

**OFFICE OF OVERSIGHT
REVIEW OF NUCLEAR CRITICALITY SAFETY**

**FIELD REPORT
FOR LOS ALAMOS NATIONAL LABORATORY
TECHNICAL AREA-55**



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**Office of Oversight
Environment, Safety and Health
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ACRONYMS

AL	Albuquerque Operations Office
ANS	American Nuclear Society
ANSI	American National Standards Institute
CSE	Criticality Safety Evaluation
DOE	Department of Energy
EH	Office of Environment, Safety and Health
ESH	Environment, Safety and Health
LAAO	Los Alamos Area Office
LANL	Los Alamos National Laboratory
NCS	Nuclear Criticality Safety
NMT	Nuclear Materials Technology
TA	Technical Area

OFFICE OF OVERSIGHT TERMINOLOGY

Noteworthy Practice: An innovative approach or practice related to environment, safety, and health systems, programs, processes, or projects that have proven effective in improving safety management systems and performance, and could be a valuable source of information and lessons learned for other DOE sites.

Positive Attribute: A management system, process, or work practice that demonstrates an effective approach, a positive trend/initiative, or a significant improvement over past performance.

Safety Issue: A condition of concern that could have an adverse impact on the environment, safety, or health of the site, its workers, and/or the public. Safety issues require formal resolution and tracking by line management in accordance with DOE Order 414.1A, *Quality Assurance*.

Weakness: A deficiency in a management system, process, or activity that warrants management attention and corrective action but does not require a formal corrective action plan or tracking under the provisions of DOE Order 414.1A.

Opportunity for Improvement: Suggestions offered by the Office of Oversight appraisal team that may assist line management in identifying options and potential solutions to various issues identified during the conduct of the Oversight appraisal.

EXECUTIVE SUMMARY

In November 1999, the Deputy Secretary of Energy directed a series of actions to strengthen Department of Energy (DOE) nuclear criticality safety (NCS) programs. As one of those actions, a team of criticality safety experts from DOE Headquarters and the field conducted a high-level review at the Los Alamos National Laboratory (LANL) and four other DOE sites. The review was led by the Office of Oversight, within the Office of Environment, Safety and Health. The purposes of this review were: (1) to identify any immediate problems and related corrective actions, and (2) to determine whether the operations and criticality safety risks at these facilities are well understood, analyzed, and controlled. The review focused on the LANL Technical Area 55 (TA-55) facility, which processes solutions of fissile materials, because solutions represent the greatest risk of a criticality accident. The Oversight team observed field implementation of selected operations but did not perform a comprehensive review of implementation of requirements.

Although some weaknesses were identified, the Oversight team did not identify any conditions that presented an immediate risk of a criticality accident involving fissile solutions at the LANL TA-55 facility. The NCS program elements of criticality safety evaluations and controls, work control, change control, and line management oversight are in place and provide assurance that the criticality safety risks at TA-55 are properly controlled. These four program elements meet the intent of applicable DOE requirements and national standards.

Some aspects of the NCS program at LANL are notably effective. The interactions between nuclear criticality safety staff and the operations personnel at LANL are exemplary at TA-55. Technician involvement in the NCS program is also a positive attribute. The technicians are well trained and knowledgeable of the requirements in the criticality safety limit approvals and the bases for the limits.

The Oversight team identified one safety issue that requires a formal corrective action plan and three other weaknesses in the application of specific elements of the requirements were identified. The safety issue involves the inadequate implementation of line management oversight of the NCS program by DOE Albuquerque Operations Office (AL) and Los Alamos Area Office (LAAO). Although the LANL NCS program is currently strong, DOE line-management does not have the information it needs to help ensure continued effectiveness because of the lack of AL/LAAO feedback and continuous improvement systems for NCS programs. The other three weaknesses involve the lack of formality of some LANL operations and lack of detail in LANL documentation, as well as a need for tighter control of large unfavorable geometry containers. Table ES-1 provides a summary of the identified safety issue and opportunities for improvement.

Table ES-1. Summary of Safety Issue and Opportunities for Improvement

Safety Issue

- Neither AL nor LAAO implements an NCS program that meets the expectations of DOE Policy 450.5 for line management oversight of environment, safety, and health at LANL.

Opportunities for Improvement

- Implement a NCS program at AL and LAAO that meets the expectations of DOE Policy 450.5 for line management oversight of environment, safety, and health at LANL.
- Enhance the formality of operations and rigor in the areas of control of criticality safety documents, technician training and certification, internal ESH-6 procedures, interface between the area work supervisor and the team leader, and implementation of criticality safety controls.
- Ensure that documentation of criticality safety evaluations includes sufficient details about assumptions and the operational aspects of contingencies and controls.
- Revise the 522-GEN procedure to include controls on open, unattended, unfavorable-geometry containers in solution processing areas.

OFFICE OF OVERSIGHT REVIEW OF NUCLEAR CRITICALITY SAFETY FIELD REPORT FOR LOS ALAMOS NATIONAL LABORATORY TECHNICAL AREA-55

1.0 INTRODUCTION

The Department of Energy (DOE) Office of Oversight, within the DOE Office of Environment, Safety and Health (EH), conducted a review of selected aspects of the nuclear criticality safety (NCS) program at the Los Alamos National Laboratory (LANL) Technical Area-55 (TA-55). The Oversight review of LANL was one portion of a broader DOE initiative to improve nuclear criticality safety, as directed by the Deputy Secretary of Energy in his November 3, 1999, memorandum entitled "Nuclear Criticality Self-Improvement Initiative." One of the provisions of the Deputy Secretary's memorandum was a review of key facilities at five sites (the other sites were the Y-12 Plant, the Savannah River Site, the Hanford Plutonium Finishing Plant, and the Rocky Flats Environmental Technology Site) by a team of criticality safety experts led by the EH Office of Oversight.

The site review was conducted November 30-December 2, 1999, by an eight-person team composed of NCS experts from DOE Headquarters and field offices. Appendix A provides additional information on the composition of the review team.

Consistent with the direction provided by the Deputy Secretary, the purpose of this review is twofold: (1) to identify any immediate problems and related corrective actions, and (2) to determine whether the operations and criticality safety risks at these facilities are well understood, analyzed, and controlled. The Oversight team focused on four key nuclear criticality safety program elements as applied to selected fissile material operations.

The four key nuclear criticality safety elements reviewed were: criticality safety evaluations and controls, work control, change control, and line-management oversight. The criteria for each of these areas were provided by the Deputy Secretary and were derived from the national consensus standard American National Standards Institute (ANSI)/American Nuclear Society (ANS)-8.19, which is required by DOE Order 420.1, *Facility Safety*, and from DOE Policy 450.5, *Line Environment, Safety, and Health Oversight*. Appendix B presents the evaluation criteria for the four criticality safety elements.

Fissile nuclear materials operations at TA-55 involve processing, handling, and storage of solutions of fissile materials. Criticality accidents typically involve safety management system breakdowns impacting fissile solution processing. Of the 22 known criticality accidents involving fissile material processing, 21 have involved solutions, including the most recently publicized accident in Tokai-mura, Japan.

The common causes of criticality accidents that have occurred to date have been failure to perform a criticality safety evaluation (CSE) for a process; undetected process and system changes; failure to develop, review, and approve operating procedures; absence of effective worker training; and failure to conform to established procedures and limits. No criticality accident has occurred as a result of a faulty calculation of reactivity, and no known criticality accident has involved storage or transport of fissile material.

The NCS review of LANL TA-55 was conducted according to Oversight protocols and procedures, including the validation of data throughout all stages of the process. The Oversight team toured the plutonium facility and interviewed DOE Los Alamos Area Office (LAAO) and LANL personnel, including DOE Facility Representatives and contractor personnel with responsibility for NCS, audits and assessments, work planning and control, configuration management, and authorization basis. The Oversight team reviewed a representative sample of operational criticality safety controls

(e.g., criticality safety limits summarized in postings and stated in operating procedures), work controls (e.g., other procedural and administrative controls governing normal work tasks, including maintenance, that affect criticality safety), change controls, and audit/self-assessment practices. Selected CSEs and other documents that form the basis for these controls and practices were also reviewed.

This Oversight review focused exclusively on criticality safety aspects of the plutonium facility in LANL TA-55. Consequently, the review does not constitute an assessment of the overall NCS program in relation to the requirements of the ANSI/ANS standards and DOE Order 420.1, Section 4.3. The elements of ANSI/ANS Standard 8.19 were applied to only those specific processes selected for review. Further, the Oversight team had only limited opportunity to observe actual work in progress during the field visit because few operations were ongoing during the period of the review. The review therefore focused primarily on interviews, documentation, records, and observation of the work place.

2.0 RESULTS

The Oversight team noted one noteworthy practice and one other positive attribute, as well as one safety issue and three other weaknesses in the application of specific elements of the requirements.

2.1 Noteworthy Practice

1. The interaction of Environment, Safety and Health (ESH)-6 staff with Nuclear Materials Technology (NMT) staff in the work-area is exemplary.

Technicians participate in the development of NCS controls, contingencies, and safe operating procedures. The NCS Staff in ESH-6 are well trained and understand the physics of criticality and its application to operations in Building PF-4. They are frequently in the areas talking with NMT personnel providing NCS guidance and training as well as working collegially to develop practical, safe criticality safety limit approvals. The rapport and interaction between the ESH-6 staff and the NMT staff is exemplary and could serve as a model for other DOE sites.

2.2 Positive Attribute

1. The technicians are knowledgeable of the requirements in the Criticality Safety Limit Approvals and the bases for the limits.

Interviews with operators indicated that they are fully aware of the contingencies and assumptions used in generating Criticality Safety Limit Approvals. They participate in the development of NCS controls, contingencies, and standard operating procedures. Also, the technician training and certification process is notably effective.

2.3 Issue

The following safety issue requires a formal response in accordance with DOE Order 414.1A, *Quality Assurance*. The corresponding corrective actions will be tracked in the DOE Corrective Action Tracking System (CATS).

1. Neither the AL nor LAAO implements an NCS program that meets the expectations of DOE Policy 450.5 for line management oversight of environment, safety, and health at LANL.

AL and LAAO do not meet most criteria and expectations for DOE line management oversight of NCS. Although the LANL NCS program is currently strong, DOE line management does not have the information it needs to help ensure continued effectiveness because of the weak AL/LAAO feedback and continuous improvement programs for NCS. LAAO does not have the resources to provide a full-time, qualified NCS Program Manager, and there is no ongoing program for NCS assessments by either AL or LAAO. AL needs to develop and implement an NCS feedback and continuous improvement program that implements the criteria provided by the Deputy Secretary.

2.4 Weaknesses

Although not requiring a separate, formal response in accordance with DOE Order 414.1A, the following weaknesses warrant management attention and appropriate corrective actions. In discussions with the Office of Oversight, the site has agreed to include these weaknesses in their site self-assessment, which is a required element under the Deputy Secretary's NCS self-improvement initiative. The sites will track the weakness and corresponding corrective actions in site-level corrective action tracking systems.

1. The formality of operations lacks rigor in the areas of control of criticality safety documents, technician training and certification, internal ESH-6 procedures, interface between the area work supervisor and the team leaders, and implementation of criticality safety controls.

There are several examples of informality of operations at TA-55. NMT and ESH-6 staffs currently rely heavily on interpersonal interactions and informal communications to conduct work. Interviews with NMT management indicated that plan-of-the-day meetings only cover non-routine work and do not include the NCS staff. Occurrences, work restrictions, and facility status are exchanged informally between the area work supervisor and the team leaders. There were also instances of lack of formality in posting new Criticality Safety Limit Approvals on the floor. Some postings had different approval dates from the procedures. In one instance a CSE was posted with a new Criticality Safety Limit Approval on a glovebox. The usual progression of CSE development leading to Criticality Safety Limit Approvals, then resulting in an approved procedure, did not appear to be followed.

Three levels of NCS training are presented in workbook format to individual workers based on their job assignments. NMT-10 is the responsible training organization at TA-55. Although not formalized, interviews verified that each operating group has an individual that tracks and notifies the team leaders, monthly, of upcoming training expiration. Although currently effective, the process for verifying controls through the training program is not formalized. No process is started unless all operators are certified as having completed the training for that process. As part of that training, a detailed understanding of all engineered controls must be demonstrated. The operators verify that the engineered controls are in place before they begin the process. Also, ongoing verification of the controls was evident. Formalization of this process is needed to ensure it continues to be effective.

2. The documentation of criticality safety evaluations lacks sufficient details about assumptions and the operational aspects of contingencies and controls.

Recent CSEs and associated documents reviewed were generally thorough and of high quality. Interviews indicated that NCS engineers are proactive in obtaining feedback from other LANL groups, especially process engineers. However, evaluations did not always document why possible solution transfer errors or process upsets would not lead to accidental criticality. For example, the Oversight team postulated an accident scenario based on precipitating a rich plutonium stream in a device that normally collects plutonium precipitated from a nearby, lean stream. The cognizant criticality safety and process engineers readily explained why this scenario was incredible. However, the evaluations did not include such explanations or the underlying bounding assumptions.

In still other cases, the Oversight team noted that LANL had established conservative limits and controls using engineering judgment (e.g., generic handling limits). While this practice was acceptable in the past, all DOE sites are transitioning from an expert-based criticality safety program to a standards-based program. LANL has not yet documented the basis for this set of generic handling limits and some other controls via formal evaluations as suggested by DOE-STD-3007.

3. The 522-GEN procedure does not emphasize the exclusion of open, unattended, unfavorable-geometry containers from solution processing areas.

The generic criticality safety controls in 522-GEN do not prohibit large-geometry containers outside gloveboxes as is common at other similar DOE facilities. The Oversight team observed a relatively large open plastic bag in one solution

process area next to an active glovebox. Similarly, the LANL 522-GEN procedure does not specify a required spacing between five-liter safe volume containers used to clean up spills outside gloveboxes. Criticality safety staff indicated that spills are typically limited to a few milliliters because all overhead liquid transfers between gloveboxes are under vacuum. Also, process leaks outside gloveboxes are very rare, and almost all solutions stored outside gloveboxes are of relatively low concentration (e.g., about 10 g Pu/L). Therefore, the staff indicated that it is not necessary to specifically control large-geometry containers or arrays of closely packed favorable-geometry containers outside gloveboxes. However, such assumptions were not documented in an evaluation that provides a formal basis for the associated generic controls.

3.0 CONCLUSIONS AND OPPORTUNITIES FOR IMPROVEMENT

Based on the Oversight review, there are no imminent criticality safety hazards at the LANL TA-55 facility. The NCS program elements that were reviewed (i.e., criticality safety evaluations and controls, work control, change control, and line management oversight) are in place and provide assurance that the criticality safety risks at this facility are properly controlled. These four program elements meet the intent of applicable requirements of Section 4.3 of DOE Order 420.1 and ANSI/ANS-8.19.

One safety issue that requires a formal corrective action plan and three weaknesses in the application of specific elements of the requirements were identified. The following opportunities for improvement should be considered to address the identified weaknesses.

1. Implement a NCS program at AL and LAAO that meets the expectations of DOE Policy 450.5 for line management oversight of environment, safety, and health at LANL (see Issue #1).

- Develop and implement an AL/LAAO NCS feedback and continuous improvement program that implements the criteria provided by the Deputy Secretary.
- Ensure that the program provides consistency and continuity of line management oversight at LANL as well as other AL sites (e.g., Sandia National Laboratories and Pantex).
- Utilize the AL NCS subject matter expert to develop and implement an effective DOE NCS line management oversight program.
- Provide independent AL NCS assessment reports, findings, and observations to LAAO as the approval authority for LANL.
- Ensure that the AL/LAAO NCS program has access to sufficient dedicated and qualified expertise to oversee the implementation of the NCS program in the facilities, including but not limited to reviews of CSEs and periodic onsite evaluations.

2. Enhance the formality of operations and rigor in the areas of control of criticality safety documents, technician training and certification, internal ESH-6 procedures, interface between the area work supervisor and the team leaders, and implementation of criticality safety controls (see Weakness #1).
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- Formalize information exchange between area work supervisors and team leaders.
- Formalize tracking of operator training.
- Formalize the connection between Criticality Safety Limit Approvals and procedures.

- Develop a formal policy/procedure based on the memos in the ESH-6-96: 009 and other appropriate NCS program requirements.

3. Ensure that documentation of criticality safety evaluations includes sufficient details about assumptions and the operational aspects of contingencies and controls (see Weakness #2).

- Ensure that evaluations document the technical basis for characterizing some accident scenarios as incredible.
- Document all assumptions in CSEs.
- Formally document all controls to demonstrate the relationship between relevant contingencies, controls, and credited barriers.

4. Revise the 522-GEN procedure to include controls on open, unattended, unfavorable-geometry containers in solution processing areas (see Weakness #3).

- Modify the 522-GEN procedure to emphasize the exclusion of open, unattended, unfavorable-geometry containers from solution processing areas.

APPENDIX A

TEAM COMPOSITION

The team membership, composition, and responsibilities are as follows:

Deputy Assistant Secretary for Oversight

S. David Stadler, Ph.D.

Associate Deputy Assistant Secretary for Oversight

Raymond Hardwick

Team Leader

Jerry McKamy, Ph.D.

Management Advisor to the Team

Ed Blackwood

Line Management Oversight Subgroup

Adolf Garcia
Jim Felty

Work and Change Control Subgroup

Bill Weaver
Gypsy Tweed

Criticality Safety Evaluations and Controls Subgroup

Steve Payne, Ph.D.
Ivon Fergus

Communications and Support

Cynthia D. Dorsey

Quality Review Board

Frank Russo
Raymond Hardwick
Thomas Davis
Thomas Staker

APPENDIX B

EVALUATION CRITERIA

INTRODUCTION

This appendix presents the evaluation criteria used in this Oversight review. It also presents the lines of inquiry (i.e., the specific areas of focus within each criterion) that correspond to each of the criteria. The criteria and lines of inquiry are presented for each of the four safety management areas reviewed by Oversight:

1. Criticality safety evaluations and controls
2. Work control
3. Change control
4. Line-management oversight.

Most of the evaluation criteria and lines of inquiry (i.e., criteria 1.1 through 4.4) for this Oversight review apply primarily to the contractors that implement NCS programs at DOE sites. These criteria and lines of inquiry were derived from the consensus standard ANSI/ANS-8.19, which is established as a DOE requirement by provisions of DOE Order 420.1.

Certain criteria (i.e., criteria 4.5 through 4.10) apply only to the DOE Operations Office and Site Office. The criteria and lines of inquiry that apply to DOE organizational elements were extracted from DOE P 450.5, *Line Environment, Safety and Health Oversight*.

1. CRITICALITY SAFETY EVALUATION AND CONTROLS

1.1 Criterion: Before starting a new operation with fissile materials or before an existing operation is changed, it shall be determined that the entire process will be subcritical under both normal and credible abnormal conditions. (ANSI/ANS-8.19, Section 8.1)

Lines of Inquiry:

- Criticality safety evaluations shall conform to the requirements of ANSI/ANS-8.1, “Nuclear Criticality Safety in Operation with Fissionable Material Outside Reactors.”
- The NCS staff, responsible operations personnel, and responsible support engineering personnel jointly develop contingencies.
- All credible process upsets are considered and are either controlled or dispositioned appropriately. NCS staff familiar with the facility and operations under consideration perform the criticality safety evaluations. The NCS Staff works as a team with operations to develop credible accident scenarios and controls.

1.2 Criterion: The nuclear criticality safety evaluation shall determine and explicitly identify the controlled parameters and their associated limits upon which nuclear criticality safety depends. (ANSI/ANS-8.19, Section 8.2)

Lines of Inquiry:

- Controls are developed in the criticality safety evaluation for each contingency.
- Controlled parameters, contingencies, and credited barriers are explicitly documented.

1.3 Criterion: The nuclear criticality safety evaluation shall be documented with sufficient detail, clarity, and lack of ambiguity to allow independent judgment of results. (ANSI/ANS-8.19, Section 8.3)

Lines of Inquiry:

- The CSEs contain a system/process description with enough detail for an independent reviewer to understand the system/process sufficiently to judge the results of the criticality safety analysis. The criticality safety evaluations conform to DOE-STD-3007-93, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*.
- All assumptions are fully documented in the criticality safety evaluation.
- The criticality safety evaluation can be read and understood by the line supervision.

1.4 Criterion: Before starting operation, there shall be an independent assessment that confirms the adequacy of the nuclear criticality safety evaluation. (ANSI/ANS-8.19, Section 8.4)

Lines of Inquiry:

- All criticality safety evaluations receive an independent technical peer review before approval for use.
- There is a process for confirming that all credited engineered features of a system or process are in place and meet the specifications anticipated by the evaluation prior to starting operations.

1.5 Criterion: Procedures shall include those controls and limits significant to the nuclear criticality safety of the operation. (ANSI/ANS-8.19, Section 7.2)

Lines of Inquiry:

- Criticality controls are included in operating procedures.
- The criticality controls are clearly identified as important to safety.

1.6 Criterion: Procedures should be supplemented by posted nuclear criticality safety limits or limits incorporated in operating check lists or flow sheets. (ANSI/ANS-8.19, Section 7.6)

Lines of Inquiry:

- Criticality safety postings are easy to understand by operators.
- Postings contain only information controlled by the operator performing the task.
- The relationship of controls in postings to controls in procedures is clear.
- Postings are easy to read from normal operator positions at the workstation.
- Operations personnel and NCS staff validate draft criticality postings and controls prior to implementation.

CHANGE CONTROL PRACTICES

2.1 Criterion: Supervisors shall verify compliance with nuclear criticality safety specifications for new or modified equipment before its use. Verification may be based on inspection reports or other features of the quality control system. (ANSI/ANS-8.19, Section 5.5).

Lines of Inquiry:

- There are procedures or mechanisms in place and effective to ensure that modifications to equipment and/or processes results in a review of the applicable CSEs-procedure-posting set prior to implementing the modification.
- There is a process for ensuring that no new or modified operation is started until all applicable verification steps have been performed which includes presence of approved CSEs, postings, procedures and that no criticality infraction will result from startup.
- A process is in place to verify that as-built equipment and processes conform to the configuration anticipated in the CSE.
- Maintenance work orders that have the potential to impact criticality safety are reviewed by the NCS Staff and a USQD is performed prior to performing the maintenance tasks.

2.2 Criterion: Active procedures shall be reviewed periodically by supervision. (ANSI/ANS-8.19, Section 7.4)

Lines of Inquiry:

- Procedures are periodically reviewed.
- The NCS Staff periodically participate in reviews of active operating procedures.
- The Authorization Basis (Safety Analysis Report, basis for interim operations, etc.) is reviewed periodically by the NCS Staff for changes that potentially impact nuclear criticality safety.

2.3 Criterion: New or revised procedures impacting nuclear criticality safety shall be reviewed by the nuclear criticality safety staff. (ANSI/ANS-8.19, Section 7.5)

Lines of Inquiry:

- New or revised procedures are reviewed by the NCS Staff.
- Proposed changes to the Authorization Basis (Safety Analysis Report, basis for interim operations, etc.) affecting nuclear criticality safety are reviewed by the NCS Staff.

WORK CONTROL PRACTICES

3.1 Criterion: Each supervisor shall provide training and shall require that the personnel under his supervision have an understanding of procedures and safety considerations such that they may be expected to perform their functions without undue risk. Records of training activities and verification of personnel understanding shall be maintained. (ANSI/ANS-8.19, Section 5.3)

Lines of Inquiry:

- At a minimum, operators receive criticality safety training in accordance with ANSI/ANS-8.20, “Nuclear Criticality Safety Training.”
- Supervisors provide job specific training on procedures.
- Pre-job briefs cover criticality controls specific to the operations at hand.
- Plan-of-the-day meetings address criticality safety related topics like work restrictions due to criticality safety infractions, availability of new procedures and postings, need for NCS Staff participation, results of recent criticality safety assessments/surveillances, etc.
- Supervisors maintain training records for their personnel.
- Supervisors and operators can answer questions about the basic criticality controls for their operations.
- Supervisors can generally describe the contingencies and controls for the contingencies for their operations, including credited engineered features and key facility assumptions, if any.

3.2 Criterion: Supervisors shall develop or participate in the development of written procedures applicable to the operations under their control. Maintenance of these procedures to reflect changes in operation shall be a continuing supervisory responsibility. (ANSI/ANS-8.19, Section 5.4)

Lines of Inquiry:

- All fissile material handling operations are performed according to approved procedures.
- Operations personnel or supervision are involved in developing procedures.
- There is a mechanism to assure that only current, approved procedures, CSEs, and postings are used for operations.
- The line program supervisor has a formalized process that authorizes work only after all NCS requirements have been met subsequent to modifications of the existing set of controls/procedures.
- There is a mechanism to ensure that OSR related controls and requirements in procedures or postings are not changed without proper analysis by the NCS Staff and approval by management.
- Unreviewed Safety Question Determinations (USQDs) are performed for all procedure modifications.

3.3 Criterion: The nuclear criticality safety staff shall provide technical guidance for the design of equipment and processes and for the development of operating procedures. (ANSI/ANS-8.19, Section 6.1).

Lines of Inquiry:

- The NCS Staff provides design input for all new or modified equipment.
- The NCS Staff reviews all operating procedures involving fissile materials.
- The NCS Staff reviews and concurs on final equipment and process designs.
- The NCS Staff reviews maintenance work orders that potentially affect criticality safety.

3.4 Criterion: The NCS staff shall maintain familiarity with all operations within the organization requiring nuclear criticality safety controls. (ANSI/ANS-8.19, Section 6.4)

Lines of Inquiry:

- The NCS staff observes fissile material handling and processing operations regularly.
- The NCS Staff attends operations planning meetings for new or restarted processes.
- The NCS Staff has access to, and familiarity with, fissile material operating procedures.
- The NCS Staff attends pre-job briefs and plan-of-the-day meetings when it is appropriate.
- The NCS Staff maintains familiarity with reports of deviations from expected process conditions even if these deviations do not result in a criticality infraction.

OVERSIGHT, AUDIT AND SELF-ASSESSMENT PRACTICES

4.1 Criterion: Management shall periodically participate in auditing the overall effectiveness of the nuclear criticality safety program. (ANSI/ANS-8.19, Section 4.6)

Lines of Inquiry:

- Contractor management participates in review teams or committees that assess facility criticality safety programs.
- Contractor program/facility management routinely audits operations for compliance with criticality safety requirements. Contractor performs NCS management self-assessments of their criticality safety staff and program.

4.2 Criterion: Management may use consultants and nuclear criticality safety committees in achieving the objectives of the nuclear criticality safety program. (ANSI/ANS-8.19, Section 4.7)

Lines of Inquiry:

- Management utilizes a nuclear criticality safety committee to assist in monitoring and improving the criticality safety program.
- Nuclear criticality safety committees report directly to the Senior Management.
- Personnel interviews indicate that findings from the nuclear criticality safety committee, or equivalent, are entered into a tracking database and corrective actions are tracked through implementation.
- Outside consultants are utilized to provide an independent viewpoint on the overall criticality safety program.

4.3 Criterion: The [NCS] staff shall conduct or participate in audits of criticality safety practices and compliance with procedures as directed by management. (ANSI/ANS-8.19, Section 6.6)

Lines of Inquiry:

- The NCS Staff participates in periodic audits of operations and procedures.
- The results of audits are shared among the NCS Staff.
- The results of audits are reported to appropriate Facility Management.
- Corrective actions are developed for Opportunities for Improvement.

4.4 Criterion: Operations shall be reviewed frequently (at least annually) to ascertain that procedures are being followed and that process conditions have not been altered so as to affect the nuclear criticality safety evaluation. (ANSI/ANS-8.19, Section 7.8)

Lines of Inquiry:

- All operations are reviewed at least annually.
- Annual reviews determine that procedures are being followed.
- Audits and reviews monitor the configuration of the facility and processes which could adversely affect criticality safety, such as movements of criticality detectors, installation of new equipment, inoperable emergency enunciators, etc.
- Personnel with NCS experience and knowledge of the operations perform the reviews.
- The reviews examine CSEs to verify that changes to the process have not compromised criticality safety.
- The results of the review are reported to senior management as well as Facility and Program Management.
- Opportunities for Improvement and proposed corrective actions are documented and tracked to closure.
- Procedures are in place to ensure that changes to process equipment over time do not degrade compliance with criticality safety controls.
- Annual reviews are conducted of facilities and operations where it has been determined that criticality is not credible but that contain more than a minimum critical mass of fissile material and/or that still require criticality safety controls.

4.5 Criterion: DOE must acquire and maintain sufficient knowledge of program activities in order to make informed decisions on criticality safety resources for these activities. (DOE P 450.5, Policy section)

Lines of Inquiry:

- Routine meetings are held with contractor NCS management.
- Periodic meetings are held with DOE contractor operations management?
- The DOE NCS Program Manager reviews budget requests made by contractor NCS management.
- The DOE NCS Program Manager reviews budget requests made by contractor operations management.
- The DOE NCS Program Manager has input to the DOE site budget process.

4.6 Criterion: DOE maintains operational awareness of contractor work activities, typically through DOE line managers and staff such as Facility Representatives and criticality safety subject matter experts. (DOE P 450.5, paragraph 2a)

Lines of Inquiry:

- The DOE NCS Program Manager and Facility Representatives work closely on NCS-related issues in the field.
- The DOE NCS Program Manager routinely spends time in the field performing walkdowns and interacting with Operations.
- The DOE NCS Program Manager reviews contractor occurrence reports related to criticality safety programs.

4.7 Criterion: DOE reviews performance against formally established criticality safety performance measures, performance indicators, and contractor self-assessments. (DOE P 450.5, paragraph 2b)

Lines of Inquiry:

- Performance measures are established for the contractor NCS program.
- Progress on the performance measures is routinely reported to DOE.
- Contractor NCS self-assessments are reviewed by the DOE NCS Program Manager.
- The NCS Program Manager provides reports and feedback on contractor self-assessments to senior DOE site management.

4.8 Criterion: DOE performs criticality safety reviews and assessments in support of required readiness assessments, Operational Readiness Reviews, Safety Management System documentation and onsite verification reviews, and authorization basis documents including Criticality Safety Evaluations (CSEs). (DOE P 450.5, paragraph 2c)

Lines of Inquiry:

- The DOE NCS Program Manager participates in readiness assessments, Operational Readiness Reviews, and Integrated Safety Management reviews when necessary.
- The DOE NCS Program Manager participates in the review and approval of facility NCS-related authorization basis documents (e.g., Safety Analysis Reports, Bases for Interim Operations, Unresolved Safety Questions, and Technical Safety Requirements).
- The DOE NCS Program Manager reviews a sample of contractor CSEs on a routine basis.

4.9 Criterion: DOE performs periodic appraisals of the contractor criticality safety program, including for-cause criticality safety reviews, as necessary. (DOE P 450.5, paragraph 2d)

Lines of Inquiry:

- Surveillances of facility criticality safety programs and controls are incorporated into the Field Office assessment plan.
- Appraisals and reviews are documented.
- Corrective actions are tracked to closure.
- The DOE NCS Program Manager performs assessments of the contractor criticality safety program in accordance with a documented plan.
- Outside DOE NCS subject matter experts are occasionally utilized to assist with reviews to provide independent feedback.

4.10 Criterion: DOE has a designated focal point for coordinating criticality safety oversight activities. (DOE P 450.5, paragraph 2)

Lines of Inquiry:

- The DOE Field Office has designated a single NCS focal point (i.e., NCS Program Manager).
- The DOE NCS Program Manager has been qualified by completing the requirements in the Federal NCS Qualification Standard.
- The DOE NCS Program Manager routinely meets with an Assistant Field Office Manager responsible for NCS.
- The DOE NCS Program Manager represents the single point of contact on NCS issues for the contractor.
- The DOE NCS Program Manager represents the Field Office on the Criticality Safety Coordinating Team (CSCT).