
		Number: EA CRAD 31-30 Revision: (Rev. 2) Effective Date: June 27, 2016
<p align="center">Criticality Safety Program and Criticality Safety Controls Implementation Criteria and Review Approach Document</p>		
Authorization and Approval	 Director, Office of Nuclear Safety and Environmental Assessments Date: 6-27-16	 Lead, Jimmy Dyke, Nuclear Engineer Date: 6-27-16

1.0 PURPOSE

The mission of the U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments (EA-30) is to assess the effectiveness of safety and emergency management systems and practices used by line and contractor organizations and to provide clear, concise, rigorous, and independent evaluation reports of performance in protecting workers, the public, and the environment from the hazards associated with DOE activities.

In addition to the general independent oversight requirements and responsibilities specified in DOE Order 227.1A, *Independent Oversight Program*, this criteria and review approach document (CRAD), in part, fulfills the responsibility assigned to EA in (reference source document) to (paraphrase responsibility or requirement).

The CRADs are available to DOE line and contractor assessment personnel to aid them in developing effective DOE oversight, contractor self-assessment, and corrective action processes. The current revision of EA's CRADs are available at <http://www.energy.gov/ea/criteria-and-review-approach-documents>.

This CRAD supersedes HSS CRAD 45-18, revision 1.

2.0 APPLICABILITY

The following CRAD is approved for use by the Office of Nuclear Safety and Environmental Assessments.

3.0 FEEDBACK

Comments and suggestions for improvements on this CRAD can be directed to the Director, Office of Environment, Safety and Health Assessments, at (301) 903-5392.

4.0 CRITERIA AND REVIEW APPROACH

The review focuses on the implementation of a criticality safety program (CSP) and criticality safety controls that ensure nuclear criticality safety is achieved by controlling one or more parameters of a system within subcritical limits including allowances for process contingencies. The review will evaluate the effectiveness of implementing the DOE approved site criticality safety program and criticality safety controls that are selected to provide preventive and/or mitigative functions for a potential criticality accident.

The following provides a set of criteria and typical activities with representative lines of inquiry to assess implementation of a CSP and criticality controls identified as part of the criticality safety process analysis to ensure fissile material activities will remain subcritical under both normal and credible abnormal conditions. All engineered features (active and passive) and administrative controls may be considered during this review as long as they are being relied upon to prevent a criticality accident. These may or may not be identified as part of the TSRs. The following objectives and associated criteria are designed to be used separately based on the needs of the specific appraisal.

OBJECTIVES

CS.1: A fully compliant criticality safety program (CSP) has been implemented at the site.

Criteria:

1. The Site Contractor has prepared and submitted a CSP description document that has been approved by the Site Office Manager or designee. The CSP description document is current and consistent with the commitments in the applicable documented safety analysis (DSA) (DOE O 422.1; NA-1 SD 411.1-1C).
2. The Site Contractor has prepared implementing mechanisms for the CSP that meet the requirements of DOE O 420.1C and the commitments in each DSA and Technical Safety Requirement (TSR) (10 CFR Part 830; DOE O 420.1B; DOE O 226.1A; NA-1 SD 226.1A).
3. Procedures and mechanisms ensure that nuclear facility operations covered by the CSP are conducted in accordance with CSP implementing mechanisms requirements (10 CFR Part 830; DOE O 420.1B; DOE O 226.1A; NA-1 SD 226.1A).
4. Issues identified during previous reviews have been appropriately resolved, corrective actions have been completed and are adequate, or a clear path to completion is indicated (DOE O 226.1A; NA-1 SD 226.1A).
5. The Site Office has developed and implemented processes and procedures to effectively oversee contractor performance in this functional area (DOE O 226.1A; NA-1 SD 226.1A)
6. The Site Office has sufficient staff, and assigned personnel have adequate technical competence, to oversee the performance of the contractor's CSP (NA-1 SD 411.1-1C).

Additional Considerations

- Has DOE approved the CSP Description Document?
- Does the Contractor have a written criticality safety policy?
- How is the criticality safety policy promulgated to employees?
- Are all fissionable material handlers and their supervisors familiar with the criticality safety policy?
- 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?
- Is the Contractor NCS Staff administratively independent of operations?
- Has management established a qualification program for the criticality safety staff?
- Is the backlog of criticality safety evaluations excessive?
- Are criticality safety related performance metrics in place and used by management to monitor the effectiveness of the 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 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 management routinely and adequately audit operations for compliance to criticality safety requirements?

CS.2: Criticality safety controls have supporting criticality safety analysis basis and are sufficiently reliable to ensure a changes in process conditions necessary for a criticality accident is at least “unlikely”.

Criteria:

1. Criticality safety controls are crafted using sound engineering/scientific principles (e.g., defense in depth, conservative design margins, human factors engineering) and appropriate standards, including the American National Standards Institute/American Nuclear Society (ANSI/ANS) Series 8 Standards, as applicable. [DOE 420.1C, Chapter III, 3.b, 3.d and 3.f; ANSI/ANS 8.1, 4.2 and 4.3.3; DOE-STD-3007-2007, II.D and II.E.]
2. Technical, functional, and performance requirements for criticality safety controls are specified in criticality safety documents. These documents identify and describe the safety functions and are effectively translated into procedures and workspace postings. [DOE 420.1C, Chapter III, 3.d and 3.f; ANSI/ANS 8.1., 4.1.3 and 4.1.4; ANSI/ANS 8.19, 7.2, 7.6, 8.2, and 8.3; and DOE-STD-3007-2007, II.G]
3. Criticality safety controls are robust and meet the Double Contingency Principle or DOE has granted a specific exemption which incorporates the foregoing criteria. [DOE 420.1C, Chapter III, 3.b and 3.c ; ANSI/ANS 8.1, 4.1.1 and 4.2.2 and ANSI/ANS 8.19, 4.2]
4. The effects of changes to criticality safety requirements or conditions to which they apply are reviewed and understood before the start of operations. [DOE 420.1C, Chapter III, 3.b and ANSI/ANS 8.19, 8.2 and 8.4]

Additional Considerations

- Within the scope of the review, do the criticality safety evaluations provide the basis for safety requirements and functions of selected criticality safety controls, which is consistent with the logic and assumptions presented?
- Do the criticality safety evaluations identify the appropriate performance criteria necessary to provide reasonable assurance that selected criticality safety control functional requirements will be met?
- Do the criticality safety evaluations identify and describe the selected criticality safety control safety functions?
- Do the criticality safety evaluations for selected criticality safety controls appropriately reflect assumptions of facility configuration and human performance of safety functions, operational parameters, and key programmatic elements?

CS.3: Criticality safety controls are implemented using documented and approved processes, and implementation is effective.

1. Management organizational structures and systems provide assurance that criticality safety controls are implemented and are being maintained such that they will fully and reliably perform their safety functions over the life of the facility. [DOE 420.1C, Chapter III, 3.b and f.; ANSI/ANS 8.1, 4.1.1, 4.1.5 and 4.1.6; ANSI/ANS 8.19 4.5, 4.6, and 4.7 and DOE-STD-1158-2002, 1.0, Criteria 4.5, 4.6 and 4.7]
2. The adequacy of criticality safety controls is confirmed by individuals or groups other than those who performed the work. Such confirmation, as well as activities ensuring that the technical basis for the controls is adequate, is completed before the start of operations. The adequacy determination considers that no single credible event or failure can result in a criticality. [DOE 420.1C, Chapter III, 3.b and 3.f; ANSI/ANS 8.19, 8.4 and ANSI/ANS 8.1, 4.3.4 and 4.3.6]
3. Criticality safety controls and how they are implemented are adequately communicated to workers via training, statements in procedures, workplace postings and other operator aids as appropriate. The need for materials labeling and other identifiers used to prevent criticality is understood and are adequate, i.e., workers may readily verify limit compliance. [DOE 420.1C, Chapter III 3.b ; ANSI/ANS 8.1, 4.1.1, 4.1.3 and 4.1.4 ; ANSI/ANS 8.19, 5.3, 7.6, and 9.4 ; ANSI/ANS 8.20, 6.1 and 6.2 and DOE-STD-1158, 2.0, Criteria 5.3 and 5.6, 1st bullet]
4. Non-adherences to controls are investigated, corrected, and documented. Additionally, cases where controls are discovered to be confusing or inadequately understood are resolved whether or not an actual non-adherence occurs. [DOE 420.1C, Chapter III 3.b; ANSI/ANS 8.19, 7.7 and DOE STD-1158-2002, 3.0, Criterion 6.7]
5. Support activities to ensure that limits are not exceeded are adequate, and involved personnel are aware of the potential consequences due to erroneous data or actions. [DOE 420.1C, Chapter III, 3.b ; ANSI/ANS 8.1, 4.1.1 and ANSI/ANS 8.19, 7.6]
6. Planned response to criticality accidents is adequate and evacuation drills and other activities verify workers understand and can execute their responsibilities during a response to a criticality alarm. Accidental alarms and miscommunications are minimized. [DOE 420.1C, Chapter III 3.b; ANSI/ANS 8.1, 4.1.1 and 4.1.7; ANSI/ANS 8.3, 4.5.1, 4.5.2, 5.4, 6.1, 6.2, and 6.4 – 6.7; ANSI/ANS 8.19, 5.3 and 10.2 – 10.6 and ANSI/ANS 8.20, 7.4.1]

Additional Considerations

- Are operations personnel knowledgeable, trained, and able to satisfactorily perform or respond to operational, abnormal response, and emergency procedures for selected criticality safety controls, as applicable, including responses to criticality accident alarms?

- Are support personnel knowledgeable, trained, and able to satisfactorily perform their respective duties regarding selected criticality safety controls and emergency response, as applicable?
- Is access to work areas controlled such that personnel who are not sufficiently trained will be assisted in the event of an emergency and are prevented from causing an infraction or emergency?
- Do the respective procedures and postings cite applicable criticality safety requirements in user-friendly terms?
- Are limits, precautions, system prerequisite conditions, data required, acceptance criteria, and independent verification elements included in the respective procedures for criticality safety controls?
- Are appropriate data recording provisions included or referenced and used to record operational data?
- Do the respective procedures include provisions for listing discrepancies?
- Do the respective procedures require timely notification to facility management about any discrepancy that could impact performance of selected criticality safety controls?
- Do appropriate personnel (e.g., operations, criticality safety engineers, criticality safety officers, etc.) review such results and take appropriate action?
- Are responses to deviations, infractions, and violations of criticality safety controls adequate? Is the frequency of such events reasonably minimal? Does management stress positive reinforcement, i.e., so that personnel are not reluctant to self-report?
- Are analyses and corrective actions, including schedules for completion, designed to prevent or minimize repeat infractions or lesser deviations of selected controls reasonable, i.e., demonstrate a graded approach to safety and reflect due diligence?
- Is timely closeout of infraction corrective action(s) the norm? Are completion date extensions reasonable?
- Is there sufficient coordination among various contractor internal organizations regarding implementing selected controls and verifying that their underlying assumptions remain valid?
- Are criticality accident alarm systems functional and do workers understand what to do if an alarm occurs?
- Do evacuation drills, i.e., plans, critiques, and other associated documents, indicate adequate compliance with requirements regarding (simulated) emergency conditions?
- Review records of false alarms and means to prevent them.
- Have rigorous assessments of criticality safety control developmental processes and their implementation, including simulated responses to emergencies, been performed by the contractor and DOE site office and appropriate corrective actions implemented, where appropriate? Do contractor self-assessments meet the intent of DOE-STD-1158 regarding the implementation of the selected controls?

REVIEW APPROACH

Record Review:

- Criticality Safety Program Document
- Criticality Safety Program Implementing Documents
- Documented Safety Analysis
- Technical Safety Requirements
- Nuclear Criticality Safety Evaluations
- Fissile Material Operations Procedures
- Criticality Safety Postings

- Training materials on how and why to comply with the selected criticality safety controls, including how to determine values of items being controlled and how to operate and calibrate systems that give alarms or other useful indications when limits are exceeded, and a sample of the respective training records, including measures to ensure that certified fissionable materials handlers perform work with fissionable materials and associated systems, equipment, and materials.
- Records relating to infractions or violations of selected criticality safety controls, any trends, and resultant analyses and corrective actions designed to prevent or minimize repeat infractions. Additionally, review records relating to lesser deviations of these controls that may indicate insufficient diligence.
- Contractor assessment activity schedules and assessment results for independent, management, and other self-assessments and external reviews/inspections (including DOE site office) of implementation for the selected controls.

Interviews:

- Criticality Safety Management
- Criticality Safety Staff
- Criticality Safety Officer
- Facility Management
- Facility Safety
- Operations Personnel
- Maintenance Supervisors
- Maintenance Personnel
- Design Engineers
- Configuration Management SME

Observations:

- Verify, by walkdown or other means that installed instrumentation and control and support equipment required to ensure ongoing implementation of selected criticality safety controls and proper emergency responses will function under credible accident/event conditions.
- Fissile Material Operations
- Fissile Material Staging Operations (vaults, etc.)
- TSR Surveillance of Criticality Safety related SSC's
- Walk-through of the fissile material operating procedures implementing the criticality safety controls
- Activities in support organizations; e.g., Chemistry Laboratory, MC&A, and NDA.
- Normal maintenance activities on SSC's associated with fissile material fissile material.