Independent Oversight Review of the Los Alamos National Laboratory Implementation Verification Review at Technical Area-55

July 2012

Office of Safety and Emergency Management Evaluations
Office of Enforcement and Oversight
Office of Health, Safety and Security
U. S. Department of Energy

Table of Contents

Acronyms

CFR	Code of Federal Regulations
COA	Condition of Approval
CRAD	Criteria, Review and Approach Document
DOE	U. S. Department of Energy
DSA	Documented Safety Analysis
FOD	Facility Operations Director
HSS	Office of Health, Safety and Security
IVR	Implementation Verification Review
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
LCO	Limiting Condition for Operation
LOI	Line of Inquiry
MAR	Material-at-Risk
MET-1	Actinide Process Support
OFI	Opportunity for Improvement
PF-4	Plutonium Facility at TA-55
R&D	Research and Development
SBIP	Safety Basis Implementation Plan
SDD	System Design Description
SME	Subject Matter Expert
SSC	Structure, System, or Component
TSR	Technical Safety Requirement

Independent Oversight Review of the Los Alamos National Laboratory
Implementation Verification Review at Technical Area-55

1.0 PURPOSE

This report documents the independent review of the implementation verification review (IVR) process at the Los Alamos National Laboratory (LANL) plutonium facility at Technical Area-55 (TA-55) conducted by the Office of Enforcement and Oversight (Independent Oversight), which is within the Office of Health, Safety and Security (HSS). The review was performed by the HSS Office of Safety and Emergency Management Evaluations from May 1 - 17, 2012 and was carried out within the broader context of an ongoing program of assessments of the execution of IVRs at U.S. Department of Energy (DOE) sites with hazard category 1, 2, and 3 facilities. The overall purpose of these Independent Oversight reviews is to evaluate the processes and methods used for verifying and re-verifying the implementation of new or substantially revised safety basis hazard controls. The objective of this review was to evaluate the extent to which the site management and operating contractor, Los Alamos National Security, LLC has developed and employed appropriate implementation verification methods.

2.0 BACKGROUND

Subpart B of 10 Code of Federal Regulations (CFR) 830.201, *Performance of Work*, states, "A contractor must perform work in accordance with the safety basis for a hazard category 1, 2, or 3 DOE nuclear facility and, in particular, with the hazard controls that ensure adequate protection of workers, the public, and the environment." In addition, 10 CFR 830, Subpart A, *Quality Assurance Requirements*, establishes requirements for conducting activities that may affect safety at these facilities; including performing work in accordance with hazard controls, using approved instructions or procedures, conducting tests and inspections of items and processes, and independently assessing the adequacy of work performance.

In February 2008, the Defense Nuclear Facilities Safety Board requested that DOE evaluate the need to conduct "independent validations on a recurring basis" to ensure that facility equipment, procedures, and personnel training related to safety basis controls have not degraded over time. In response, the Department conducted an evaluation that led to the conclusion that the existing requirements for implementation of safety controls and DOE policy for oversight of the implementation of nuclear safety requirements were appropriate. The evaluation also concluded that Departmental directives contained no explicit requirement to validate safety basis hazard controls, so the Department committed to develop guidance on the validation of safety controls and to add that guidance to its directives.

A DOE working group developed a "best practices guide" for the independent validation of safety basis controls. In November 2010, the guidance for performing IVRs was incorporated in DOE Guide 423.1-1A, *Implementation Guide for Use in Developing Technical Safety Requirements*, Appendix D, *Performance of Implementation Verification Reviews (IVRs) of Safety Basis Controls*.

3.0 INTRODUCTION

This review focused on the implementation of the institutional IVR process by LANL during an IVR at TA-55. The objective was to determine if the LANL review adequately verified implementation of the revised safety basis hazard controls at TA-55. The evaluation of the effectiveness of the LANL review is based in part on objectives 3 through 6 of HSS Criteria, Review and Approach Document (CRAD) 45-39, *Implementation Verification Review of Safety Basis Hazard Controls: Inspection Criteria, Activities, and*

Lines of Inquiry, Revision 1, including the cited inspection criteria, inspection activities, and lines of inquiry (LOIs) that are posted on the HSS Independent Oversight Program website. The HSS review of the IVR also followed the protocols established in Los Alamos Site Office (LASO) Work Instruction 00 04, Revision 3, *Assessment Shadowing Activity Reporting.* The overall objectives were to determine whether:

- LANL has established procedures and processes governing the IVR process that provide assurance that safety basis hazard controls are maintained and hazard control changes are correctly implemented.
- LANL has developed and implemented appropriate methods for performing IVRs or similar reviews.
- The LANL IVR assessment adequately evaluated the implementation of safety basis hazard controls.
- The LANL IVR assessment was sufficient to verify that safety structures, systems, or components (SSCs) and design features are installed, inspected, and maintained as described in the safety basis documentation.
- The LANL IVR assessment was sufficient to verify that specific administrative controls are implemented such that they adequately meet the functional requirements and expectations of the safety basis.
- The LANL IVR assessment adequately evaluated that personnel working at the facility are adequately trained and qualified to implement and maintain the safety basis hazard controls.

The review was accomplished by assessing the documentation that establishes and governs the LANL IVR process (for example, procedures, forms, and checklists) and observing the conduct of the LANL IVR at TA-55.

Issues identified by Independent Oversight are characterized in accordance with LASO MP 00.12, *LASO Independent Assessment Process*, and Independent Oversight protocols. LASO uses "issue" as a generic term for any problem or condition (i.e., finding or observation) significant enough to be reported, tracked, and trended for use in continuous improvement activities. A finding is a violation of an applicable requirement or performance criterion and requires corrective action. An observation is a problem or concern that if left unaddressed could lead to a non-compliance with requirements but is not a violation of requirements.

According to Independent Oversight protocols, opportunities for improvement (OFIs) "are suggestions offered by the Independent Oversight appraisal team that may assist line management in identifying options and potential solutions to various issues identified during the conduct of the appraisal." OFIs do not require formal resolution by management through the corrective action process. Rather, OFIs are offered to the site to be reviewed and evaluated by the responsible line management and accepted, rejected, or modified as appropriate using site-specific processes. During the review, Independent Oversight identified several OFIs, which are similar to observations as defined in the LASO assessment process. The OFIs are listed at the end of the discussion for each objective in Section 4.0.

4.0 RESULTS

4.1 Objective 1: Processes have been established that provide assurance that safety basis hazard controls are maintained and hazard control changes are correctly implemented.

4.1.1 Discussion

Independent Oversight reviewed the procedures and processes that LANL has established to implement the safety basis hazard controls at TA-55. P116, *Implementation Verification Review Process for Safety Basis Changes*, establishes a suitable process to ensure that implementation of safety basis changes is complete. The procedure includes steps by which the Facility Operations Director (FOD) determines the significance (minor, moderate or major) of the safety basis change. The significance of the change is then used to determine the level of verification required. Minor changes can be verified using simple checklists while major changes require independent reviews using CRADs with LOIs. The procedure clearly defines the roles and responsibilities for determining the level of the IVR, as well as for planning and conducting the IVR and reporting the results. Attachments to the procedure provide additional detail regarding generic CRADs and LOIs, an IVR plan outline, and examples of CRADs and LOIs. The procedure also includes an example matrix to be used as a tool to track implementation of changes to surveillance requirements. As a major safety basis change, the 2011 update to the TA-55 Documented Safety Analysis (DSA) and Technical Safety Requirement s (TSRs) was subject to an independent IVR.

4.2 Objective 2: The contractor has developed and implemented appropriate methods for performing IVRs or similar reviews.

4.2.1 Discussion

Independent Oversight reviewed the LANL IVR methods employed for the TA-55 IVR to determine whether they adequately address the implementation of safety basis hazard controls. The review examined whether the review criteria and approaches were appropriately tailored to the hazard controls being verified and sufficient for the scope of the review and whether the review activities were sufficiently well documented (per procedures) to support the conclusions of the review. Independent Oversight activities included review of documents provided to the LANL IVR team (such as safety basis revisions, the safety evaluation report, and the safety basis implementation plan and implementing documents), observation of the conduct of the IVR (including meetings, interviews and performance demonstrations), and review of the LANL IVR report.

The *2011 TA-55 Safety Basis Implementation Plan* (SBIP) describes the scope of implementation for the changes to the 2011 TA-55 safety basis hazard controls. It conforms to the LANL procedure for safety basis implementation and includes the implementation strategy, process and schedule. The SBIP addressed the need for an independent IVR to verify implementation and served as the basis for the IVR plan. During the review, the LANL IVR team and Independent Oversight noted a few weaknesses in the identification of implementing procedures in the SBIP. For example, TA55-DOP-016GB was not listed as an implementing procedure for TSRs 3.7.1 or 3.7.2, even though the procedure identifies that it was revised in order to implement the TSR changes. In addition, the implementation plan did not include all the procedures that implement the new delta pressure TSR for the beryllium lathe enclosure or the heat generating device control program. Because the IVR implementation plan was based on the SBIP these weaknesses were also present in the IVR plan. The LANL IVR team took appropriate actions to validate the accuracy of the SBIP but the accuracy of entries in the SBIP was not initially identified as part of the scope of the review. (See Section 4.2.2, **OFI 2-1**.)

On May 1, the FOD declared the facility's readiness to validate implementation of the 2011 TA-55 safety basis. The declaration of readiness was consistent with Attachment H of the IVR procedure, and it included the status of safety basis controls, implementing procedures, training of operators and facility personnel on the new controls, required surveillances, screening against safety basis changes, and the status of Conditions of Approval (COAs). The declaration of readiness also listed self-identified items requiring resolution and identified the need to review implementation of safety evaluation report COA #7, which was related to revising the system description documents. The declaration of readiness included the level determination for the IVR and concurrence record, and appropriately determined that this would

be a major IVR; requiring the use of CRADs and LOIs. It also identified several items that remained to be resolved; including procedure training, completion of the material-at-risk (MAR) tracking software and TA55-DOP-016SW software, changes to radiography limits in the TSR, and re-posting of some glovebox limits.

The *2011 TA-55-DSA Implementation IVR Plan* provided adequate purpose, scope, criteria and approach to conduct the verification activities. The scope of the review identified in the plan included revisions made to the 2008 TSR revision 7 up through the 2011 TSR revision 1.1, which includes submittals for revisions 0.0 and 1.0 of the 2011 TSR. Major changes to the TSR hazard controls included, for example, the addition of seismic accelographs, the upgraded MAR tracking software, and fire-rated safes and containers. Additionally, new controls were added to the cement silo and to the lathe enclosure for the beryllium weld dress machining, and changes were made to the controls for the vault water bath. In accordance with FOD direction, the IVR also addressed revisions to the system description documents (which included the vital safety system design descriptions or SDDs) and training for applicable safety basis changes.

The IVR was executed by a team of experts using the CRADs and LOIs in accordance with procedure P116. A table in the plan (derived from the SBIP) provided a detailed linking document between the safety basis document revisions and the implementing procedures. Additional tables provided the team members with tools to execute the review. For example, one table provided a means to record verification that procedures had been appropriately reviewed against the safety basis and that proof of training on the changes was generated. A matrix of the surveillance and in-service inspection requirements also provided a tool for recording the implementing procedural step(s) for new or revised requirements. Overall objectives for the IVR included:

- Safety basis controls and requirements are incorporated in appropriate work documents, procedures, and orders.
- Facility management operations support and operations personnel are knowledgeable of safety basis controls and requirements.
- The approved safety basis controls and requirements, as translated into work documents, procedures, and orders, have been implemented.
- A documented agreement exists between the facility and the National Nuclear Security Administration for operation under the new TSRs.

The IVR included document reviews, interviews, performance demonstrations, and walkdowns.

Independent Oversight observed that the assessment was conducted in accordance with the plan, CRADs, and LOIs specified in the plan and, in particular, the implementation matrix for TSR controls. Team members had adequate technical expertise in their assigned areas and were sufficiently independent of TA-55 line management. IVR team members were properly prepared for interviews, walkdowns, and performance demonstrations. The LANL IVR team placed sufficient emphasis on observation of operations and work activities. The team was rigorous and critical in its approach and identified a number of pre-implementation issues. Overall, identified issues were properly evaluated and categorized using the applicable LANL procedures. The IVR results are properly documented, and the final report provides an adequate record of the conduct of the review. The LANL IVR team determined that all three criteria under objective 1 were met, one of two criteria under objective 2 was met, and one of three criteria under objective 3 was met. The overall conclusion of the team was that the DSA and TSR changes would be implemented following closure of the pre-implementation findings and implementation of the MAR tracking software. The LANL IVR team conducted a number of field walk downs in conjunction with operations and engineering personnel and observed demonstrations of performance for nearly all the new

surveillance and in-service inspection test procedures. The IVR team leader emphasized the need for the team members to observe the procedures being demonstrated; however, the implementation plan schedule did not include a list of planned performance demonstrations to guide the team activities and ensure that evolutions were planned and conducted in a timely manner. (See Section 4.2.2, **OFI 2-2**.)

4.2.2 Opportunities for Improvement

OFI 2-1: When the safety basis implementation plan serves as the basis for the IVR implementation plan, consider including a line of inquiry to verify the accuracy of the entries in the safety basis implementation plan.

OFI 2-2: To ensure that the IVR includes a sufficient number of performance demonstrations and that the facility and LANL IVR team activities are efficiently coordinated, evaluate including the planned demonstrations, tabletop interviews, and field walkdowns in the IVR implementation plan schedule.

4.3 Objective 3: The contractor IVR assessment adequately evaluates the implementation of safety basis hazard controls.

4.3.1 Discussion

Within the scope of the IVR, this objective applies to administrative and operational procedures, such as surveillance scheduling, Limiting Condition for Operation (LCO) entry and tracking, and mode changes. The LANL IVR team reviewed the changes associated with the TSR revisions for administrative and operational procedures, including TA55-STP-003, *Mode Changes*; TA55-AERI-001, *Operations Center Alarm/Emergency Instruction*; and TA55-STP-004, *Surveillance Rounds*. The LANL IVR team found that the mode change procedure included a revised definition for "Terminate Normal Operations," but that Mode 2 could not be added to the definition of "Standby," because "Standby" was not included in the definitions.

Changes to the Operations Center alarm/emergency instruction were reviewed by the team member assigned to the specific TSR control, so several LANL IVR team members were involved in reviewing this procedure. Two post-implementation issues were identified; one involved difficulties in implementing the instructions in an attachment (Attachment 64) of the procedure and a second noted that the reference change from "outside air" to "outside air reference header" was not consistently implemented in the procedure. Additionally, the list of issues noted that the alarm/emergency response instruction was more restrictive than the LCO with regard to the amount of heat source plutonium allowed in solution. Since this discrepancy is conservative, it was reported as an observation.

The LANL IVR team reviewed TA55-STP-004, *Surveillance Rounds*, which included changes to the surveillances for Ventilation System Mode 1, Ventilation System Mode 2, Ventilation System – Confinement System, and transient combustible loading. The LANL IVR team also reviewed TA55-STP-103, *Ventilation System Functional Test*, and TA55-STP-102A-E for confinement doors and determined that most of the changes to these procedures were editorial; however, the team identified pre- and post-implementation issues with respect to the confinement door surveillance and an observation related to the system functional test.

Independent Oversight observed the walkdown of a portion of the surveillance round associated with the ventilation system, as well as the implementing procedure for the surveillance associated with the negative pressure requirement for the beryllium lathe enclosure. The IVR assessor was well prepared for the walkdown and had the procedure in hand. The TA-55 personnel on the walkdown included the cognizant system engineer for the ventilation system and a research and development (R&D) engineer.

The ventilation system cognizant system engineer was knowledgeable of the systems and the changes to the procedures.

Since the surveillance requirement for the lathe enclosure for the beryllium weld dress machining is included in the LCO for Ventilation System Mode 1, the LANL IVR team member also reviewed procedure PA-DOP-01045, *General CNC Machining for Lathes and Mills*, during this walkdown. This procedure was listed as the implementing procedure for TSR surveillance requirement 4.1.1.9. During the walkdown of the lathe area, the R&D engineer indicated that the general computer numerical control machining procedure was not used and that the operators instead used specific operational procedures. The R&D engineer provided a logbook that included entries for the delta pressure and also provided a preoperational checklist (MFG-WI-0049) that was to be completed before beginning operations. Two issues that addressed the procedural concerns were resolved prior to the completion of the IVR.

Independent Oversight's observation of the LANL IVR team activities provided evidence that team members adequately reviewed the in-scope changes to the procedures, including interviewing subject matter experts (SMEs) and walking down the implementing procedures as appropriate. The team members reviewed the procedures in advance, were knowledgeable of the changes to the procedures, had the procedures in hand, and asked probing questions. The LANL IVR team also verified that the deactivated controls had been removed from the implementing procedures. However, some of the procedures, such as the mode change procedure, had more extensive revisions related to the TSR implementation. These changes could be seen in the red-line strikeout version included in the evidence file and were not included in the IVR review plan. (See Section 4.3.2, **OFI-3-1**.)

Independent Oversight's review of the evidence files identified the following observations that were not included in the LANL IVR team report:

- PA-DOP-01045, *General CNC Machining for Lathes and Mills,* does not accurately implement the TSR required action. The LCO action says to terminate operations in the affected area "immediately" if lathe enclosure delta pressure is > 0.0 inches water column; however, step 7.1 of the procedure (contingency actions) requires the operator to notify the Operations Center; implement applicable required actions in accordance with the TSR; safely shut down test equipment, if possible; and have the Operations Center document the failure where appropriate. The procedure does not clearly indicate that operations are to be terminated immediately. (See Section 4.3.2, **OFI-3-2**.)
- Also, PA-DOP-01045 has been revised to require that the completed Attachment A, *TSR Surveillance Requirement Verification*, be provided to the Operations Center by the end of the shift, instead of as a prerequisite action before beginning the operation. This could be interpreted to mean that the delta pressure can be checked any time during the shift.
- The editorial changes to TA55-STP-004 adding "Area" and "pressures" for TSR 4.1.1.4 were not made.
- TA55-AERI-001, *Alarm/Emergency Response Instruction*, Attachment 41, *Vault Water Bath Cooling System Failure*, continues to require entry to LCO 3.5.1, which has been deleted. (See Section 4.3.2, **OFI 3-3**.)

4.3.2 Opportunities for Improvement

OFI 3-1: Review the Mode Change procedure to verify all of the changes to the procedure, not just the definition changes, have been accomplished.

OFI 3-2: Evaluate the need to revise PA-DOP-01045 to make sure that operations are terminated "immediately" if conditions are outside the TSR requirement.

OFI 3-3: Ensure technical accuracy of TA55-AERI-001 Alarm/Emergency Response Instruction Attachment 41, *Vault Water Bath Cooling System Failure*, by deleting the requirement to enter LCO 3.5.1.

4.4 Objective 4: Contractor IVR or similar processes are sufficient to verify that safety SSCs and design features are installed, inspected, and maintained as described in the safety basis documentation.

4.4.1 Discussion

The LANL IVR team reviewed procedure PMT2-DOP-CF-007, the implementing procedure for the surveillance requirement 4.1.3.5 associated with the PF-53 cement silo level. Independent Oversight observed the walkdown of the procedure, which was conducted by the LANL IVR team member and included the cement fixation SME and an Actinide Process Support (MET-1) engineer. The team member had the procedure in hand and was familiar with its contents. Questions posed by the team member addressed the TSR change and included such topics as how to measure the level in the silo, how much time is allowed to complete the surveillance, and the required actions if the surveillance requirement is exceeded. The SMEs were knowledgeable of the operations and the changes to the procedure and they answered the questions accurately. The LANL IVR team member identified a pre-implementation finding associated with uncontrolled electrical changes to the vibration system and the need to restore the configuration, as well as a post-implementation finding to track and ensure the surveillance is completed within the allotted time. When asked about how long the facility could remain in the condition when the surveillance requirement was not met, the SMEs' response was inconsistent with the LCO action statement, which allows 14 days to reduce the amount of cement in the silo to $\leq$ ½ silo capacity. Although the cement fixation SME did know to call the Operations Center if the surveillance time limit was exceeded, neither procedure PMT2-DOP-CF-007 nor the alarm/emergency response instruction addresses this action condition.

As a follow-up activity, the LANL IVR team presented an operational scenario to the Operations Center indicating that filling of the cement silo per PMT2-DOP-CF-00 had been completed with a silo level of 100 inches. The operator reviewed the TSR to determine what the action should be and after several minutes, located the appropriate action statement. He stated that he would enter LCO Action 3.1.3.E (to return the level in the silo to less than ½ filled within 14 days) on an LCO tracking sheet, and it would be tracked from there as a shift turnover item. The operator did not know whether there were instructions in the alarm/emergency response instruction. The LANL IVR team considered that the lack of familiarity with this TSR LCO indicated a need for additional training, though there are no procedural instructions on which to base the training. (See Section 4.4.2, **OFI 4-1**.)

The LANL IVR team reviewed the implementing procedures associated with the LCO surveillances for the ion exchange column (TA55-STP-809, TA55-STP-808, and PMT2-DOP- RFX-001) and conducted a walkdown of the system. Issues identified by the LANL IVR team included a post-implementation finding related to the nitric acid calculation and two editorial changes. The LANL IVR team also included a post-implementation issue associated with the LCO condition that the temperature be a certain temperature; for which there was no implementing surveillance. The TSR Bases for the LCO states that surveillance is not required because it had been analytically proven that this temperature will not be exceeded. Independent Oversight concurs with this issue and notes that the calculation cited in the TSR Bases contains assumptions that must be protected in the operating procedures in order to remain valid. (See Section 4.4.2, **OFI 4-2**.)

The LANL IVR team reviewed the changes to the implementing procedures for the vault water bath

containers, which are safety class design features, as well as the deletion of the LCO and surveillance requirement for the vault water bath level. The area was not walked down because of the high radiation levels in the area. The LANL IVR team members met with the container system engineer, who was very knowledgeable, to discuss the vault water baths, as well as the fire-rated containers and fuel storage outer containers.

The LANL IVR team also reviewed the implementing procedures for the safety significant design features, including containers for nuclear material outside of gloveboxes (DF 6.2.5), and for the Off-Site Source Recovery Project (DF 6.2.15). The LANL IVR team found that all the changes were editorial, but noted one observation related to the use of the term transportainer.

The LANL IVR team reviewed implementation of a design change package entitled "Seismic Design for Electrical Power Shut Offs in Glove-boxes." The seismic switches and associated control system are classified as safety class and were designed to mitigate the potential for a post-seismic fire by shutting down glovebox power in the laboratory areas for a seismic event. The LANL IVR team performed a walkdown of the system, observed performance of the monthly surveillance test (using the currently effective procedure), and walked through the performance of the approved revision of the procedure. IVR team members also interviewed the cognizant system engineers for the electrical distribution system and the seismic switch system and discussed the general system operation, functional classification, and support systems. Additionally, an IVR team member interviewed TA-55 personnel regarding the software quality assurance process that was applied to the installation and control of the system software, including system and unit software acceptance testing. The LANL IVR team appropriately identified three pre-implementation findings related to the seismic switches.

The first two findings concerned the system's vulnerability to failure of the non-safety 130 VDC control power supply and the lack of compensatory measures to monitor control power and take corrective actions, if appropriate. The first finding identifies the 130 VDC control power supply as a potential for a single point failure in the support system. Failure of this power source will remove power to the tripping circuit (shunt relays) that would otherwise remove power to the laboratory gloveboxes. The second finding is that control power cannot currently be monitored by the Operations Center; so failure of the control power could go undiscovered. The SDD appropriately identifies the potential single failure vulnerability of the control power, which LANL is addressing. The third finding identified that the breakers that perform a safety class function - removing power from the first floor laboratories - were not identified as safety class (ML-1) but rather as safety significant (ML-2) and that this potential vulnerability was not evaluated in the DSA. The seismic switch and the shunt trip relay are classified safety class (ML-1); however, the breakers that remove power to the gloveboxes are classified as safety significant (ML-2). Additionally, the conduit and wiring to and from the seismic switches and the control circuit are classified as non-safety (ML-3). Consistent with DOE-STD-1189, *Integration of Safety into the Design Process*, the breakers that remove power to the gloveboxes should be designated as safety class. When controls are selected to perform a safety class function, the control set must be adequate to fully perform the identified safety function and include all SSCs that are either required to operate to perform the safety function or required not to fail if that failure would prevent the function from being performed. These SSCs must be classified at the same level; that is, safety class (ML-1).

As part of its follow up to a previous joint review of the LANL nuclear facility configuration management program conducted concurrently with LASO in August 2011, Independent Oversight placed increased emphasis on review of the documents governing the design and installation of the system and the surveillance test procedures, observed the LANL IVR team interviews, and witnessed performance of the monthly surveillance test. Independent Oversight concurred with the identified findings. Independent Oversight made the following additional observation, which was not identified in the IVR report: the single line electrical drawings do not indicate safety classification breaks between the seismic switch and

the breaker that removes power to the first floor gloveboxes. (See Section 4.4.2, **OFI 4-3**.)

The LANL IVR team reviewed the implementation of the revised in-service inspection procedure for the glovebox support stands, conducted interviews with system engineers and TA-55 staff, and witnessed completion of the in-service inspection on a glovebox mockup. The in-service inspection procedure requires a visual inspection for signs of wear, degradation, or unauthorized modification. The LANL IVR team identified one post-implementation finding and one observation for this in-service inspection. The team identified an apparent configuration control issue with the method of performing the inspection; that is, the individuals who performed the glovebox baseline inspections only considered the changes they perceived as potentially affecting the structural integrity of the stand for inclusion in the facility controlled drawings. Changes that were considered not to impact structural integrity were excluded and were not recorded to assist subsequent inspections (for example, to identify an unauthorized modification). This issue was appropriately identified as post-implementation. Second, the acceptance criterion specifies that there should be minimal signs of wear and degradation. The operability of the glovebox stands is determined based on this assessment, and any gloveboxes/stands that are found to show excessive degradation are declared inoperable and maintained on the Operations Center list of inoperable glovebox stands, shelves, and storage racks. The LANL IVR team appropriately noted, as an observation, that the acceptance criterion in the procedure was subject to interpretation and should be more specific.

The LANL IVR team reviewed the design change (DCP-10-009) that installed safety class fire-rated safes in the Plutonium Facility at TA-55 (PF-4). They conducted interviews, performed a walkdown of the installed safes, and witnessed implementation of the in-service inspection procedure that visually verifies the safes are free from signs of wear or degradation. During review of the design change package, the team discovered several potential inadequacies in the supporting analysis (CALC-10-55-0004-0000-0016-S-Rev 0) for the safety basis functional requirement that the fire-rated safes do not topple during or after a performance category-3 seismic event. Although the appropriate seismic accelerations were used in the model, the welds connecting the mounting flange to the safe were not analyzed. The current analysis model considers the safes as a single point attachment (distributed over 10 bolts) and considers the angled flange to be integral with the safe. This is not the installed configuration of the safes. Additionally, the LANL IVR team reviewed the design change package and found no specification requirements with regard to the quality of flange welds. These issues were included in a pre-implementation finding. The IVR team also recorded an observation that the in-service inspection procedure requires a visual inspection for signs of wear or degradation, but provides no objective acceptance criteria - leaving the judgment of acceptability to the inspector or cognizant system engineer.

Independent Oversight also identified the following issue with the design change package and safety basis controls. The analysis (CALC-10-55-0004-0000-0016-S-Rev 0) specifies the maximum weight of the contents of the safe is 325 pounds. This added weight affects the center of gravity of the safe assembly used in the calculation and there appears to be no procedural limitation imposed on the weight of the contents of the safes. (See Section 4.4.2, **OFI 4-4**.)

The LANL IVR team conducted interviews with the cognizant system engineer and participated in a table top demonstration and discussion regarding fired-rated containers used at TA-55. This method of data collection was appropriate because facility operations precluded entry into the area and the LANL IVR team was therefore unable to observe an actual performance of the in-service inspection procedure. The system engineer provided a detailed narrative of the in-service inspection process and included a visual examination of unused demonstration containers in a simulated performance of the procedure. Based on the detailed discussions during the interview and the in-depth knowledge demonstrated by the engineer, the LANL IVR team concluded that thorough knowledge of the performance requirements for the in-service inspection, as established in the safety basis, was demonstrated.

The LANL IVR team reviewed updated SDDs to address, in part, COA #7 of the DSA. The updated SDDs are intended to support closure of this COA by providing sufficient detail to supplement information found in DSA Chapter 4 and to support system operability determinations. However, LANL IVR team review of the SDDs revealed numerous examples of reference to superseded versions of the DSA, TSRs, and other documents. A recent LASO configuration management assessment revealed a similar issue related to frequent minor errors, omissions of important information, and lack of rigor that impacts the quality of engineering products.

Independent Oversight observation of the team revealed that sufficient emphasis was placed on observing operations and work activities and that the degree of rigor applied to the IVR was appropriate. The reviews of the implementing procedures were thorough. The IVR personnel were well qualified to perform their reviews.

4.4.2 Opportunities for Improvement

OFI 4-1: Consider revising either or both PMT2-DOP-CF-007 and the alarm/emergency response instruction to provide procedural direction to reduce the amount of cement in PF-53 silo to $\leq$ ½ silo capacity within 14 days of entry into LCO 3.1.3 Action condition E.

OFI 4-2: Evaluate the need to revise the appropriate ion exchange column operating procedures to ensure that assumptions used to support the ion exchange column temperature calculation are adequately protected by controls in the procedures.

OFI 4-3: Review the need to update facility electrical single line drawings to indicate safety classification boundary breaks.

OFI 4-4: Establish methods such as revising procedures governing the use of the fire-rated safes to guarantee the maximum weight of the contents does not exceed the weight assumed in the seismic calculation.

4.5 Objective 5: Contractor IVR processes are sufficient to verify that specific administrative controls are implemented such that they adequately meet the functional requirements and expectations of the safety basis.

4.5.1 Discussion

The LANL IVR team included members who were assigned to review the implementation of the MAR controls and the software quality assurance related to the software programs that will support the implementation of those controls. The LANL IVR team conducted several interviews on MAR controls and the MAR Tracker software, reviewed the revised implementing documents, and conducted a field walk down. For example, team members interviewed operating personnel and operating supervisors to determine their understanding of roles and responsibilities for controlling MAR. A LANL IVR team member also interviewed TA-55 personnel regarding the software quality assurance applied to the installation and control of the MAR Tracker software, including software verification and validation testing; the review was hindered by the fact that most of the required documents were not complete. The LANL IVR team identified three pre-implementation findings related to the facility's processes for controlling MAR. The first finding covers several identified discrepancies between the glovebox limits in procedures TA55-DOP-016GB and RPS-TA55-600. The second finding documents the need to complete the verification and validation of the MAR Tracker software, along with the supporting software changes (identified as open in the FOD declaration of readiness). The third pre-implementation finding identified

the need to revise the general casting procedure to ensure that activities under this procedure are appropriately controlled and coordinated with those of the special recovery line. The LANL IVR team also identified an observation related to the fact that the implementing procedure governing MAR limits for heat source plutonium does not include a process or steps to guide the workers in remaining under the first floor limits for heat source material as required by TSR 3.7.2.2.

As discussed further below, the LANL IVR team identified a pre-implementation finding on the status of the required reading assignments on the TSR procedure changes - also included in the readiness to proceed memorandum - and described a significant number of discrepancies in the program. The team also noted that no new formal training had been identified to support the implementation of the new TSRs.

Independent Oversight reviewed the implementing documents for controlling the facility MAR inventory and observed the IVR team interviews and discussions. Independent Oversight concurred with the identified findings.

The LANL IVR team reviewed documents, conducted an interview with the fire protection system engineer, and reviewed changes to the TA-55 fire protection program implementing document (TA55-AP-121). The review included the heat generating device control program and fire barrier inspection, test, and maintenance programs. The team found that the TA-55 fire protection program invokes the LANL fire protection program document, PD-1220. Although the TA-55 fire protection program document lists the heat generating device control program, it does not call out a specific administrative procedure to control heat generating devices, and the facility SBIP does not identify TA55-AP-128, *Heat Generating Device Control Program*, as an implementing document. The IVR team identified the failure to reference the heat generating device control program as a post-implementation finding. The fire barrier inspection, testing, and maintenance programs are referenced appropriately in the TA-55 program and invoked through TA55-AP-123, *Fire Barrier Program*, TA55-AP-124, *Fire Barrier Through-Penetration Numbering and Labeling Control*, and TA55-DOP-75, *Monthly Fire Barrier Inspections*.

4.6 Objective 6: Contractor personnel working at the facility are adequately trained and qualified to implement and maintain the safety basis hazard controls.

4.6.1 Discussion

The LANL IVR team conducted a thorough review of the processes used to ensure that facility personnel are knowledgeable of the safety basis hazard controls associated with the TSR changes, including a comprehensive review of the training determination forms and document action requests for each of the 55 impacted procedures. Additionally, the LANL IVR team attended a safety basis change overview presentation, reviewed the training records for a MET-1 engineer, and conducted interviews with the designated training specialist, the Central Training team leader for TA-55, and the Operations Center staff.

In reviewing the evidence files, the LANL IVR team found that no formal training was required or had been provided for any of the procedures revised to implement the safety basis changes and that the required reading program was the primary mechanism for informing the staff of changes to the implementing procedures. This conclusion was consistent with the interview with the training specialist, who stated that very little formal training was provided on procedures. A briefing had been developed and was being provided to facility personnel (the 2011 TA-55 Safety Basis Change Overview Course 15200), but was not considered formal training. The LANL IVR team attended a presentation of the overview. The LANL IVR team reviewed the evidence files and noted that no formal training was required for any of the revised procedures. An observation related to the lack of consistency in the

training determination forms was noted.

Since required reading was the primary mechanism for disseminating procedure changes, the LANL IVR team prepared a comprehensive matrix of the required reading status for the 2011 DSA implementation. The matrix included the status of required reading for the current version of the procedure (or if required reading had not been documented for the current version, then the most current revision that did have documented required reading), percent completion, and when it was completed. The acceptable completion level established by the facility is greater than or equal to 80% completed. The matrix highlighted a concern with the status of required reading, which did not reach the acceptable completion level in a number of instances, and resulted in a pre-implementation finding on the required reading program. Independent Oversight concurs with this finding.

The LANL IVR team conducted an interview with the training specialist, who indicated that the training analysis process involved the TA-55 safety basis responsible implementation manager determining which procedures were involved in the safety basis change. The training specialist completes a training determination form and provides input on the document action request form. During the interview, the training specialist stated that very little formal training was provided on procedures, that the Operations Center is required to certify that personnel are trained before performing surveillances, and that qualification/certification standards are required as appropriate. The LANL IVR team reviewed the training record (the LANL curriculum status report) for a MET-1 engineer and found the training to be acceptable.

The LANL IVR team conducted an interview with an operator at the Operations Center, who stated that the Operations Center is responsible for keeping the STP-004 surveillance rounds, and that the training of personnel who perform surveillances is confirmed. Those personnel are required to complete required reading for TA55-STP-002, *Control and Execution of TA-55 Safety System LCOs and Surveillances*. An IVR team member asked what the response would be if the surveillance on the cement silo level was exceeded, and the operator responded that STP-002 required personnel to stop and call the operations center. The operator stated that all of the Operations Center operators had nuclear Navy and/or other nuclear experience, and that he had completed qualification, including an oral board and written examination.

Independent Oversight's observation of the team found that the assessment of the training program was conducted in accordance with the IVR plan and criteria. The review of the training program was thorough and included a detailed review of the required reading implementation. The LANL IVR team was well qualified to perform this review.

Independent Oversight also reviewed the evidence files for a sample of the procedures, including the training determination forms and the document action requests. A training determination form had been completed for the procedures; however, Independent Oversight noted numerous errors in the training determination forms (for example, incomplete forms and incorrect responses). There were also inconsistencies between the training determination forms and the document action requests. During the walkdown of the cement silo surveillance, Independent Oversight questioned the cement fixation SME and MET-1 engineer on the LCO action statement to "reduce amount of cement in PF-53 cement silo to ≤ ½ of silo capacity within14 days". Neither the SME nor the engineer was aware of this action statement. Additionally, when the operational scenario involving the cement silo level was presented to the Operations Center, the operator could not easily find the appropriate LCO in the TSR. The briefing provided on the 2011 TA-55 Safety Basis Changes did address the surveillance requirement related to the cement silo level, but did not address the LCO action statement noted above. (See Section 4.6.2, **OFI 6-1**.)

4.6.2 Opportunity for Improvement

OFI 6-1: Ensure that operators and SMEs fully understand the surveillance requirements and LCO actions associated with the PF-53 silo.

5.0 CONCLUSIONS

LANL has established a suitable process for ensuring that implementation of safety basis changes is complete through application of safety basis implementation plans and independent IVRs. The safety basis and IVR implementation plans for the 2011 changes to the TA-55 safety basis provided adequate scope, level and detail to satisfactorily guide implementation and accomplish the verification. The IVR was adequately executed by a team of experts following the CRADs, LOIs and implementation matrix. LANL IVR team members had adequate technical expertise in their assigned areas and were sufficiently independent of TA-55 line management. The LANL IVR team placed sufficient emphasis on observation of operations and work activities and team members were properly prepared for interviews, walkdowns, and performance demonstrations. The team was rigorous and critical in its approach and identified a number of pre-implementation issues. Overall, identified issues were properly evaluated and categorized using the applicable LANL procedures. The IVR results were properly documented and the final report provides an adequate record of the conduct of the review. The LANL IVR team determined three of the four IVR objectives were met but that the facility had not sufficiently demonstrated the procedural implementation of the safety basis controls (specifically, the key MAR tracker processes). The overall conclusion of the LANL IVR team - that the DSA and TSR changes would be implemented following closure of the pre-implementation findings and implementation of the MAR tracking software - was appropriate. Independent Oversight noted that basing the IVR implementation plan closely on the safety basis implementation matrix introduces some vulnerability to potentially compromise the independent determination of the scope of the review.

6.0 FOLLOW-UP ITEMS

The opportunities for improvement identified in this report have been evaluated by TA-55 as part of the declaration of implementation of 2011 TA-55 DSA and have been entered into the TA-55 tracking system for resolution. Independent Oversight will follow up on any corrective actions and potential areas of weakness resulting from this assessment as part of its normal operational awareness activities under the site lead program. Potential areas for follow-up include:

- The completion of training analysis, determination of method of delivery, and training implementation resulting from procedure and document changes.
- Design change packages, and their implementation, for other design changes related to the updated TA-55 DSA and TSRs.
- Procedure and processes for tracking and controlling MAR.

Appendix A
Supplemental Information

Dates of Review

Onsite Preparation:	April 24 - 26, 2012
Onsite Review:	May 1 - May 17, 2012

Office of Health, Safety and Security Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer
William A. Eckroade, Principal Deputy Chief for Mission Support Operations
John S. Boulden III, Director, Office of Enforcement and Oversight
Thomas R. Staker, Deputy Director for Oversight
William E. Miller, Deputy Director, Office of Safety and Emergency Management Evaluations

Quality Review Board

William Eckroade
John Boulden
Thomas Staker
Michael Kilpatrick
George Armstrong
Robert Nelson

Independent Oversight Site Lead

Robert Freeman

Independent Oversight Reviewers

Robert Freeman – Lead
David Odland
Terry Olberding
Joseph Panchison

Appendix B
Documents Reviewed, Interviews Observed and Activities Observed

Documents Reviewed

- 2011 TA-55 -DSA Implementation IVR Plan, Rev. 0, 5/2/12
- Altus-Etna System Configuration Sheets, 3/12
- CALC-10-55-0004-0000-0016-S-R-0, TA-55 PF-4 Fire Safes in Basement, Rev. 0, 6/17/2010
- CALC-2008-0016-DC-001, Cement Silo Seismic Evaluation, Rev. 0, 7/26/2011
- DCP-10-005, Seismic Design for Electrical Power Shut Offs in Glove-boxes, 8/31/2010
- DCP-10-009, Install Fire Resistant Safes, PF-4 BSMT
- Document Number 301858, Condor System Factory Acceptance Test Procedure, Rev. F, 4/08
- FFS-DOP-011, Packaging TRU Waste in Drums, R4, 9APP /21/11
- LANL-P101-26, Welding, Cutting, and Other Spark- or Flame-Producing Operations
- MAR Tracker Quality Assurance Criteria Checklist
- Memorandum to Arthur Dye from Robert Mason, Subject: FOD Declaration of Readiness to Validate Implementation of the 2011 TA-55 Safety Basis, 5/1/12
- MET2-DOP-003, General Casting (U), Rev. 2, 10/11
- MST16-DOP-011, Kolsky Bar Test Facility Operations, Rev. 4, 6/3/11
- P115, Verification of Readiness to Startup or Restart LANL Nuclear Facilities, Activities and Operations, Rev. 7, 2/27/12
- P116, Implementation Verification Review Process for Safety Basis Changes, Rev. 1, 3/10
- P330-2, Control and Calibration of Measuring and Test Equipment (M&TE), Rev. 4, 4/5/12
- PA-DOP-01045, General CNC Machining for Lathes and Mills, Rev. 1, App. 4/24/12
- PA-PLAN-01004, 2011 TA-55 Safety Basis Implementation Plan, Rev. 0, 11/11
- PMT10-DOP-005, Operations and Maintenance of the TA-55 SRL, Rev. 3, App. 4/25/12
- PMT2-DOP-CF-002, Drum-in/Drum-out Operations for Cement Fixation, Rev. 2, 10/24/11
- PMT2-DOP-CF-002, Drum-in/Drum-out Operations for Cement Fixation, Rev. 3, App. 4/12/12
- PMT2-DOP-CF-007, Cement Addition Operations for Cement Fixation, Rev. 1, 9/13/11
- PMT2-DOP-CF-007, Cement Addition Operations for Cement Fixation, Rev. 2, App. 4/26/12
- PMT2-DOP-CLO-002, Dissolution Using Hydrochloric Acid, Rev. 3, App. 4/25/12
- PMT2-DOP-CLO-003, Solvent Extraction, Rev. 2, App. 4/19/12
- PMT2-DOP-PMP-003, Direct Oxide Reduction, Rev. 6, App. 4/12/12
- PMT2-DOP-RFX-001, Nitrate Ion Exchange, Rev. 3, App. 4/18/12
- PMT2-SAM-DOP-009B, Large Scale Surveillance Container Installation and Gas Sampling, Rev. 1, App. 4/19/12
- RPS-TA55-101, HS-PuO2 Aqueous Scrap Recovery, Rev. 1, App. 4/24/12
- RPS-TA55-306, Helium Leak Detection, Rev. 1, App. 4/25/12
- RPS-TA55-406, Hydroxide Precipitation of Solutions and Calcination of Hydroxide Cake, Rev. 1, App. 4/12/12
- RPS-TA55-600, Control of Material at Risk in the 238 Pu Laboratories, Rev. 4, App. 4/11/12
- RPS-TA55-632, Introducing and Removing HS-Pu Items Into and Out of Glovebox Systems in PF-4, Rev. 1, 5/11
- SDD-TA-55- SPOS-031, Seismic Power Shut-Off System Design Description, Rev. 1, 4/26/2012
- SDD-TA-55-EDS-013, Electrical Distribution System Design Description, Rev. 1, 4/26/2011
- SDD-TA-55-FP-018, Fire Protection System Design Description, Rev. 2, 4/10/2012
- SDD-TA-55-GB-001, Glovebox System Design Description, Rev. 1, 3/15/2012

- SDD-TA-55-IAS-019, Instrument Air Supply System Design Description, Rev. 3, 2/23/2012
- SDD-TA-55-UPS-010, Uninterruptible Power Supply System Design Description, Rev. 2, 3/20/2012
- SDD-TA-55-VNT-023, Ventilation and Ductwork System Design Description, Rev. 2, 3/28/2012
- Seismic Switch Quality Assurance Checklist
- SER PF4.01, Safety Evaluation Report, Rev. 6, 10/11
- SPOS-CSAT, SPOS Commissioning Software Acceptance Tests, Rev. 0, 2/11
- TA55-AERI-001, Operations Center Alarm/Emergency Instruction, Rev. 3, App. 4/24/12
- TA55-AP-121, TA-55 Fire Protection Program, Rev. 2, 3/22/12
- TA55-AP-123, TA-55 Fire Barrier Program
- TA55-AP-124, TA-55 Fire Barrier Through-Penetration Numbering and Labeling Control
- TA55-AP-128, TA-55 Heat Generating Device Control Program
- TA55-DOP-006, Preparation Requirements and Actions for Shelving and/or Retrieving Items in the Vault, Rev. 6, App. 4/24/12
- TA55-DOP-016, Material Transfer Procedure, Rev. 8, App. 4/16/12
- TA55-DOP-016GB, TA-55 PF-4 Glovebox Material at Risk (MAR) List, Rev. 1, App. 5/1/12
- TA55-DOP-075, TA-55 Monthly Fire Barrier Inspection
- TA-55-DOP-091, Nuclear Material Packaging for Storage at TA-55, PF-4, Rev. 2, 10/11
- TA55-DOP-901, Off-Site Source Recovery Material Staging at TA-55, Rev. 5, App. 4/18/12
- TA55-DSA-2011-R1.1, 2011 TA-55 Documented Safety Analysis, Rev. 1.1, 2/8/12
- TA55-FM-01000, TSR 6.2.5 ISI 5, TRU Waste Shipping Container Inspection Form
- TA55-ISI-6111, In-Service Inspection of the Fire-Rated Containers, Rev. 0, App. 4/12/12
- TA55-ISI-6112**,** In-Service Inspection of the Fire-Rated Safes, Rev. 1, App. 5/1/12
- TA55-ISI-614, Credited Safety Class Glovebox Support Stands In-Service Inspection, Rev. 4, App. 4/12/12
- TA55-ISI-617, In-Service Inspection of Shelves/Storage Racks and Cages, Rev. 5, App. 4/23/12
- TA55-ISI-6192, Vault Water Bath Containers In-Service Inspection, Rev. 0, App. 4/11/12
- TA55-ISI-6215, DOT 7A /Type A Container Vents In-Service Inspection, Rev. 1, App. 4/12/12
- TA55-ISI-628, TA-55 Glovebox In-Service Inspection, Rev. 2, App. 4/22/12
- TA55-SPOS-SQAP, TA-55 Seismic Power Shut-off (SPOS) Software Quality Assurance Plan (SQAP), Rev. 0, 2/11
- TA55-STP-002, Control and Execution of TA-55 Safety System LCOs and Surveillances, Rev. 10, App. 4/30/12
- TA55-STP-003, Mode Change, Rev. 9, App. 4/16/12
- TA55-STP-004, Surveillance Rounds, Rev. 13, App. 4/12/12
- TA55-STP-102A, Southeast Confinement Door Leakage Verification, Rev. 0.2, App. 4/13/12
- TA55-STP-102E, North and South Basement Confinement Door Leakage Rate Verification, Rev. 1, App. 4/12/12
- TA55-STP-103, Ventilation System Functional Test, Rev. 5, App. 4/19/12
- TA55-STP-702, TA-55 Material at Risk Surveillance Procedure, Rev. 14, App. 5/1/12
- TA55-STP-806, Seismic Power Shut Off System, Rev. 2, First Time Performance Copy, 4/10/12
- TA55-STP-806, Seismic Power Shut Off System, Rev. 3, App. 4/30/12
- TA55-STP-808, MET-1 Ion Exchange Resin MRad and Acid Calculations, Rev. 0, App. 4/11/12
- TA55-STP-809, Liquid Level in WG-Pu Ion Exchange (IX) Columns, Rev. 0, App. 4/11/12
- TA55-TSR-2011-R1.1, TA-55 Technical Safety Requirements, Rev. 1.1, 2/8/12

Interviews Observed

- Seismic Switch System Cognizant System Engineer
- TA-55 Software Quality Assurance Engineer
- Engineering Team Leader
- Cement Fixation Subject Matter Expert
- Container Cognizant System Engineer
- Glovebox Cognizant System Engineer
- Support Stands Cognizant System Engineer
- Ventilation Cognizant System Engineer
- MET-1 Engineer
- Operations Center Operator
- Research and Development Engineer
- Training Specialist

Activities Observed

- IVR Team Daily Meetings
- IVR In-brief
- Presentation of 2011 TA-55 Safety Basis Change Overview, Course 15200
- Walkdown of Cement Silo Level Surveillance
- Walkdown of Surveillance Rounds
- Walkdown of Beryllium Lathe Enclosure Surveillance
- Operational Scenario involving the Cement Silo Level Surveillance