

**Independent Oversight Review of the  
Los Alamos National Laboratory Waste  
Characterization, Reduction, and Repackaging  
Facility  
Fire Suppression System**



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**Office of Safety and Emergency Management Evaluations  
Office of Enforcement and Oversight  
Office of Health, Safety and Security  
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## Acronyms

CM	Configuration Management
DOE	U.S. Department of Energy
FSS	Fire Suppression System
HSS	Office of Health, Safety and Security
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NFPA	National Fire Protection Association
SFD	Safety Function Definition
SM	System Maintenance
SST	System Surveillance and Testing
TA	Technical Area
TRU	Transuranic
TSR	Technical Safety Requirement
WCRRF	Waste Characterization, Reduction, and Repackaging Facility
WDP	Waste Disposition Project

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**1.0 PURPOSE**

The Office of Enforcement and Oversight (Independent Oversight), within the Office of Health, Safety and Security (HSS), conducted an independent review of the Los Alamos National Laboratory Waste Characterization, Reduction, and Repackaging Facility (WCRRF) safety significant fire suppression system (FSS) vital safety system in conjunction with a scheduled Los Alamos Site Office (LASO) assessment.

The purpose of the LASO assessment was to evaluate the facility's compliance with its authorization basis, national consensus standards, U.S. Department of Energy (DOE) orders and standards, and National Fire Protection Association (NFPA) standards and requirements. The assessment was conducted May 1-13, 2011, in parallel with the Waste Disposition Project (WDP) facility centered assessment, whose purpose was to determine the performance and compliance implementation status of WDP facility operations and transuranic (TRU) waste disposition activities conducted within the WDP, including the WCRRF.

LASO was the overall lead organization for the WCRRF FSS vital safety system evaluation. An HSS subject matter expert participated with a role of independently assessing selected technical areas that were delineated in the LASO assessment plan described in the scope section below, and performing an evaluation of the LASO assessment process. The HSS independent review scope was selected based on current HSS priorities to focus oversight activities on nuclear facilities, and in particular, the adequacy and implementation of nuclear facility safety basis requirements.

**2.0 BACKGROUND**

WCRRF operations are carried out in Los Alamos National Laboratory (LANL), Building Technical Area (TA)-50-69 and in outdoor waste staging areas, which comprise the WCRRF site. Building TA-50-69 is used primarily for waste remediation and repackaging activities, specifically in the waste characterization glovebox. The Building TA-50-69 structure is rated as Performance Category 2 for seismic, wind, and snow hazards. Further, because this building has the capability to remediate or repackage above-ground TRU waste containers, it has been classified as a nuclear hazard category 2 facility.

Part of the WCRRF mission is to support the closure of TA-54, so the WCRRF is considered a limited-life facility. Because of this limited mission, a basis for interim operations has been prepared.

**3.0 SCOPE**

The LASO assessment evaluated five objectives: Safety Function Definition (SFD), Configuration Management (CM), System Maintenance (SM), System Surveillance and Testing (SST), and Cognizant System Engineer (CSE). The evaluation of the FSS vital safety system was achieved primarily through a performance-based assessment, the methodology and process of which were based on LASO Procedure MP 06.02, Rev. 4, *Safety System Oversight*. Assessment of the FSS included:

- Reviewing documentation supporting the design and safety basis requirements of the system, including supporting analyses, drawings, and testing and maintenance procedures
- Conducting interviews with facility engineering staff, maintenance personnel, and representatives of the LANL site Utilities Department
- Observing field performance of applicable surveillance requirements and/or system maintenance activities
- Walking down the FSS and supporting systems, including the exterior yard.

The HSS independent review placed priority attention on review of the established design and safety basis relied-on performance requirements of the FSS, and verification that the safety basis requirements were appropriately translated into technical specification and surveillance testing procedures, including compliance with applicable codes and standards.

#### 4.0 RESULTS

Overall, the LASO assessment was competently implemented by knowledgeable personnel using appropriate and challenging criteria. The assessment included an appropriate balance of technical document reviews, interviews, and field activities. The LASO assessment team in conjunction with HSS identified 17 findings and concluded that SFD and SST objectives were not met and that existing FSS surveillance and testing activities do not demonstrate the FSS system's ability to perform its safety function. The following issues generally reflect concerns identified and recognized by HSS Independent Oversight's review in conjunction with the LASO assessment team as particularly significant because they may challenge the ability of the FSS system to perform its safety function as described in the facility safety basis:

- The hydraulic demand of the FSS and the water supply capability have not been thoroughly analyzed to account for system modifications, as-found conditions, water supply degradation, and DOE-STD-1066 design margins. The current FSS system physical configuration has changed significantly from the original installation, which was constructed in the mid-1980s in conformance with NFPA 13-1979. For example, major modification DCP-06-TA-50-0069-016, completed in 2007, modified the original configuration of the FSS system from a branched/tree design into a looped system design to make it capable of meeting Ordinary Hazard Group 2 requirements of NFPA 13. This was a significant departure from the original installation. With a change of this magnitude, DOE Order 420.1B requires that facility modifications meet current code requirements. The code in effect at the time of the modification was NFPA 13-2002, which requires a sprinkler coverage spray density of 0.20 gpm/ft<sup>2</sup> over the most hydraulically remote design area; however, the current hydraulic calculation value of 0.19 gpm/ft<sup>2</sup> is specified in the documented safety analysis, as previously required by NFPA 13-1979. The current analytical basis for FSS system flow rate is therefore uncertain.
- The LANL fire-water supply piping feeding the WCRRF FSS is pre-conditioned before the annual hydrant flow surveillance test; that is, the normal valve lineup is changed before the test is performed. Specifically, surveillance test procedure EP-WCRR-FP-DOP-0301, *Hydrant Flow Test*, Step 8.5, closes utility cross-connect valve #037 before the hydrant flow test, thereby changing the normal water supply valve lineup for a potential fire scenario. Consequently, this test does not demonstrate the operability of the FSS system in the as-found normal operational lineup.
- The monthly surveillance test to validate an unobstructed flow path from the LANL water supply system tank to the WCRRF facility FSS system does not adequately demonstrate and confirm appropriate valve alignments to assure fire water supply to WCRRF. Specifically, procedure EP-

WCRR-FP-DOP-0303, *Monthly FSS Valve Alignment Checklist*, including its past and present implementation, does not validate monthly surveillance requirement SR 4.2.4 in that all valve positions in the flow path are not verified to be in the correct open/closed position and all technical safety requirement (TSR)-required verified valves are not physically labeled as referenced in the procedure. An incident related to this concern occurred during the team's assessment; during the TSR valve alignment surveillance, related water supply path valves were closed without notification to WCRRF operations personnel, and the WCRRF facility proceeded into operations mode for a day before the subject valve was re-opened. This incident resulted in issuance of an Occurrence Reporting and Processing System report.

- Inconsistencies in hydrant flow test data have not been evaluated for cause or FSS performance impacts as required by NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. This NFPA code requires investigation of flow test results that indicate deterioration of available water flow and pressure to ensure that the required flow and pressure are available for fire protection. Contrary to this requirement, the most recent documented flow test data is not consistent and indicated lower static and residual pressure and flow than in the previous annual test. This data is used as input to the facility hydraulic calculation and should be revisited and reconciled with the facility hydraulic analysis.
- The most current facility combustible loading verification (per procedure EP-WCRR-FP-DOP-0304, *Quarterly Combustible Loading Verification*, dated 3/30/2011) documented a total quantity of combustibles that considerably exceeds the maximum safe combustible loading limit as documented and evaluated in the Basis for Interim Operations hazards analysis.

In addition to these issues, the HSS and LASO assessment team also identified important findings and observations related to SM and CM that were documented in the formal LASO Safety System Oversight Report for WCRRF FSS, issued in June 2011.

## **5.0 CONCLUSIONS**

Overall, the LASO assessment was competently performed by knowledgeable LASO personnel using appropriate criteria as defined in LASO Procedure MP 06.02, *Safety System Oversight*. The LASO team was technically well qualified and, based on prior preparation and knowledge, demonstrated a high degree of familiarity with the WCRRF facility.

The HSS independent review in conjunction with the LASO assessment identified significant issues that require the LANL management attention. Some of the issues are particularly significant because they may challenge the ability of the FSS system to perform its safety function as described in the facility safety basis. Independent Oversight concurs with the objectives and results of the LASO assessment and believes that sufficient rigor was applied before and during the FSS review.

## **6.0 ITEMS FOR FOLLOW-UP**

The LASO report was formally issued to the contractor identifying findings in the areas of Safety Function Definition, Configuration Management, System Maintenance, and System Surveillance and Testing. LANL was asked to review the report and provide confirmation that the identified issues were entered into the facility's corrective action program.

Based on the conclusions drawn in the report and the significant nature of many of the findings, Independent Oversight will monitor potential actions being taken below or other appropriate actions to selected findings identified in the LASO report.

- Reconciliation of the hydraulic analysis using the appropriate NFPA spray density requirements and the as-installed FSS configuration
- Application of more rigor regarding the TSR surveillance flow testing and validation of water supply valve alignment
- Validation and reconciliation of combustible loading limits as documented in the DSA.

## **Appendix A Supplemental Information**

### **Dates of Review**

Onsite Review: May 1-13, 2011

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