status: NSD has developed a Division Ergonomics Plan that expresses the Division's commitments to ergonomic training, evaluations, and implementation of corrective actions. Progress in implementing the requirements in the Plan is discussed monthly with senior division management. Approximately 90% of staff has completed required EHS060 (Ergonomics for Computer Users) training and about 75% have had ergonomic evaluations of their workstations, as recommended. In addition, a recent recordable injury is due to ergonomic hazards. These factors indicate that progress has been made, but continued attention is required.

Institutional Concern: NSD struggles with ensuring that all appropriate guests complete the Job Hazard Questionnaire (JHQ). The Lab's systems do not provide an easy and effective way for divisions to monitor which guests and visitors should be completing JHQ's. As a result, the division safety coordinator spends extended time with principal investigators and other hosts in order to make the proper determinations.

Concern: The Project/ Facility Safety Review Questionnaires, completed at least annually, are used by the to review hazards and provide line management authorization of hazard controls. However, not all project leaders are completing these forms. In addition, several completed forms were not fully filled out. NSD appears to lack a formal mechanism to ensure that these forms are filled out by all applicable parties and are completed properly.

Observation: When "unsatisfactory" conditions are noted on NSD Walk-Around Checklists, the form provides no indication that these findings were pursued. NSD may want to consider augmenting the forms to provide space for the safety coordinator and other reviewers to note the resulting actions for unsatisfactory conditions. In many cases, this note may be as simple as stating "entered into CATS."

Observation: The 88" Cyclotron control room was constructed many years before ergonomic hazards were considered in such design. As a result, the ergonomic condition of control room workstations is not optimal. For example, the main workstations designed to monitor operation of the Cyclotron are on a stationary, flat surface that does not accommodate the various physical attributes of the operators.

Noteworthy Practice: The Project/ Facility Safety Review Questionnaires are an effective tool for project leaders in identifying and controlling hazards. These forms are tailored to NSD needs, and the NSD safety program requires that they are completed annually and when there are

changes to a project safety envelope. This ensures that all projects are reviewed annually in manner that is easy for principle investigators to apply.

Noteworthy Practice: The NSD Walk-Around Checklists provide research groups with an easy and effective basis for assessing safety hazards in their workspaces. The checklists are designed to review the most common hazards found in research laboratories. NSD has implemented a formal requirement that these forms are completed quarterly by each PI. PIs understand the value in this exercise and are responsive in completing forms.

3. Establishment of Controls

NSD uses the Project/ Facility Safety Review Questionnaires to establish controls and authorize work below the formal authorization threshold. The Division also has seven activity hazard documents, 18 radiological authorizations (including RWA's, radiological work permits, and sealed source authorizations). The 88-Inch Cyclotron also performs Technical Safety Reviews and Experiment Tracking for experiments. NSD also records hazards in the Hazard, Equipment, and Authorization Review (HEAR) database.

The 2004 NSD MESH review identified one concern in Establishment of Controls.

2004 Concern: The MESH team noted a significant number of cabinets and other equipment that were not seismically braced.

Status: Site visits determined that appropriate equipment was seismically braced, with the exception of the Building 88 mezzanine level. This is discussed further below.

Concern: The housekeeping of the Building 88 mezzanine level requires improvement, as current conditions result in safety hazards. Most significantly, a Cf-249 source was recently discovered on this level. Staff estimates that this source was on the mezzanine and unaccounted for over ten years. In addition, several seismic hazards are present, as some of the storage cabinets are not secured. Staff indicates that some cabinets intentionally remain unsecured, as they are regularly moved to partition different locations of the mezzanine. NSD should consider applying barriers for this purpose, rather than storage cabinets.

Observation: The 88" Cyclotron uses a key system as an administrative control to restrict access to the cyclotron during certain operations. A secondary key, which is obtained from the control room, provides access to the mezzanine level. This second key is only required when Prompt External Radiation Fields (PERF) are present in the Cyclotron. The key itself is not considered a control item; rather, the act of engaging the second lock communicates the presence of PERF conditions. Although staff is encouraged to sign out the key for each use and then, following use, return it to the control room, they are not diligent in doing so. Building Management notes that when staff signs out the second key in the control room, they review a map of PERF locations. However, this benefit is not fully realized under current practices.

Observation: A post-doc expressed concern over the quality of fire extinguisher training provided by the lab, noting the online refresher may not be sufficient and observing that the

initial training only includes hands-on instruction for one type of extinguisher, not the type of extinguisher applicable to her laboratory. This is an institutional observation.

4. Work Performance

Nuclear Science Division staff has incurred two recordable injuries in the past year, including one lost work-time injury. These incidents, as well as progress in investigating causes and implementing corrective actions, are discussed weekly with the Division Deputy. NSD has received three level 1 (minor) and two level 2 (major) RWA violations during FY06 and FY07 combined.

The RWA violations continue a trend from the 2004 MESH review, which identified one concern in Work Performance:

2004 Concern: The Division has experienced one level 1 and one level 2 RWA violations in 2004.

Status: NSD continues to struggle with RWA violations, as detailed below.

Observation: One RWA received three level 1 violations in an 18-month span for missing monthly surveys. However, no long-term corrective actions have been developed to address this issue. Additionally, the repeat violations beg the question of whether or not the current individual should be listed as PI for this RWA and responsible for the monthly surveys.

Observation: In following up on the aforementioned RWA violations and other RWA violations in the last couple of years, no division-wide discussion was conducted to review the violations, lessons learned, or emphasize the importance of authorization compliance. The Division all-hands meeting and Monday Morning Meetings are excellent forums to discuss these issues. RWA compliance was also a concern of the 2004 MESH review. While NSD has made some effort to address this concern, more could be done.

5. Feedback and Improvement

Line managers and principal investigators are required to inspect their staff workspaces and document results at least quarterly. This is an excellent method for ensuring that management is involved in self-assessment activities. The Division is very diligent in tracking and resolving findings through CATS, though a couple of items identified in management inspections were missed (this was likely due to the recent transition in safety coordinators). The Division's safety program has implemented several improvements in recent years, including hiring a new division safety coordinator, increased management involvement, improved safety communications, and formalized inspection processes.

The 2004 NSD MESH review identified one concern in Feedback and Improvement.

2004 Concern: Although the Division has improved its usage of LCATS to track corrective actions of its ES&H deficiencies, there remain significant inconsistencies in retrieving complete, accurate and up-to-date information on corrective actions.

Status: This Concern has been properly addressed for the most part. Minor process improvements, as discussed below, should fully resolve this issue.

Concern: The NSD Safety Committee lacks a meaningful charge. Division staff, including senior management and safety managers, could not clearly describe the Committee's role or the responsibilities of Committee members. Several staff members were unable to identify their Safety Committee representatives. NSD should review the role of the Committee and provide it with a meaningful purpose. One possible Committee role, as suggested by the Division Director, could be providing technical support to the Safety Coordinator. One easy and beneficial way to enact this is to have the Committee review all completed Project/ Facility Safety Review Questionnaires. Other possible roles for Committee members are participating in inspections and self-assessment activities and formally providing safety communications to their groups.

Observation: Most findings identified on Walk-Around Checklists not immediately remedied are properly tracked in CATS. However, a few unsatisfactory conditions were not recorded in CATS. This process for identifying and recording findings on Walk-Around Checklists lacks a formal check/ review to ensure that all appropriate unsatisfactory conditions are properly tracked.

In addition, the form provides no indication that the "unsatisfactory" findings are pursued. NSD may want to consider augmenting the forms to provide space for the safety coordinator and other reviewers to note the resulting actions for unsatisfactory conditions. In many cases, this note may be as simple as stating "entered into CATS."

Noteworthy Practice: The Monday Morning Meetings, a bi-weekly meeting that all division staff is invited to, is an outstanding ES&H communication mechanism. Safety discussion is conducted for 10 minutes or so before a scientific presentation. This is a good way of engaging scientific staff and ensuring robust staff representation. Staff appears to appreciate the safety discussion that takes place in these meetings and, in interviews, cited several safety topics that they found valuable.

Noteworthy Practice: Senior management involvement in the division safety program is noteworthy. Including safety in every agenda of the Director's Monday Morning Meetings sends a strong message. Additionally, the Division Deputy sits on the Division Safety Committee and meets with the Division Safety Coordinator and EH&S Division Liaison weekly.