Independent Oversight
Focus Area Review of

Specific Administrative Controls at DOE Nuclear Facilities

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Abbreviations Used in This Report

AC	*Administrative Control*
CFR	*Code of Federal Regulations*
D&D	*Decontamination and Decommissioning*
DA	*Directive Action*
DNFSB	*Defense Nuclear Facilities Safety Board*
DSA	*Documented Safety Analysis*
DOE	*U.S. Department of Energy*
IVR	*Implementation Validation Review*
LCO	*Limiting Condition for Operation*
LDD	*Linking Document Database*
MC&A	*Material Control and Accountability*
NNSA	*National Nuclear Security Administration*
ORPS	*Occurrence Reporting and Processing System*
SAC	*Specific Administrative Control*
SME	*Subject Matter Expert*
SRS	*Savannah River Site*
SSC	*Structure, System, and Component*
STD	*Standard*
TSR	*Technical Safety Requirement*

Executive Summary

U.S. Department of Energy (DOE) nuclear facility hazards that could potentially harm workers, the public, and/or the environment are addressed in documented safety analyses (DSAs) and technical safety requirements (TSRs). For some postulated accidents addressed in a DSA, it is not practical to prevent or mitigate the potential consequences via engineered features. In these cases, DOE recognizes that administrative controls are needed instead of safety structures, systems, and components (SSCs). To clearly define the use of such administrative controls, DOE revised DOE Standard 3009 and issued DOE Standard 1186-2004 to address specific administrative controls (SACs). These documents identify an acceptable approach – a "safe harbor" methodology – for meeting the requirements of Part B of 10 CFR 830, *Nuclear Safety Management*, for cases in which SACs are implemented in lieu of safety SSCs. SACs are typically implemented by flowing TSR-level requirements down into work instructions (e.g., operating or maintenance procedures or other comparable worker-level instructions, area postings, and other operator aids, such as daily surveillance forms).

This report analyzes and summarizes the results of reviews of implementation of SACs, which were included in 2008-2009 Independent Oversight inspections of selected DOE nuclear facilities. The Independent Oversight reviews focused on flowdown of SAC requirements to the working level and corresponding enhancements to procedures, work area postings, or other task-level instructions; integration into data management processes for radioactive/hazardous materials; and other necessary steps, such as personnel training and assessments. Because this report summarizes results at the time Independent Oversight reviews were performed, it does not reflect corrective actions taken at the individual sites or progress that has been made in SAC development and implementation since the time of the Independent Oversight review. In addition, the report is intended to provide insights based on lessons learned and Independent Oversight observations but is not intended to provide a comprehensive evaluation of the current status of SAC implementation across all DOE nuclear facilities.

Overall, the reviewed sites had effectively incorporated the concept of SACs and supporting measures into their safety basis implementation programs. Each site that was reviewed had formulated and implemented a systematic process for developing safety bases that addressed the guidance and requirements associated with SACs, as defined in the standards. In most cases, the reviewed sites had developed effective SACs to control higher-risk activities and had ensured that the procedures implementing them were readily accessible by workers. Data management tools incorporated SAC limits, and most of the training for applying the requirements of the new and revised standards to site operations were effective. Section 3 of this report identifies some site-specific practices that are particularly effective with respect to SAC implementation, such as the use of electronic data management systems to manage the flowdown of requirements to implementing procedures, data and other information, and periodic assessments.

Over the SAC implementation review period, Independent Oversight also identified certain types of deficiencies at more than one site, as discussed in Section 2. For example, SACs identified in the safety basis development process were not always translated into sufficiently detailed work instructions, supplemented appropriately with operator aids or tools, and communicated to workers, especially less experienced workers, involved in performing the SAC-related activities. Some newly implemented versions of SACs and the supporting administrative controls varied in content and effectiveness, and site implementation efforts and follow-up self-assessments at some sites only partially revealed the extent of weaknesses in SAC implementation. Contractors and site offices at the reviewed sites were taking positive steps to further strengthen SAC development, implementation, and support processes, especially in response to identified deficiencies.

To support DOE site office and contractor management efforts to improve their programs and ensure full and effective implementation of 10 CFR 830 requirements, this report also identifies a number of opportunities for improvement for consideration by DOE line management and site contractors in Section 4. These include: using contractual performance objectives to promote effective performance, performing self-assessments of SAC development and implementation that incorporate lessons learned, and increasing the emphasis on human performance improvement principles in SAC development. In addition, the report identifies opportunities to improve site-specific guidance, as well as revisions to DOE-wide guidance, that may improve the effectiveness and efficiency of site efforts to develop, revise, and implement SACs.

1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight, within the Office of Health, Safety and Security, occasionally reviews specific focus areas. Focus areas are aspects of safety programs that Independent Oversight determines warrant increased management attention based on reviews of performance data, inspection results, and operating experience across DOE sites. Due, in part, to operating experience and previous inspection results, DOE selected specific administrative controls (SACs) as a focus area. SACs are new or revised technical safety requirements (TSRs) for administrative controls (ACs) that are used in lieu of engineered safety-class or safety-significant structures, systems, and components (SSCs). SACs perform a similar function to these SSCs in cases where such SSCs were not selected.

In 2002, the Defense Nuclear Facilities Safety Board (DNSFB) issued Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*, to address technical inadequacies in SACs at DOE nuclear facilities. As part of the DOE actions and commitments associated with the implementation plan for Recommendation 2002-3, DOE issued new standards to establish expectations for SACs. DOE issued Change Notice 3 to DOE Standard (STD) 3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis*, and issued DOE-STD-1186-2004, *Specific Administrative Controls*. These documents identify an acceptable approach – a "safe harbor" methodology – for meeting the requirements of Part B of 10 CFR 830, *Nuclear Safety Management*, when SACs are identified and implemented in lieu of safety SSCs. In accordance with these new standards, sites formulated and implemented a process for developing and implementing safety bases to address the guidance and requirements associated with SACs. Each SAC was implemented by flowing the TSR-level requirements down into operating or maintenance procedures or other comparable worker-level instructions, area postings, and other operator aids, such as daily surveillance forms. Additionally, sites assessed their own SAC implementation and compliance.

On January 4, 2007, DOE notified the DNFSB that all actions and commitments associated with Recommendation 2002-3 had been completed. However, on July 30, 2007, the DNFSB informed DOE that DNFSB reviews revealed continued deficiencies. Further, the DNFSB determined that a number of major National Nuclear Security Administration (NNSA) defense nuclear facilities had not fully implemented Recommendation 2002-3, and that DOE/NNSA line management audits and self-assessments were ineffective in determining the status of implementation.

To focus greater attention, seven Independent Oversight inspections included an evaluation of the effectiveness of processes for implementing SACs, including initial feedback and improvements. Those reviews collected data for immediate feedback to each site, as well as to foster beneficial changes in the way SACs and related items are implemented. Each site review sampled a few SAC-related activities at one or more facilities.

This report summarizes and analyzes the results of those Independent Oversight inspections that considered SACs as a focus area. The results provide information that will help DOE and contractor management implement applicable requirements effectively and efficiently, as well as assist DOE Headquarters in evaluating institutional guidance.

Section 2 provides an overall assessment of the current status of SAC implementation, including positive aspects and areas where deficiencies were identified at multiple sites. The report also identifies site-specific practices that are particularly effective (Section 3). Section 4 presents specific opportunities for improvement that could help sites address deficiencies that may be present at their sites and specifically indicates how DOE-wide guidance documents addressing SACs could be improved.

Review Scope

This special review is based on data pertinent to SAC implementation that was collected during seven scheduled inspections performed by Independent Oversight's Office of Environment, Safety and Health Evaluations from January 2008 through November 2009 (see Table 1). The schedule of inspections was not governed by considerations to review SAC implementation. However, the Independent Oversight inspection scoping and planning process determined that the selected seven sites (among all the sites inspected during the stated period) had sufficiently complex SACs and significant inventories of special nuclear material or other particularly hazardous materials such that they warranted a detailed SAC implementation review.

Table 1. SAC Programs Evaluated During Independent Oversight Inspections

Inspection Site	Headquarters Program Office
Los Alamos National Laboratory	NNSA
Sandia National Laboratories	NNSA
Y-12 National Security Complex	NNSA
East Tennessee Technology Park	Office of Environmental Management
Pantex Plant	NNSA
Savannah River Site (SRS)	NNSA
Lawrence Livermore National Laboratory	NNSA

During these inspections, Independent Oversight reviewed implementation of SACs for a number of work activities associated with research, production, construction, maintenance, waste management, and decontamination and decommissioning (D&D). To assess effectiveness, Independent Oversight reviewed recent SAC-related events, ongoing activities at the field level, and a sample of TSRs that delineate SACs. In addition, Independent Oversight reviewed selected aspects of site contractor assurance programs as they were applied to SAC implementation by the individual sites. Observations from the review of these activities were grouped according to certain key aspects of SAC implementation, namely, the flowdown of requirements to work instructions, data management, personnel training, assessments, and improvement initiatives. The Overall Assessment section of this report is organized around the same key aspects of SAC implementation.

Requirements and Guidance

Regulations that govern nuclear facilities include 10 CFR 830 Part B, *Nuclear Safety Management*, which references the "safe harbor" standard, DOE-STD-3009, as a means to meet the regulatory requirements. DOE revised the standard DOE-STD-3009 and issued a new standard, DOE-STD-1186-2004, *Specific Administrative Controls*, to provide sites with guidance for developing SACs. DOE-STD-3009 states: "SACs provide preventive and/or mitigative functions for specific potential accident scenarios, which also have safety

importance equivalent to engineered controls that would be classified as safety-class or safety-significant if the engineered controls were available and selected." Additionally, DOE revised DOE-STD-1120-2005, *Integration of Environment, Safety, and Health into Facility Dispositioning Activities*, to provide guidance for developing SACs for those situations.

DOE-STD-1186-2004 mentions two acceptable forms for specifying SACs. The first is referred to as a limiting conditions for operation (LCO) type SAC; these are appropriately used when conditions supporting the SAC can be readily surveilled and times for recovery actions identified. The second is referred to as a directive action (DA) type SAC; these are appropriate to use when it is essential that the SAC be performed when called upon every time and without any delay. For DA-type SACs, exceeding any limit or violating any requirement is cause for an Occurrence Reporting and Processing System (ORPS) report. On the other hand, for LCO-type SACs, a reportable occurrence typically occurs only if the LCO is not satisfied.

Independent Oversight has developed criteria for inspecting and assessing sites' implementation of SACs. These criteria are derived from the applicable requirements and serve as a tool to assist personnel performing inspections or assessments of safety procurement programs. The inspection criteria can be found at: http://www.hss.energy.gov/IndepOversight/ESHE/docs.html.

2 Overall Assessment

For most of the reviewed sites, SACs were adequately defined and effectively functioning. With one exception, the reviewed sites had developed appropriate SACs and incorporated them into the documented safety analyses (DSAs)/TSRs, with SAC implementing procedures in place; the remaining site had efforts underway. Furthermore, implementation validation reviews (IVRs) had been performed to ensure effective implementation of the SACs. Workers were generally knowledgeable of SAC requirements for their work tasks and had implemented them conservatively. There were many examples where sites had adequately defined the SAC requirements in a user-friendly manner.

However, deficiencies were noted in the SAC programs at some of the sites reviewed. Some weaknesses existed in the flowdown and application of SAC requirements and in SAC procedure implementation. In some cases, the IVR process did not identify implementation deficiencies. Additionally, not all sites ensured adequate quality in the generation, review, verification, and approval of DSA documents containing SAC changes and their implementation. As part of the Independent Oversight inspection process, these deficiencies were communicated to individual DOE sites for corrective actions and the sites developed appropriate corrective action plans.

The following paragraphs provide additional discussion on the various key aspects of SAC implementation at the sites inspected by Independent Oversight.

Flowdown of Requirements to Work Instructions

For the sites reviewed, various methods were used to flow SAC requirements down to the working level. These were typically in accordance with formal implementation plans that were supported by appropriate documentation. In most cases, the documents clearly demonstrated that flowdown was properly ensuring useful direction to workers on institutional requirements, such as institutional processes, data management, and procedure systems. Some sites used IVRs to verify that requirements had been appropriately flowed down to activity-level documents. For example, SRS used a sophisticated mechanism to ensure that higher-level requirements were effectively translated into activity-level procedures and other relevant documents (discussed in Section 3). Also, a number of SACs were implemented through surveillances or surveillance test procedures, most of which were effectively implemented.

However, in a few cases, SAC requirements were not adequately transferred to activity-level procedures. For example, at one site, SAC requirements were in an "umbrella"-type procedure governing several glovebox operations. Supporting operational procedures were not adequately linked to this broad procedure to ensure full compliance with the SAC requirements. In this case, the supporting operations procedures were updated and were verified to contain the appropriate implementing SAC requirements and the information was retained in a special binder containing all procedures, maintenance work requests, detailed schedules, and

other useful documents. However, the site's corrective actions were not sufficient to ensure configuration control of the operation procedures and to ensure that workers use only the correct procedures.

In several cases, the processes were not sufficiently effective in ensuring that workers understood the actions needed to comply with some SACs. For example, at some sites, the work instructions simply repeated the SAC verbatim from the DSA/TSRs, rather than translating it, when appropriate, into clear and simple instructions that could be readily understood and implemented by workers at the activity/task level. In some cases, the SACs were written verbatim in authorization basis terms in a SAC implementing procedure and were therefore beyond the level of training and experience of the workers performing the SAC. These examples indicate that, at some sites, SAC procedures were developed and written without sufficient worker/operator involvement in the process, which is contrary to the general principles of integrated safety management. The SAC development process at some sites also may not have included a review of the basic principles of human performance improvement. Additionally, some sites experienced significant challenges when the SACs were implemented by a transient/temporary workforce, which is typical for D&D projects; particular challenges were evident in ensuring the transient workforce maintains the required training on SAC requirements.

Independent Oversight also noted instances where the content of SACs had certain specific deficiencies or issues. The following provides some examples:

- A few SACs were broadly worded to cover many different operations, locations, or situations. As a result, some specific applications of these SACs were not adequately implemented.
- Some SACs did not provide a specific numeric limit, or, when a limit was specified, the SAC did not provide the appropriate actions to take to verify that the required parameter(s) was within the limit. For example, at one site, a SAC did not set a clear limit on transient ordinary combustibles. Instead, the SAC referred workers back to the fire hazards analysis to determine the combustible limit.
- Some SACs were overlapping and provided conflicting limits.
- Some SACs contained requirements that lacked enough detail to set clear expectations. For example, one SAC required non-combustible outer containers, but did not provide specifications for these containers or the minimum inspection requirements to ensure that the containers to be used were adequate.
- Some SACs were overly conservative. For example, at one site, SACs established a limit of zero transient combustible material in one process area. Although the site was in the process of evaluating more realistic controls, this interim SAC was onerous to implement and was prone to implementation mistakes/violations.

Data Management

In most cases, site inventory data management systems were able to directly support the implementation of SACs related to inventory controls. Special nuclear material internal transfers and inventory processes were rigorously controlled via established material control and accountability (MC&A) programs at many sites. The electronic data management systems that sites used to manage such inventories were, in most cases, robust and provided timely information about material quantities and locations with sufficient accuracy for effective SAC implementation. In many observed cases, workers performed proper computer input; the computer program used for MC&A correctly tracked the items via the respective unique identifiers on outer material containers; and there was little or no potential for confusion with the associated inventory control SACs. In addition, certain security requirements (such as the two-man rule) also provided safety benefit (two

independent entries into the MC&A computer program for each step of each transfer) and thus inherently provided independent verification of safety that met the intent of DOE-STD-1186 and conduct-of-operations provisions. Also, data management was adequate for the inventories of some other hazardous materials governed by SACs at the sites reviewed.

Personnel Training

The reviewed sites provided courses that adequately trained workers to perform their respective work activities and the associated SAC requirements. Some of the training on SACs was performed as part of required training for DSA updates; this training commonly emphasized the importance of properly implementing SACs (as with other TSR requirements).

Assessments

Independent Oversight reviewed a number of assessments that sites had performed to assess the effectiveness of their SACs, such as the IVRs and a special assessment of NNSA sites using criteria developed by NNSA. In general, sites had established and implemented an appropriate process for assessing SAC implementation and had identified some SAC deficiencies. For example, the Pantex Plant had established an effective IVR process to evaluate and ensure proper implementation of safety basis changes/controls, including SACs when developed. For the most part, site offices were appropriately engaging their Facility Representative programs to periodically check implementation of SACs on a recurring basis. In addition, the subject matter experts (SMEs) who develop or review SACs were expected to review procedures and other work instructions to ensure that they incorporated the full intent of each SAC. However, some sites' assessments were not fully effective in determining whether SACs were correctly implemented. At the reviewed sites, some SMEs did not assess the effectiveness of SAC implementation as thoroughly as they routinely assessed the effectiveness of SSCs performing similar functions.

Improvement Initiatives

Some sites were actively seeking alternatives to some SACs, consistent with the expectation to use SACs only when it *is not* practical to achieve the safety function through an engineered control. One site was in the process of defining, refining, and implementing a cost-benefit process to determine which SACs should be replaced by safety SSCs because of their inherent weaknesses. In some cases, sites were reviewing the type of SAC being used (LCO or DA) to ensure that DA SACs were used only when necessary, considering the ORPS reporting requirement if the SAC limit is exceeded. However, there were some isolated instances where sites were not aggressively seeking to replace poorly defined SACs with better SACs, or with SSCs if possible.

3 Site-Specific Best Practices

The SAC implementation aspects that were found to be particularly effective at one or more DOE sites are described below. Such information may be useful to sites that are working to improve the effectiveness or efficiency of their programs. Independent Oversight recognizes that the information in this section is derived from a sample of DOE sites, and that other sites may also have effective and innovative practices.

Data Management Systems

The SRS Linking Document Database (LDD) provides a particularly robust automated system and supporting processes for flowing down TSR-level requirements. Specifically, information tracked through the LDD includes a listing of all procedures that implement SACs, as well as other useful data. Queries of the LDD can show every place where every SAC is implemented, as well as providing other useful information and features. The combination of the SRS LDD system and a suitable approach for handling special cases would be a notably effective model that warrants consideration for adapting at other DOE sites. Also, at some SRS facilities where electronic procedures or MC&A programs are used to implement SACs, a variety of routine and customized report queries can be run by location, worker, specific component, quantity, or other parameter to verify that no proposed transfer will exceed limits or cause other SAC violations.

Management Observations and Mentoring

At some sites (e.g., SRS and Y-12), managers, supervisors, and SMEs conduct specific activities, including backshift observations, for a period of time to ensure that initial operations using procedures implementing SACs are properly communicated and controlled. The implementation of SACs was generally effective when these efforts were undertaken. DOE guidance documents do not specifically address either the need to provide such initial internal assistance and oversight, or the need to document it in the same manner as on-the-job training, when implementing SACs.

Periodic Assessments

In coordination with the Pantex Site Office, the Pantex Plant contractor committed to reviewing a percentage of its TSRs for implementation adequacy annually. The Pantex Site Office had effectively promoted this practice by establishing a contract performance objective related to periodic assessments of safety bases controls. A specific contractor performance incentive directs the contractor to use the contractor assurance system to formally assess the flowdown and implementation of TSR controls, DSA safety management programs, orders and manuals listed in DOE Order 410.1, *Central Technical Authority Responsibilities Regarding Nuclear Safety Requirements*, and a "smart sample" of contractor requirements from List B of the prime contract. The provisions call for the Pantex Plant contractor to assess 20 percent of the TSR controls listed in the Pantex Plant DSAs each year for the next five years, including ACs, SACs, surveillance requirements, and in-service inspections. Such assessments could be particularly beneficial at other DOE sites in ensuring the robustness of SAC implementation along with other TSR-level controls.

SAC Development

The Lawrence Livermore National Laboratory established a very effective process for developing and implementing SACs. The SACs that were sampled fully meet the intent of 10 CFR Part 830 Subpart B and DOE-STD-1186. For example, SACs established for metal conversion glovebox operations were appropriate, provide hydrogen operation controls that protect the assumptions used in accident analysis, and ensure that the consequences determined in the accident analysis are not invalidated by placing the facility in an unanalyzed condition. Nuclear Materials and Technology Program activities supporting the SACs are further defined in surveillance requirement procedures, operating safety procedures, and administrative support procedures that effectively flow down the applicable DSA and TSR requirements.

4 Opportunities for Improvement

The opportunities for improvement listed below were identified during Independent Oversight inspections to address deficiencies identified in Section 2. While the identified deficiencies did not necessarily apply to all sites and many individual sites have implemented corrective actions, full and effective implementation of nuclear safety and other safety basis requirements in a timely manner is important. Therefore, DOE organizations and site contractors should evaluate the applicability of the following opportunities for improvement, recognizing that sites may identify alternative methods for strengthening their programs.

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1. **As part of the normal revision cycle, ensure that updates to DOE-STD-1186 incorporate lessons learned from operating experience to date.** Specific actions to consider include the following:
   - Provide additional expectations and guidance for implementing SACs at the working level, including SAC supporting measures and processes, reflecting operating experience and lessons learned. Emphasize lessons learned about the benefits, pitfalls, and appropriate use of DA-type and LCO-type SACs.
   - Provide more examples based on field experience related to LCO-type SACs in the area of combustible loading and controls to mitigate the consequences of heavy dropped loads (e.g., controlling overhead crane movements).
   - Provide additional guidance on targeting IVR, assessment, and oversight activities on potential areas of performance problems (e.g., activities performed by less experienced personnel).
   - Provide additional guidance on the use of human performance improvement principles in the development and implementation of SACs, including the importance of worker involvement in developing SACs that are readily understood by workers.

DOE Site Offices

1. **Use contractual performance objectives and targeted oversight to promote and ensure contractors effectively design and implement SACs.** Specific actions to consider include the following:
   - Establish performance elements in annual performance evaluation plans that incentivize periodic independent review of safety basis controls (see the Pantex Plant best practices for lessons learned).
   - Ensure periodic assessment of the implementation of SACs is integrated into Facility Representative and Safety System Oversight program activities.

- Target oversight activities in areas of potentially increased risk due to ineffective implementation (e.g., areas where personnel who normally perform SAC implementation activities are transient or experience high turnover).

Site Contractors

1. **Perform assessments of SAC development and implementation, and make improvements based on operational experience and lessons learned.** Specific actions to consider include the following:
   - Re-evaluate current DA-type SACs, and look for opportunities for converting to LCO-type SACs where feasible.
   - Ensure that SACs are translated into specific work steps and instructions so that the controls are adequately communicated to workers.
   - Ensure that site processes have appropriate cautions and guidance about the limitations of using SAC-specific verbiage, and include guidance on how to craft instructions for workers in other appropriate terms. Recognize that information in authorization basis documents is normally not well suited for verbatim translation into procedure-style work instructions.
   - Ensure that all key assumptions relied upon in the hazard analysis within the DSA are evaluated for potential application of SACs.

2. **Increase emphasis on the use of human performance improvement principles and techniques in the development of SACs.** Specific actions to consider include the following:
   - Ensure personnel/workers responsible for verifying implementation of SACs are involved in the development of SACs, particularly in development of implementing procedures.
   - Increase focus on change control aspects of implementing procedures, with particular emphasis on situations where less experienced personnel are performing SAC activities (e.g., high turnover or transient work crews in D&D environment).
   - Ensure that the necessary tools are available to effectively implement the SAC as part of the implementing procedure. For example, if a spreadsheet/calculation sheet is required to be contained and filled out to determine a parameter (for example, to determine combustible loading in an area), the sheet is included in the SAC. Also, for example, if a particular tool or instrument is used to verify a parameter, the tool is part of the maintenance and test equipment program.
   - Ensure area postings or other operator aids that reinforce specific aspects of SAC compliance are controlled and are periodically reviewed.