The Deputy Secretary of Energy
Washington, DC 20585

November 3, 1999

MEMORANDUM FOR HEADS OF DEPARTMENTAL ELEMENTS

FROM: T. J. GLAUTHIER

SUBJECT: NUCLEAR CRITICALITY SELF-IMPROVEMENT INITIATIVE

The purpose of this memorandum is to direct a series of actions we will take over the next several months to strengthen the Department's ongoing nuclear-criticality safety programs and identify and make any necessary improvements in the management of fissile materials at our sites to ensure that we maintain appropriate nuclear criticality controls. These actions have been developed with the Under Secretary, Dr. Ernest Moniz, and other senior members of the Department and are essential to maintaining a workplace that is safe for our workers and protective of the public's health.

Over the last several years, the Department has worked on several key initiatives associated with the criticality safety programs at our sites. These initiatives include stabilizing at-risk fissile materials for safe long-term storage; enhancing the analytical underpinnings of our criticality safety programs (e.g., by performing relevant critical experiments and other activities that enhance the numerical processing codes used in criticality safety analyses); developing mechanisms to attract, maintain, and retain qualified criticality safety professionals within the Federal and contractor workforces; and ensuring adequate criticality safety training facilities for criticality safety practitioners. Details of these initiatives and the actions underway are provided in the Department's Implementation Plans in response to Defense Nuclear Facilities Safety Board Recommendations 97-2, 94-1, and 97-1.

This past August, the Department also launched a nuclear criticality self-improvement initiative through a conference for senior Federal and contractor managers. This conference resulted in the identification of a series of specific, additional actions needed to strengthen our criticality safety programs.

In addition, in September we took another important step to improve the Department's management of fissile materials with the formation of the Nuclear Materials Council. The Council, chaired by the Under Secretary will guide the development of an integrated nuclear-materials management plan. The plan will be completed by March 2000 and will include an assessment of fissile material

stabilization programs and identify opportunities for better integrating criticality expertise into our operations.

To support these initiatives, particularly in light of the recent criticality event in Japan, I am directing program and field offices and the Office of Environment, Safety and Health (EH) to take the following steps to assess the adequacy of our nuclear criticality safety programs at our sites and to identify and implement, where needed, enhancements to these programs.

1. **Review of Key Facilities.** A team of criticality safety experts from Headquarters, Federal staff from the field elements, and independent experts -- and led by the Office of Environment, Safety and Health -- will work collaboratively with field elements to conduct a high-level assessment of the operational criticality safety aspects of several key facilities in the Department, listed in order of priority: Oak Ridge Y-12 plant; Los Alamos National Laboratory building PF-4 at TA-55; Savannah River Site FB-Line facility and H-Area exterior tank storage; the Hanford Plutonium Finishing Plant; and Rocky Flats Building 371.

   The anticipated scope of the review is contained in Attachment 1. Within 90 days, the team will complete the review with relevant field elements and forward a report to Secretary Richardson that includes a summary of the results of this review -- including an identification of any immediate problems and related corrective actions and an assessment of whether the operations and criticality safety risks at these facilities are well understood, analyzed, and controlled.

   The results of these assessments also will be used by the Nuclear Materials Council in developing the Department's framework for long-term fissile materials stewardship.

2. **Self-Assessments.** On a broader basis and within 120 days, DOE field elements will complete self-assessment(s) for all facilities and operations involving fissile materials, using the criteria contained in Attachment 2. In addition, the Department's operating contractors also should be directed by appropriate field elements to conduct self-assessments using the criteria provided in Attachment 3.

   The self-assessments will evaluate adequacy of procedures, procedural adherence; adequacy of criticality safety training, including training and qualification of criticality safety practitioners. The assessments also will include staffing analyses to ensure the short-term and 5-year adequacy of staffing for criticality safety professionals at the Federal and contractor levels at our sites.

Although an emphasis of the self-assessments is on the operational aspects of criticality safety, training and qualifications, the assessments should determine whether normal and accident conditions represented by the facilities/operations have been adequately considered and properly analyzed.

Deficiencies identified through these assessments -- and any deficiencies identified in the review of key facilities described above --- that cannot be corrected immediately, will require an accompanying corrective action plan (in accordance with the Department's Implementation Plan for the Defense Nuclear Facilities Safety Board Recommendation 98-1). Corrective actions plans, including plans to increase or change staffing, should specifically identify the actions planned, the affected facility(ies), schedule, and cost considerations, including potential sources or offsets for funding. Ensuring the safety of our sites clearly must take priority over other work.

These assessments must be performed by qualified criticality safety professionals. The Department's Criticality Safety Support Group should be consulted to identify qualified technical resources for these assessments. In addition, expertise represented on the Criticality Safety Support Group should be considered a technical resource for these assessments.

The results of the assessments, including any associated corrective actions, should be reported to the respective Program Secretarial Office, with a copy to the Office of Environment, Safety and Health. Within 30 days of receipt from the field, programs should review these materials, resolve comments with the field elements, and submit the reports to the Office of Environment, Safety and Health, indicating whether there are any outstanding issues that require resolution. The Office of Environment, Safety and Health will report regularly to me and the Under Secretary on the status of these reviews and corrective action plans.

3. **EH Analysis of Results.** Based on the submittals provided by the Program Secretarial Offices, the Office of Environment, Safety and Health will analyze the results and identify what field investigations will be performed by EH. These investigations will include a review of conduct of operations, a walk-down of work areas, and interviews with workers to assess worker knowledge of criticality risks and controls. Additionally, the EH analysis will evaluate the recommended Federal and contractor criticality safety resource needs across the complex.

Within 120 days of receiving these submittals, EH will provide a report to Secretary Richardson on the overall adequacy of the Department's criticality safety programs, including any additional general actions needed or significant open issues requiring senior management attention.

4. **Performance Metrics**. Within 120 days, DOE field elements should develop performance metrics that are specific to nuclear criticality safety at their sites that could be incorporated into the contract in subsequent contract modifications. Metrics should be tailored to meet the specifics of the site and contract. The metrics should be submitted to the Program Secretarial Offices for review, with subsequent transmittal to EH within 45 days of receipt.

5. **Options Study for Los Alamos Critical Experiments Facility**. A team will perform an options study over the next 6 months on options for relocating the Critical Experiments Facility at Los Alamos TA-18, including whether to move to an existing facility at another site, or whether and where to construct a new facility, in order to maintain the Department's criticality safety experimental capability and the requisite training facilities for criticality safety practitioners. The team will include the Office of Defense Programs in a key role, and representation from the Offices of Nonproliferation and National Security; Security and Emergency Operations; Environmental Management; Science; Nuclear Energy; and Environment, Safety and Health. Members of the Department's Criticality Safety Support Group also will participate in the effort, and will review and provide comments on the results of the options study.

   This study will consider security, safety, and health aspects of each of the options as well as the cost and schedules for design, modification/ construction, operation of existing, replacement, or new facilities. The study should result in a recommendation to the Secretary, supported by a proposed transition plan that would ensure continuity of training and the retention of critical staff to manage and operate these facilities.

We look forward to the results of these efforts – and to working with you to strengthen our criticality safety programs. Thank you for your cooperation on this very important issue.

Attachments

ATTACHMENT 1

Review of Key Facilities:

Scope of Review: Operational criticality safety controls (e.g. criticality safety evaluations, criticality safety limits, postings, and operating procedures), work control, change control, and audit/self-assessment practices associated with selected fissile material operations bearing similarity to those that have been involved in criticality accidents in the past.

Objectives:

1. Provide assurance that controls are in place for existing operations that ensure that the systems will remain subcritical under all normal and credible abnormal conditions.
2. Provide assurance that there is a change control process in place such that all new processes and changes to existing processes are reviewed appropriately by the nuclear criticality safety staff and nuclear criticality safety controls are implemented prior to authorizing work.
3. Provide assurance that work control practices are in place such that only authorized activities occur and that operations personnel are trained and knowledgeable of criticality safety controls and hazards.
4. Provide assurance that there are audit/self-assessment processes in place (both DOE and Contractor) that will find and correct deficiencies in the implementation of the nuclear criticality safety program.
5. Work with field offices to develop corrective action plans for any deficiencies found as a result of this review.

Team Members:

Jerry McKamy, Team Leader, DOE EH
Ivon Fergus, DOE EH
Adolf Garcia, DOE ID
Bill Weaver, DOE EH
Jim Felty, Consultant
Gypsy Tweed, Consultant
Steve Payne, DOE AL
Cyndi Dorsey, Administrative Support, DOE EH

Approach:

1. Sites identify any fissile solution processing and storage operations, particularly batch operations, low-concentration (i.e. <30 g/l) solutions, and processes that

transfer solutions from geometrically favorable to unfavorable geometry containers.

2. Sites identify any new or modified processes or processes about to be re-started.
3. Sites identify any processes that have experienced multiple violations/infractions of criticality safety controls or procedures in the past two years.
4. Sites provide criticality safety evaluations, postings, and procedures for the identified processes.
5. Sites provide occurrence descriptions, root cause evaluations, corrective action plans and plans to prevent recurrence for multiple criticality safety violations or infractions of the same type or involving the same process or facility during the past two years.
6. Sites provide documentation of procedures and policies for work control, training operators, change control (i.e. process, hardware, maintenance, procedure and safety basis), and audit/self-assessment.
7. Team arranges interviews with site and reviews documentation prior to site visit.
8. Team conducts on-site review consisting of walkdowns of specified operation(s) and interviews with nuclear criticality safety management and staff, operations supervision, operators, DOE nuclear criticality safety staff, and DOE facility representatives.
9. Team writes interim draft report for each individual site at the conclusion of the site assessment and leaves draft at site for validation review prior to departure.
10. Team writes final report covering all the sites and provides it to the Secretary.

Conduct of Site Assessment:

Day 1: Team arrives, receives badges, in-briefs, and receives site/facility specific training as needed.
Day 2: Team tours facilities/operations and begins interviews.
Day 3: Team completes interviews and drafts report.
Day 4: Team completes draft report and departs site.

Schedule:

October 29-November 5: Request and Obtain Documentation from Sites
November 8-12: Team Reviews Y-12 Documentation
November 15-18: Y-12 Site Assessment
November 22-24: Review LANL Documentation
November 30-December 3: LANL TA-55 Site Assessment
December 6-10: Review SR Documentation
December 13-16: Savannah River FB-line and H-Area Exterior Tanks Storage Assessment
December 20-31: Review Hanford PFP and Rocky Flats Documentation
January 3-6: Rocky Flats Building 371 Site Assessment
January 10-13: Hanford PFP Site Assessment

January 17-21: Complete First Rough Draft of Final Report
January 24-25: Management Review of First Rough Draft
January 26: Incorporate Management Comments
January 27: Final Draft Issued for Management Approval
January 28: Issue Report to Secretary

Follow-on Review:
February 7-11: Review Portsmouth GDP Documentation
February 14-17: Portsmouth GDP Site Assessment

Key Assumptions:

1. The Hanford/PFP review will focus on the status of corrective actions on NCS deficiencies stemming from the December 1997, March 1998, March 1999, and September 1999 NCS reviews in addition to verifying the adequacy of NCS controls on solution operations.

2. The Team will draft a bullet report prior to leaving each site and leave it with the site for validation.

3. The NCS review of the Portsmouth GDP will be a separate effort by a subset (2-3 members) of this team using this protocol to be coordinated with the planned EH-2 review.

Team Assignments:

Jerry McKamy, Team Leader
Adolf Garcia and Jim Felty, Self-Assessments and NCS Audits
Bill Weaver and Gypsy Tweed, Work Control and Change Control
Ivon Fergus and Steve Payne, NCS Evaluations & Controls
Cyndi Dorsey, Administrative Support

ATTACHMENT 2

SELF-ASSESSMENT FOR DOE CRITICALITY SAFETY PROGRAMS

OFFICE OF NUCLEAR AND FACILITY SAFETY, EH-3
OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

U.S. DEPARTMENT OF ENERGY

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I. SCOPE

The Department of Energy (DOE) issued DOE P 450.5, *Line Environment, Safety and Health Oversight*, to set forth its expectations for line management environment, safety and health (ES&H) oversight. DOE line oversight and contractor self-assessments together ensure that field elements and contractors adequately implement the DOE Safety Management System. Both DOE and contractor line managers must acquire and maintain sufficient knowledge of program activities in order to make informed decisions on safety resources for these activities. The Department's line organizations have the following responsibilities:

A. Develop ES&H performance objectives, measures, and expectations tied to DOE's strategic goals and objectives, as well as to performance goals and objectives of the Safety Management System elements.
B. Develop contract performance measures and performance indicators that are linked to the DOE Safety Management System.
C. Develop a high level of performance assurance that results in improved ES&H performance.

II. PURPOSE

The purpose of this document is to provide an assessment tool to evaluate the elements of the DOE nuclear criticality safety (NCS) oversight program. The requirements are based on the criteria outlined in DOE P 450.5.

III. ASSESSMENT REQUIREMENTS

A. DOE LINE ENVIRONMENT, SAFETY AND HEALTH OVERSIGHT

Criteria for the review of DOE criticality safety programs were extracted from DOE P 450.5, *Line Environment, Safety and Health Oversight.*

Criterion: Elements of the DOE Criticality Safety Program must be documented.

a. Are the responsibilities of the DOE NCS Program Manager clearly defined and understood?
b. Are the elements of a DOE NCS surveillance plan documented?

Criterion: DOE must acquire and maintain sufficient knowledge of program activities in order to make informed decisions on criticality safety resources for these activities.

a. Are routine meetings held with contractor NCS management?
b. Are periodic meetings held with DOE contractor operations management?
c. Does the DOE NCS Program Manager review budget requests made by contractor NCS management?

d. Does the DOE NCS Program Manager review budget requests made by contractor operations management?
e. Does the DOE NCS Program Manager have input to DOE site budget process?

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.

a. Do the DOE NCS Program Manager and Facility Representatives work closely on NCS-related issues in the field?
b. Does the DOE NCS Program Manager routinely spend time in the field performing walkdowns and interacting with Operations?
c. Does the DOE NCS Program Manager review contractor occurrence reports related to criticality safety programs?

Criterion: DOE reviews performance against formally established criticality safety performance measures, performance indicators, and contractor self-assessments.

a. Have contractor NCS program performance measures been established? See Appendix A for examples.
b. Is progress on the performance measures routinely reported to DOE?
c. Are contractor NCS self-assessments reviewed by the DOE NCS Program Manager?
d. Does the NCS Program Manager provide reports and feedback on contractor self-assessments to senior DOE site management?

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.

a. Does the DOE NCS Program Manager participate in readiness assessments, operational readiness reviews and Integrated Safety Management reviews when necessary?
b. Does the DOE NCS Program Manager participate 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 Reports)?
c. Does the DOE NCS Program Manager review a sample of contractor Criticality Safety Evaluations (CSEs) on a routine basis?

Criterion: DOE performs periodic appraisals of the contractor criticality safety program including for-cause criticality safety reviews, as necessary.

a. Have facility criticality safety surveillances been incorporated into the Field Office assessment plan?
b. Are appraisals and reviews documented?
c. Are corrective actions tracked to closure?

d. Does the DOE NCS Program Manager perform assessments of the contractor criticality safety program in accordance with a documented plan?
e. Are outside DOE NCS subject matter experts occasionally utilized to assist with reviews to provide independent feedback?

Criterion: DOE has a designated focal point for coordinating criticality safety oversight activities.

a. Has the DOE Field Office designated a single NCS focal point (i.e., NCS Program Manager)?
b. Has the DOE NCS Program Manager been qualified by completing the requirements in the Federal NCS Qualification Standard?
c. Does the DOE NCS Program Manager routinely meet with an Assistant Field Office Manager responsible for NCS?
d. Does the DOE NCS Program Manager represent the single authority on NCS issues to the contractor?
e. Does the DOE NCS Program Manager represent the Field Office on the Criticality Safety Coordinating Team (CSCT)?

Appendix A

Examples of DOE Performance Measures

- All infractions are closed in 90 days or less, with 50% closed within 30 days.
- Less than three of the same type of infraction occur within a six-month period.
- The Criticality Safety Engineer performs one criticality safety audit per month.
- The Criticality Safety Engineer audits all operational areas of the facility annually with a specific schedule for assessments of individual areas (not a single annual event, but the accumulation of smaller, in-depth audits).
- 80% of infractions discovered by Operations for the first nine months; zero thereafter.
- No more than 10% defects in the approved Evaluations and Postings for the first year; 1% thereafter.
- All Criticality Safety Engineers are formally qualified within a specified date.
- 40% of the Criticality Safety Engineer s have attended at least one technical conference.
- NCS performs self-assessments in accordance with ANSI/ANS-8.19.

Appendix B

Sample Review Form

ATTACHMENT 3

REVIEW PLAN FOR DOE CONTRACTOR CRITICALITY SAFETY PROGRAMS

OFFICE OF NUCLEAR AND FACILITY SAFETY, EH-3
OFFICE OF ENVIRONMENT, SAFETY AND HEALTH
U.S. DEPARTMENT OF ENERGY

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REVIEW OF DOE CONTRACTOR CRITICALITY SAFETY PROGRAMS

PURPOSE

The purpose of this document is to provide an assessment tool for review of DOE Contractor criticality safety programs. Assessment of elements of this plan will evaluate whether the program meets the requirements of ANSI/ANS-8.19, *Administrative Practices for Nuclear Criticality Safety*, as well as related ANSI/ANS-8 series standards. These standards represent the best practices for criticality safety programs and are mandatory under DOE Orders 5480.24 and its successor 420.1.

SCOPE

This document encompasses all elements of the Contractor criticality safety program at DOE facilities. Criticality safety practices must conform to the expectations of the DOE Orders and the applicable national consensus ANSI/ANS Standards. The effectiveness of the criticality safety program is dependent upon management implementing its roles and responsibilities to integrate criticality safety into work practices as stated below:

An effective nuclear criticality safety program includes cooperation among management, supervision, and the criticality safety staff and relies upon conformance with operating procedures by all employees. (Introduction to ANSI/ANS-8.19)

In May of 1997 the Defense Nuclear Facility Safety Board (Board) issued Recommendation 97-2 dealing with criticality safety. Among the nine specific recommendations made were: 1) the need for DOE Sites to maintain a formally trained and qualified nuclear criticality safety staff including hands on experience at critical mass laboratories; 2) the use of simplified bounding methods of setting subcritical limits with priority given to existing experimental data; 3) line management ownership of criticality safety; and, 4) the formation of a core group of criticality safety experts available to assist the DOE with criticality safety related issues.

The applicable DOE Order for criticality safety is 5480.24 or DOE Order 420.1 as stated in the facility contract. Both mandate compliance with certain ANSI/ANS Standards for criticality safety. The assessment areas presented in this plan were drawn from the mandatory Standard, ANSI/ANS-8.19, *Administrative Practices for Nuclear Criticality Safety*, and are categorized as follows:

- Management Responsibilities - Management demonstrates ownership and participation in the criticality safety program; authorities and responsibilities are defined, understood and implemented; management provides a nuclear criticality safety staff that is competent in the

physics of criticality and associated safety practices as well as familiar with fissile material operations; management ensures that the nuclear criticality safety staff is independent of line management to the extent practicable; management assigns responsibility for criticality safety in a manner consistent with other safety disciplines; and, management establishes means of monitoring the criticality safety program and obtains feedback on the overall effectiveness of the program.

- Supervisory Responsibilities - Line supervision accepts responsibility for the criticality safety of their operations; supervisors understand the controls, contingencies, and criticality safety basis for operations under their control; classroom and job-specific training in criticality safety is provided to personnel; procedures govern all work and there are effective change control and configuration control mechanisms; supervisors verify compliance with criticality safety specifications before authorizing work; and supervisors require conformance with good safety practices, good housekeeping, and unambiguous identification of fissile materials.

- Nuclear Criticality Safety Staff Responsibilities - The nuclear criticality safety staff is comprised of specialists skilled in the techniques of nuclear criticality safety assessment and familiar with plant operations while, to the extent practicable, administratively independent of line management; the staff provides technical guidance for design of equipment, processes, and procedures; the staff reviews modifications to equipment, process, and procedures involving fissile material; the staff maintains familiarity with criticality codes, guides, standards, and best practices; the staff is interactive, both internally and externally having access to criticality safety professionals to provide assistance as needed; the staff understands the physics of criticality and makes use of experimental data, handbook data, and bounding methods where applicable; the staff participates in training personnel; the staff participates in audits of operations; and the staff examines reports of procedural violations and criticality infractions and recommends improvements in safety practices to management.

- Operating Procedures - Procedures are written and organized to facilitate operator use and understanding; procedures contain criticality controls; mechanisms are in place to facilitate revising and improving procedures on a periodic basis; new or revised procedures involving fissile material are reviewed by the nuclear criticality safety staff; procedures are supplemented by postings; postings are easily visible, understood by operators and contain clear, and contain all criticality controls implemented by the operator; deviations from procedures and processes and criticality infractions are investigated promptly, documented, reported to management, categorized according to approved procedures, and actions are identified to prevent recurrence; criticality infractions are resolved in a timely manner; and, operations are reviewed frequently (at least annually) to assure that processes and procedures have not been altered in a way so as to affect the applicable nuclear criticality safety evaluation.

- Process Evaluation for Nuclear Criticality Safety - All fissile material operations are analyzed to show that the processes will remain subcritical under all normal and credible abnormal

conditions; the criticality safety evaluation is documented in a clear unambiguous manner; contingencies and controls are explicitly identified; calculational methods are properly validated; priority is placed on experimental data, handbook values, and bounding methods where applicable; engineered safety features are relied on to provide criticality safety to the extent practicable; procedures for producing criticality safety evaluations, limits, and postings are used; and criticality safety evaluations are independently peer reviewed before operations are authorized.

- Materials Control - Movement of fissile materials is controlled; fissile material is labeled including mass, chemical form, and isotopic composition; storage areas are posted with applicable criticality safety limits; methods are established to monitor the presence and effectiveness of credited neutron absorbers; access to fissile material handling areas is controlled and fissile material handler qualification verified; and, control of spacing, mass, density and geometry of fissile material is maintained to assure subcriticality under all normal and credible abnormal conditions.

- Planned Response to Nuclear Criticality Accidents - Criticality accident detectors are capable of detecting the minimum accident of concern; the criticality accident alarm system (CAAS) is designed in such a way as to minimize false alarms; detector placement criteria for all permanent and temporary detectors is documented; a configuration management system is in place to assure the ongoing functionality of the CAAS; the CAAS can alarm all areas of the facility by either audible or visible means; emergency response procedures for criticality accidents are in place; personnel are trained in evacuation procedures; evacuation routes and assembly points are identified; procedures for accounting for personnel are in place; criticality accident drills are conducted at least annually and are as realistic as practicable; advance arrangements are in place for the treatment of exposed and contaminated individuals; radiation monitoring equipment is available to response personnel; radiation monitoring personnel are trained; and, emergency procedures address re-entry of facilities and the membership of re-entry teams.

ASSESSMENT REQUIREMENTS

The following elements should be contained in an facility assessment activity at least once during a three year period. The Assessor should establish appropriate lines of inquiry and may use the ones suggested below or may generate his/her own for a given assessment activity.

1.0 MANAGEMENT RESPONSIBILITIES

Criteria: Management shall accept overall responsibility for safety of operations. Continuing interest in safety should be evident. (ANSI/ANS-8.19, Section 4.1)

- Does the Contractor Facility Management demonstrate continuing interest in criticality safety as evidenced by conducting safety meetings, issuing safety bulletins, inspecting facilities on a regular basis, and ensuring continuous improvement in safety?

- Does the Contractor Facility Management demonstrate continuing interest in criticality safety as evidenced by regular meetings with the criticality safety engineers and the Nuclear Criticality Safety (NCS) manager?
- Does the Contractor Program Management regularly meet with the NCS manager?

Criteria: Management shall formulate nuclear criticality safety policy and make it known to all employees involved in operations with fissile material. (ANSI/ANS-8.19, Section 4.2)

- Does the Contractor have a written criticality safety policy?
- Are all fissile material handlers and their supervisors familiar with the criticality safety policy?
- How is compliance to the Contractor criticality safety policy required of all program personnel performing work?

Criteria: Management shall assign responsibility and delegate commensurate authority to implement established policy. Responsibility for nuclear criticality safety should be assigned in a manner compatible with that for other safety disciplines. (ANSI/ANS-8.19, Section 4.3)

- Are the roles and responsibilities of the Criticality Safety Engineers (CSEs) documented?
- Are the roles and responsibilities of the NCS Manager and Organization documented?
- Are the roles and responsibilities of the Criticality Safety Officers (CSOs) documented, if applicable?
- Is there a clear distinction between the roles of the CSO and the CSE?
- Is line management assigned responsibility for criticality safety?
- Has the Contractor assigned responsibility for oversight of the NCS program?

Criteria: Management shall provide personnel familiar with the physics of nuclear criticality and with associated safety practices to furnish technical guidance appropriate to the scope of operations. This function should, to the extent practicable, be administratively independent of operations. (ANSI/ANS-8.19, Section 4.4)

- Does the Contractor have sufficient funding to assure continuous support by NCS Staff?
- Does the Contractor management provide discretionary funding to the NCS manager to provide training and professional development for the NCS staff, to address laboratory wide issues, to maintain the NCS program documentation, and to ensure that criticality safety codes and platforms are verified and validated?
- Does the NCS Staff have unilateral, unscheduled access to the facility and operations personnel?
- Does the Contractor have a plan or policy to assure the NCS Staff is familiar with fissile operations? Does the Contractor issue requirements for the qualification and training of NCS Staff, including subcontractors?
- Is the Contractor NCS Staff administratively independent of operations?
- Do all members of the NCS Staff have technical degrees in physics or nuclear engineering?

Criteria: Management shall establish a means for monitoring the nuclear criticality safety program. (ANSI/ANS-8.19, Section 4.5)

- Who is responsible for monitoring the criticality safety program?
- Are all deficiencies related to criticality safety entered in a corrective action tracking system?
- Are mechanisms in place to validate closure of all criticality safety related deficiencies?
- Does line program management maintain awareness of criticality safety deficiencies through the use of a corrective action tracking system?
- Is there a program or procedure for trending deficiencies in the criticality safety program?
- Does the Contractor perform assessments of compliance to operating procedures?
- Does the Contractor assess implementation of conduct of operations?
- How are NCS funding levels proposed and approved?

- How does the Contractor management determine that funding for NCS is sufficient and is there a mechanism for adjusting the funding during the fiscal year?

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

- Does the Contractor management participate in review teams or committees to assess facility criticality safety programs?
- Does the Contractor program management routinely audit operations for compliance to criticality safety requirements?
- Does the Contractor facility management routinely audit operations for compliance to criticality safety requirements?
- Does the Contractor perform NCS management self-assessments of their criticality safety staff and program?

Criteria: 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)

- Does management utilize a nuclear criticality safety committee to assist in monitoring and improving the criticality safety program?
- If nuclear criticality safety committees are used, do they report directly to the Senior Management? Are the findings from the nuclear criticality safety committee, or equivalent, entered into a tracking database and corrective actions implemented?
- Are outside consultants utilized to provide an independent viewpoint on the overall criticality safety program?

2.0 SUPERVISORY RESPONSIBILITIES

Criteria: Each supervisor shall accept responsibility for the safety of operations under his control. (ANSI/ANS-8.19, Section 5.1)

- Line program supervisors accept responsibility for criticality safety of their operations. Is ownership demonstrated by the following: 1) approving criticality safety postings; 2) reviewing and approving criticality controls in procedures; 3) participating in the development of criticality safety evaluations; 4) participating in the development of credible process upsets for the NCS staff to consider; and 5) approving criticality safety evaluations for operations?

Criteria: Each supervisor shall be knowledgeable in those aspects of nuclear criticality safety relevant to operations under his control. Training and assistance should be obtained from the nuclear criticality safety staff. (ANSI/ANS-8.19, Section 5.2)

- Are line program supervisors familiar with the criticality accident scenarios in CSEs supporting their operations?
- Does line program supervisors approve credible process upsets analyzed by the NCS staff during development of the CSE?
- Do line program supervisors understand the underlying assumptions in CSEs which involve configuration of equipment, facility modifications, isotopic composition, etc.?
- Does the Nuclear Criticality Safety Staff provide NCS training to line program supervisors?
- Does line program supervision know the safety basis for the criticality controls for their operations?
- Does the NCS staff provide advice and assistance to line program management regarding implementation of NCS controls?

Criteria: 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)

At a minimum, operators receive criticality safety training in accordance with ANSI/ANS-8.20, "Nuclear Criticality Safety Training."

- Do supervisors provide job specific training on procedures?
- Are walkthroughs and dry-runs on procedures provided?
- Do pre-job briefs cover criticality controls specific to the operations at hand?
- Do 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?
- Do supervisors maintain training records for their personnel?
- Do supervisors ensure that their personnel are current in criticality safety classroom training?
- Are there required reading records or other evidence that personnel are knowledgeable of changes to procedures, and criticality safety postings?
- Can supervisors and operators answer questions about the basic criticality controls for their operations?
- Can supervisors generally describe the contingencies and controls for the contingencies for their operations including credited engineered features and key facility assumptions, if any?
- Do supervisors ensure that personnel have demonstrated an understanding of modified or revised procedures, and criticality safety postings prior to authorizing work?
- Are there records of job specific training on procedures and criticality safety postings?
- Do supervisors request assistance from the Nuclear Criticality Safety Staff to provide training for operations personnel?
- Do firefighters receive criticality safety training?
- Are firefighters aware of any moderator-controlled areas or processes?

Criteria: 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)

- Are all fissile material handling operations performed according to approved procedures?
- Are operations personnel or supervision involved in developing procedures?
- Is there a mechanism to assure that only current, approved procedures, CSEs, and postings are used for operations?
- How does the line program supervisor know when to authorize work after all NCS requirements have been met after modifications to the existing set of controls/procedures?
- Does a clear, unambiguous link between the CSE, procedure and posting exist such that it is traceable from floor level documentation?
- Is there a mechanism to ensure that OSR related controls and requirements in procedures or postings are not changed without proper analysis and approval?
- Are Unreviewed Safety Question Determinations (USQD) performed for all procedure modifications?

Criteria: 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)

- Are there 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?
- Are there documented surveillances or methods that ensure that new or modified operations conform to applicable CSEs-procedures-postings?
- Is there 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?

Criteria: Each supervisor shall require conformance with good safety practices including unambiguous identification of fissile materials and good housekeeping. (ANSI/ANS-8.19, Section 5.6)

- Are stored, empty containers labeled as such?
- Are gloveboxes with criticality drains free of loose debris which could potentially clog the drain?
- Is fissile material stored in approved containers?
- Prior to beginning work at a workstation, is there a procedure to verify compliance with criticality safety requirements?
- Is there evidence of fissile material holdup or filings in gloveboxes?
- Are criticality drain liquid traps monitored for adequate liquid levels periodically?

3.0 NUCLEAR CRITICALITY SAFETY STAFF RESPONSIBILITIES

Criteria: 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)

- Does the NCS Staff provide design input for all new or modified equipment?
- Does the NCS Staff review all operating procedures involving fissile materials?
- Does the NCS Staff review and concur on final equipment and process designs?

Criteria: The staff shall maintain familiarity with current developments in nuclear criticality safety standards, guides, and codes. Knowledge of current nuclear criticality information should be maintained. (ANSI/ANS-8.19, Section 6.2)

- Do all members of the Nuclear Criticality Safety Staff understand and know how to properly utilize monte carlo codes (e.g. KENO and MCNP), criticality safety handbooks, critical experiment data, hand-calculations, etc.?
- Does the Contractor NCS Staff participate in professional development activities such as ANS Standards Committees, Nuclear Criticality Technology Project Workshop, ANS Meetings, LANL/LACEF courses, UNM courses, etc.?
- Is there a training and qualification program for the Contractor NCS Staff? Are all the members of the Contractor NCS Staff qualified?
- Does the NCS Staff have working knowledge of criticality safety related standards, guides, and codes?

Criteria: The staff should consult with knowledgeable individuals to obtain technical assistance as needed. (ANSI/ANS-8.19, Section 6.3)

- Does a synergistic interaction exist among the NCS Staff assigned to specific facilities and the remainder of the Contractor NCS staff?
- Does the NCS Staff consult with offsite criticality safety experts periodically, particularly retirees from the facility?

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

- Does the NCS staff observe fissile material handling and processing operations?
- Are members of the NCS Staff knowledgeable of credible abnormal process upsets applicable to facility operations?
- Does the NCS Staff attend operations planning meetings for new or restarted processes?
- Does the NCS Staff have access to and familiarity with fissile material operating procedures?
- Does the NCS Staff attend pre-job briefs and plan-of-the-day meetings?
- Does the NCS Staff maintain familiarity with reports of deviations from expected process conditions even if these deviations do not result in a criticality infraction?

Criteria: The staff shall assist supervision, on request, in training personnel. (ANSI/ANS-8.19, Section 6.5)

- Does the NCS Staff participate in training personnel?
- Is the training documented?
- Does the training provided by the NCS Staff include job specific criticality safety related information?

Criteria: The 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)

- Does the NCS Staff participate in periodic audits of operations and procedures?
- Are the results of audits shared among the NCS Staff?
- Are the results of audits reported to appropriate Facility Management?
- Are corrective actions developed for deficiencies?

Criteria: The staff shall examine reports of procedural violations and other deficiencies for possible improvement of safety practices and procedural requirements, and shall report their findings to management. (ANSI/ANS-8.19, Section 6.7)

- Are deficiencies identified by the occurrence of criticality safety infractions reviewed by the NCS Staff?
- Does the NCS Staff formally report findings and recommendations to Facility Management?
- Are lessons learned developed and recommendations to prevent recurrence made to Facility management?
- Are all criticality safety related deficiencies captured in a database and tracked until closure is verified?
- Is there a mechanism for trending criticality safety related deficiencies so that the collective significance of multiple minor incidents can be assessed and corrected?
- Are lessons learned from other facilities reviewed by the NCS Staff for potential application at the facilities?

4.0 OPERATING PROCEDURES

Criteria: The purpose of operating procedures is to facilitate the safe and efficient conduct of the operation. Procedures should be organized and presented for convenient use by operators. They should be free of extraneous material (ANSI/ANS-8.19, Section 7.1)

- Are criticality controls in procedures clear, concise, free of criticality safety jargon, and easily identifiable?
- Is the criticality safety related information presented in procedures free of unnecessary detail and directly applicable to the job task being performed?
- Do the operators find the criticality safety related instructions easy to understand and follow?

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

- Are criticality controls included in operating procedures?
- Are the criticality controls clearly identified as important to safety?
- Is there a clear, unambiguous, link between criticality controls in procedures and their parent CSE?
- Does the Contractor have a formalized process for determining which controls are incorporated in procedures?
- Do pre-fire plans incorporate criticality safety controls?
- Are criticality related instructions in pre-fire plans and firefighting procedures practical under actual conditions of responding to fires?

Criteria: Supplementing and revising procedures as improvements become desirable shall be facilitated. (ANSI/ANS-8.19, Section 7.3)

- Are procedures revised based on lessons learned to reduce occurrence of deviations and infractions?
- Do operators have a feedback process whereby improvements to procedures can be implemented?
- Are adequate resources available to facilitate procedure improvements as they are identified?
- Are procedure revisions timely?
- What change control mechanism is in place that assures only the current, approved procedures are utilized?

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

- Are procedures periodically reviewed?
- Does the NCS Staff periodically participate in reviews of active operating procedures?
- What mechanisms are in place to ensure that all procedures are reviewed as planned?

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

- Does new or revised procedures receive review by the NCS Staff?
- Is there a mechanism for resolving conflicting comments the NCS Staff and the other reviewers?

Criteria: 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)

- Are criticality safety postings easy to understand by operators?
- Do the postings contain only information controlled by the operator performing the task?
- Do the postings require any analysis on the part of the operator such as decoding "IF-THEN", "EITHER-OR" type options to select appropriate controls?
- What is the relationship between the controls in the posting and the controls in the procedures?
- Is there a formalized process for determining which controls appear on postings and which appear in procedures?

- What mechanism is in place to ensure that the controls in the posting are consistent with those intended by the parent CSE?
- Are postings easy to read from normal operator positions at the workstation?
- Do operators rely primarily on postings to obtain their criticality safety controls?
- Are all the controls necessary for criticality safety included in postings?
- Is it possible to comply with the requirements of the posting and still incur a criticality safety infraction because additional controls are contained in the procedures?

Criteria: Deviations from operating procedures and unforeseen alterations in process conditions that affect nuclear criticality safety shall be documented, reported to management, and investigated promptly. Action shall be taken to prevent a recurrence. (ANSI/ANS-8.19, Section 7.7)

- How are infractions graded?
- Are the contingencies and barriers for a given operation readily available to the NCS Staff investigating potential infractions?
- Do procedures exist to upgrade the assigned severity level of infractions due to adverse trends?
- Do procedures exist to upgrade the assigned severity level of infractions due to the magnitude of the decrease in the margin of subcriticality?
- Do operators immediately stop work, leave the immediate vicinity, notify supervision, post the area, and contact the NCS Staff promptly when a potential infraction is identified?
- Does the NCS Staff respond to the scene of a potential infraction?
- Are the responsibilities defined for responding to a potential infraction?
- Does the NCS Staff participate in management critiques of infractions, assigning levels of infraction, and developing corrective actions?
- Are infractions resolved promptly and normal operations restarted?
- When the NCS Staff recommends immediate corrective actions to recover from an infraction, are these recommendations made in writing, peer reviewed, and approved by line (Facility or Program) management?
- Are corrective actions stemming from criticality infractions entered into a tracking database and monitored until closure?
- Are minor criticality infractions tracked and trended?
- Are all criticality infractions, regardless of severity, documented?

Criteria: 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)

- Are all operations reviewed at least annually?
- How do annual reviews determine that procedures are being followed?
- Do 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.?
- Do personnel with NCS experience and knowledge of the operations perform the reviews?
- Do the reviews examine CSEs do verify that changes to the process have not compromised criticality safety?
- Are the results of the review reported to senior management as well as Facility and Program Management?
- Are deficiencies and proposed corrective actions documented and tracked to closure?
- Are procedures in place that verify that changes to process equipment over time have not degraded compliance with criticality safety controls?
- Do annual reviews of operations look at all the elements of the criticality safety program affecting operations?

5.0 PROCESS EVALUATION FOR NUCLEAR CRITICALITY SAFETY

Criteria: 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)

Criticality safety evaluations shall conform to the requirements of ANSI/ANS-8.1, "Nuclear Criticality Safety in Operation with Fissionable Material Outside Reactors."

- Are natural phenomena hazards, especially seismic, considered in developing accident scenarios?
- Are firefighting scenarios considered (i.e. addition of moderator, displacement of fissile material in water streams, etc.)?
- Do the contingencies credited represent events that are at least unlikely?
- Are all credible process upsets considered and either controlled or dispositioned appropriately?
- Are the criticality safety evaluations produced in a timely fashion?
- Do formalized procedures exist for generating criticality safety evaluations?
- Does staff familiar with the facility and operations under consideration produce the criticality safety evaluations?
- Does the NCS Staff take full advantage of simplifying methods, bounding calculations, critical experiment data, handbook data, etc. where appropriate to minimize dependence upon monte carlo techniques?
- Does the NCS Staff have access to archived criticality safety evaluations as reference?
- Do criteria and procedures exist to determine the magnitude of process change which can be implemented without revising the criticality safety evaluation?
- Does the NCS Staff work as a team with operations to develop credible accident scenarios and controls?

Criteria: 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)

- Are controls developed in the criticality safety evaluation for each contingency?
- Are controlled parameters, contingencies, and credited barriers explicitly documented?
- Does the criticality safety evaluation identify those controls that are to be included in procedures and those that should be included in postings?

Criteria: 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)

- Does the criticality safety evaluations conform to DOE-STD-3007-93, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*?
- Does 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?
- Is there a change control and document control system in place for criticality safety evaluations?
- Are internal memoranda used to communicate limits and controls in place of formal evaluations?
- Are temporary limits and evaluations (i.e. those that expire after a specified period) used?
- Are all assumptions fully documented in the criticality safety evaluation?
- Can the criticality safety evaluation be read and understood by the line supervision?

Criteria: 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)

- Does all criticality safety evaluations receive and independent technical peer review before approval for use?
- Is there 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?

6.0 MATERIALS CONTROL

Criteria: The movement of fissile materials shall be controlled. (ANSI/ANS-8.19, Section 9.1)

- Are procedures in place to control the movement of fissile material between material balance areas?
- Are procedures in place to control movement of fissile material within a single material balance area?
- Are procedures in place to control transfers of fissile material out of the facility?
- Do the procedures have requirements to verify compliance with criticality safety limits at the shipping and receiving points of the transfer prior to performing the movement?
- Are material balance checksheets or equivalents used to maintain a running log of fissile mass contained in gloveboxes, storage arrays, etc.?

Criteria: Appropriate material labeling and area posting shall be maintained specifying material identification and all limits on parameters that are subject to procedural control. (ANSI/ANS-8.19, Section 9.2)

- Do fissile material labels contain all the information necessary to determine compliance to applicable NCS controls such as fissile mass, cladding, moderators, chemical form, shape, isotopic composition, etc.?
- Are all fissile material storage areas posted as such with criticality controls clearly identified?
- Can the mass and location of all fissile materials in a glovebox be determined by inspection of logs posted on the glovebox?

Criteria: If reliance is placed on neutron absorbing materials that are incorporated into process materials or equipment, control shall be exercised to maintain their continued presence with the intended distributions and concentrations. (ANSI/ANS-8.19, Section 9.3)

Any use of borosilicate raschig rings shall conform to the requirements of ANSI/ANS-8.5, "Use of Borosilcate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material."

- Are any processes dependent upon the presence of fixed neutron absorbers?
- Are controls in place to monitor the continued effectiveness of credited neutron absorbers?
- Are any soluble neutron absorbers credited?
- If soluble neutron absorbers are credited, are procedures in place to ensure they remain in their intended distribution and concentration?
- Are practices dealing with fixed neutron absorbers generally consistent with ANSI/ANS-8.21, *Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors?"*

Criteria: Access to areas where fissile material is handled, processed, or stored shall be controlled. (ANSI/ANS-8.19, Section 9.4)

- Is access to fissile material handling areas controlled such that only trained, qualified, and authorized personnel can handle fissile material?
- Does facility management verify the qualification of fissile material handlers prior to authorizing work?

Criteria: Control of spacing, mass, density, and geometry of fissile material shall be maintained to assure subcriticality under all normal and credible abnormal conditions. (ANSI/ANS-8.19, Section 9.5)

Are fissile material storage areas in conformance with the requirements of ANSI/ANS-8.7, "Guide for Nuclear Criticality Safety in the Storage of Fissile Materials" where applicable?

- Are containers of residue and product fissile material stored in fixed arrays or have engineered spacers attached?
- Where administrative spacing controls are in place, has the criticality safety evaluation demonstrated that the system will remain subcritical in a seismic event?
- Are administrative spacing controls credited as unlikely events in criticality safety evaluations?
- Where engineered features are credited for criticality control, are inspections conducted to verify they are capable of performing the intended function?
- For solution storage areas are procedures in place to detect concentration and stratification changes in the solution?
- Are fissile solutions periodically monitored for changes in pH?
- Does double-block-and-bleed valve arrangements, or equivalent, where the addition of fissile material is prohibited, protect isolated, inactive fissile solution storage tanks?
- Has the criticality safety evaluation determined that all storage vaults, gloveboxes, and solution storage arrays will remain subcritical under credible seismic conditions?
- Does fissile material holdup in gloveboxes and the HVAC present a credible criticality accident scenario?
- Is holdup of fissile material monitored and controlled?
- Will fissile material in gloveboxes remain subcritical under credible firefighting scenarios?

7.0 PLANNED RESPONSE TO NUCLEAR CRITICALITY ACCIDENTS

Criteria: Guidance for the installation of nuclear criticality accident alarm systems may be obtained from the American National Standard Criticality Accident Alarm System, ANSI/ANS-8.3-1979[2]. Evacuation signals are addressed in the American National Standard Immediate Evacuation Signal for Use in Industrial Installations. ANSI/ANS-N2.3-1979[3]. (ANSI/ANS-8.19, Section 10.1)

- Does documentation exist to demonstrate that the installed criticality detectors can detect the minimum accident of concern?
- Does documentation exist to show that existing criticality detector coverage provides the necessary redundancy and detection thresholds?
- Is there one group responsible for analyzing criticality detector locations?
- Is there a procedure that governs the evaluation of criticality detector locations?
- Is the criticality alarm audible at all locations where personnel are potentially located?
- Where the alarms are not audible, are beacons present and visible?
- Does the criticality accident alarm system prevent false alarms?

- When portable, temporary alarms are used do they meet the requirements of ANSI/ANS-8.3?
- Before portable, temporary alarms are used is there an analysis to demonstrate that the detectors will alarm if the minimum accident of concern occurs?

Criteria: Emergency procedures shall be prepared and approved by management. Organizations, on and off-site, that are expected to provide assistance during emergencies shall be informed of conditions that might be encountered. They should be assisted in preparing suitable emergency response procedures. (ANSI/ANS-8.19, Section 10.2)

- Are emergency procedures available and approved?
- Do offsite organizations participate in emergency exercises for criticality scenarios?
- Do offsite organizations required to respond in the event of a criticality accident have emergency response procedures?
- Does the NCS Staff have a role in responding to criticality accidents?
- Are procedures in place to provide estimates of source terms and fission estimates in the event of a criticality accident?
- Are offsite responders aware of the plant conditions that might be encountered in the event of a criticality accident?

Criteria: Emergency procedures shall clearly designate evacuation routes. Evacuation should follow the quickest and most direct routes practicable. These routes shall be clearly identified and should avoid recognized areas of higher risk. (ANSI/ANS-8.19, Section 10.3)

- Do emergency procedures designate evacuation routes?
- Are evacuation routes identified and avoid areas of higher risk?

Criteria: Personnel assembly stations, outside the areas to be evacuated, shall be designated. Means to account for personnel shall be established. (ANSI/ANS-8.19, Section 10.4)

- Are personnel assembly stations clearly identified?
- Have the designated assembly areas been analyzed in advance to minimize radiation exposures from a criticality accident?
- Do procedures exist to account for all facility personnel, including visitors, in the event of an evacuation?

Criteria: Personnel in the area to be evacuated shall be trained in evacuation methods and informed of routes and assembly stations. Provision shall be made for the evacuation of transient personnel. Drills shall be performed at least annually to maintain familiarity with the emergency procedures. Drills shall be announced in advance. (ANSI/ANS-8.19, Section 10.5)

- Are personnel trained to evacuate by the quickest and most direct route?
- Do personnel know where they are to assemble?
- Are criticality drills performed at least annually?
- Are annual criticality drills an OSR requirement?
- Does the alarm tone for a drill mimic the alarm that will be heard in a real accident?
- Are personnel pre-staged for criticality alarm drills or are they at their normal work locations?
- Does multiple buildings participate in criticality alarm drills?
- Will more than one facility go into alarm if a criticality accident occurs?
- Are facility visitors indoctrinated in proper evacuation procedures?
- Is an emergency command center established for criticality accident drills?

Criteria: Arrangements shall be made in advance for the care and treatment of injured and exposed persons. The possibility of personnel contamination by radioactive materials shall be considered. (ANSI/ANS-8.19, Section 10.6)

- Are procedures in place to care for injured and exposed personnel?
- Are area hospitals equipped and trained to handle personnel with extreme radiation exposures?
- Are procedures in place to deal with contaminated personnel?

Criteria: Planning shall include a program for the immediate identification of exposed individuals and should include personnel dosimetry. Guidance for dosimetry may be found in American National Standard Dosimetry for Criticality Accidents, N13.3-1969 (R 1981) [4]. (ANSI/ANS-8.19, Section 10.7)

- Does radiation monitoring personnel participate in criticality drills?
- Does radiation monitoring personnel respond to the assembly areas to monitor for radioactive contamination?

Criteria: Instrumentation and procedures shall be provided for determining the radiation at the assembly area and in the evacuated area following a criticality accident. Information should be correlated at a central control point. (ANSI/ANS-8.19, Section 10.8)

- Are procedures in place to monitor radiation levels at the assembly areas?
- Are both gamma and neutron detectors available?
- Are radiation monitoring personnel trained in the interpretation of radiation data as it pertains to an ongoing criticality accident?
- Are procedures in place to move personnel from designated assembly areas in the event an unacceptably high radiation field is encountered?
- Are radiation readings reported to the emergency command center?

Criteria: Emergency procedures shall address re-entry procedures and the membership of response teams. (ANSI/ANS-8.19, Section 10.9)

- Do emergency response procedures address re-entry?
- Can the criticality alarm system be reset remotely prior to re-entry?
- What is the membership of re-entry teams?
- Are members trained in the use of proper equipment such as supplied breathing air?
- Does the incident commander have pre-determined criteria for authorizing re-entry?

DOE Contractor Criticality Safety Program
Review Form

Review Area:
__ Management Responsibilities
__ Supervisory Responsibilities
__ Nuclear Criticality Safety Staff Responsibilities
__ Operating Procedures
__ Process Evaluation for Nuclear Criticality Safety
__ Materials Control
__ Planned Response to Nuclear Criticality Accidents

Form No._____

Date:_____

3. Contractor Response (Provide basis and references):

4. Contractor Signature Section:

Contractor Originator: _____ Date: _____

Contractor Approval: _____ Date: _____

REVIEW FORM

DOE Contractor Criticality Safety Program
Review Form

Review Area:
__ Management Responsibilities
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Form No._____

Date:_____

1. Identification Section:

A. Observation (including overall significance and basis):

B. References:

C. Information Requested (list of information needed to complete this form)

2. Reviewers' Signature Section:

Originator _____ Date: _____

Approved _____ Date: _____