

APPENDIX C

**Detailed Discussion of Results  
of the Phase II Assessment of the  
Comprehensive Facility Fire Safety Reviews  
At LANL TA-48, RC-1 and TA-55, PF-4**



## Facility Fire Safety Program

### **Objective:**

The facility is governed by an up-to-date (within three years), comprehensive, documented fire safety program.

### **Criterion 1:**

Management exhibits a significant and measurable commitment to fire safety.

### **Criterion 2:**

A documented fire safety program exists.

### **Criterion 4:**

The fire protection program applies to leases and to the activities of subcontractors to the extent that they involve operations that pose a risk to the public, site workers, DOE programs, and Government facilities.

Criteria 1, 2, and 4 are addressed together below.

### Are the Criteria met?

Yes, with Opportunity for Improvement.

### How the Review was Conducted:

Interviews were conducted with LANL Facility and Waste Operations (FWO) Fire Protection Group personnel; facility senior level management, fire protection system maintenance engineers/technicians, and other resident staff; LANL Emergency Management and Response Group Leader; Los Alamos County Fire Department Chief and Deputy Chief; and U.S. Department of Energy (DOE) personnel from the Office of Los Alamos Site Operations (OLASO) and the Albuquerque Operations Office (AL), including Facility Representatives, fire protection engineers, and other subject matter experts. Both facilities were toured accompanied by the facility manager and resident engineering personnel knowledgeable of fire safety systems. Additionally, the following relevant documents were reviewed:

- Fire Protection Program Manual
- Fire Protection Program document (LIR-402-910-01.4)
- Emergency Response Plan (ERP-CFM-48-01, R.12)
- Conduct of Operations (PLA-CFM-002-02)
- TA-48 JCNNM Impairment Log
- Fire Protection Checklist for C-FM Nuclear Facility TA-48-RC1, April 2, 2002

- University of California/Department of Energy Contract No.: W-7405-EN G-36, Appendices F, G, and O.
- LPR 402-00-00.2, Worker Health & Safety, Appendix 9, "Fire Protection" (10/03/2000)
- LANL-LIR 402-840-01.0, Welding and Cutting and Other Flame or Spark Producing Operations
- Fire Protection Program Self-Assessment Report, (3/21/2002)
- Occurrence Report ALO-LA-LANL-TA55-1996-0042
- Occurrence Report ALO-LA-LANL-TA-55-1994-0012
- Occurrence Report ALO-LA-LANL-TA-55-1993-0036
- Occurrence Report ALO-LA-LANL-RADIOCHEM-2001-0003
- Occurrence Report ALO-LA-LANL-RADIOCHEM-2001-0002
- Quality Management Plan (NMT-PLAN-001, RO)
- NMT Division Fire Protection Program (NMT-AP-020, RO)
- TA-55 Change Control Manual
- Transient Combustible Control Inspection (NMT8-TSR-005-R03.2)
- Site Audible Alarm Test (NMT8-TSR-203-R00.1)
- NMT Division Performance Assurance Program Plan (NMT-PLAN-013,R0)
- Facility Operations Group (NKMT-8) Roles and Responsibilities Plan (NMT8-AP-202, R0)
- Selected TA-55 Management Walkaround Reports (pertaining to fire safety)
- Preliminary Results – Emergency Management/Fire Protection Assessment (by the Internal Assessments Group, August 6, 2001)
- Selected TA-55 Occurrence Reports (from the period 1995-2002 pertaining to fire safety)

#### Discussion of Results:

LANL management support of fire safety is evident, as site-wide fire safety expectations are delineated in the *Fire Protection Program Manual*, supplemented with implementation requirements contained in the *Fire Protection Program* document. Together, these documents describe the LANL fire safety program scope and objectives, including expectations; applicable codes and standards; training; recordkeeping; inspection, testing, and maintenance; surveillance; and corrective actions. The responsibilities of the LANL Fire Marshal and the FWO-Fire Protection Group are diverse and generally all encompassing, as delineated in the *Fire Protection Program* and supporting documents. A noteworthy exception is Contract Technical Representative responsibility for the fire department, which resides within the LANL Emergency Management Group (S-8). Valid justification exists for placing this responsibility within S-8. Further evidence of LANL's commitment to fire safety is the authorizing of two additional fire protection engineers for the Fire Protection Group, and the availability of funds to permit these personnel to acquire additional training. In contrast, however, the several years of delay in negotiating a contract between LANL and the Los Alamos County Fire Department remains a concern and represents a weakness in defense-in-depth. At TA-48, RC-1 the fire suppression system is designed for fire containment until arrival of the fire department.

DOE, in its latest contract negotiation with the University of California (UC), introduced new, specific program performance initiatives (in Appendix O) to ensure that LANL adequately

addresses Defense Nuclear Facility Safety Board Recommendation 2000-2. DOE also included performance measures (in Appendix F) to ensure that program missions are balanced with fire safety performance goals.

There are documents specific to TA-48, RC-1, including the *Emergency Response Plan* and *Conduct of Operations*, which further address and clarify fire protection policy, fire detection and notification, roles and responsibilities, and fire emergency instructions for residents, tenants, and visitors at this facility. Supporting the TA-48 fire safety program is a computer-based records system that precludes residents, tenants, and principal subcontractors without current and applicable fire safety training from performing certain work.

There are division-level documents applicable to TA-55, PF-4, including the *NMT Division Fire Protection Program* and, to a lesser extent, the *Quality Management Plan*, which further address and clarify the fire protection program. These documents address the TA-55 fire protection program scope, including the following: responsibilities; recordkeeping; and requirements for inspection, test, maintenance, combustible control, outage control, cutting, welding, grinding, open flames, portable heaters, control of flammable and combustible liquids, compressed gas cylinders, emergency and exit lights, fire extinguishers, fire barriers, and emergency response. Additional fire safety-related information is contained in TA-55 manuals, instructions, and procedures that address conduct of operations, inspection, test, and maintenance.

Supporting the TA-55 fire safety program is a computer-based records system for all personnel, as residents and principal subcontractors to UC, precluding them from entering the space and performing work without current and applicable fire safety training.

A LANL site-wide issues management system has been established that includes fire safety issues; however, management is not ensuring that there is rigorous tracking to resolve root causes or that the data are being analyzed to identify trends and precursors of weak performance. Similarly, a facility-level framework exists to capture and track to closure fire safety findings from inspections, management walk-arounds, and assessments. However, there is no evidence that root cause analysis is being conducted, and informal rather than rigorous trend analysis of this information is being performed.

Tenant-based funding and the associated budget to maintain adequate fire protection at an aging facility continues to challenge TA-48 management. Several measures have been implemented to help address this situation, including using fire safety support from the LANL FWO-FIRE Protection Group and contractors to perform monthly inspections in lieu of maintaining a full-time resident fire protection engineer. Greater funding is needed, however, to reduce the current backlog of corrective actions pertaining to fire safety.

While fire protection defense-in-depth characterizes TA-48, a major responsibility for both management and (indirectly) FWO-FIRE is managing change in such a manner as to ensure that the level of fire safety does not degrade over time. Such degradation can and has occurred as a result of facility modifications that do not conform to fire protection standards or work activity that does not reflect the principles and practices of Integrated Safety Management. At the present time, the Fire Marshal and his staff are integrated into the LANL configuration

management process in several ways. For example, FWO-FIRE witnesses all acceptance tests of fire protection systems. However, they do not have responsibility for reviewing and approving all work packages, permits for hazardous activities (such as hot work), or other potentially hazardous operational activities of diverse nature. Instead, their involvement is initiated "upon request."

FWO-FIRE does not presently have a sufficient number of fire protection engineers (FPEs) to support a significant expansion of their responsibilities, hence the effort to augment the staff by the addition of two FPEs mentioned above. When the additional fire protection engineers are hired, the Fire Marshal is planning to assign them to groups of facilities on a full-time basis. This follows the successful implementation of similar schemes elsewhere within the DOE. Such an approach will help ensure that change occurs without compromising fire safety. An expansion of responsibility to encompass all potentially hazardous activities or work packages would not be prudent from a managerial perspective. Instead, additional guidance to Facility Managers and other members of the operational staff is advisable. This would serve to further clarify the circumstances under which FWO-FIRE participation in decision-making is required.

The fire safety surveillance program, which consists of periodic facility inspections by FWO-FIRE, can be an effective mechanism for confirming that facility modifications and operational changes are made with appropriate consideration for fire safety in general, and code compliance in particular, and for identifying situations where fire safety deficiencies have already occurred and require correction. This program is not currently functioning in a manner that will ensure significant deviations from a fire protection engineering perspective are identified (refer to discussion under Comprehensive FHA and Self-assessment later in this report). However, tentative plans exist to improve the functional effectiveness of this program. These plans should be implemented expeditiously.

#### Issues or Concerns:

- The absence of a signed contract between LANL and Los Alamos County Fire Department for fire fighting and emergency medical support represents a weakness in defense-in-depth.
- Findings from LANL and facility surveillances, inspections, assessments, and management walk-arounds are not analyzed for root cause, or analyzed to identify trends and precursors, nor used to establish the scope of subsequent review activities.
- The existing change control process for fire safety at LANL may not be sufficiently rigorous to ensure that facility modifications or operational changes do not diminish the level of fire safety.

#### Opportunity for Improvement:

- The dissemination of additional guidance to Facility Managers and other operational staff pertaining to the circumstances under which FWO-FIRE review and approval is required will help ensure that facility changes progress in a (fire) safe manner.

### Criterion 3:

The fire safety program document addresses all of the essential elements of a comprehensive fire protection program.

Is the Criterion met?

Yes, with Opportunities for Improvement.

How the Review was Conducted:

See Facility Fire Safety Program Criteria 1 and 2 above for documents reviewed, facility tours/walk-downs conducted, and personnel interviewed.

Discussion of Results:

The LANL fire protection program is manifested in a number of source documents including the UC contract, LANL ES&H Work Smart Standards, Laboratory Performance Requirements (LPR), Laboratory Implementation Requirements (LIR), and Laboratory Implementation Guidance, among other criteria. Considered collectively, these source documents generally define a comprehensive fire safety and emergency services program, as defined by Department of Energy (DOE) fire safety criteria (Reference DOE O 420.1 and its Implementation Guide). With the exceptions noted below and in other sections of this report, fire safety criteria have been implemented in such a manner as to achieve fire protection defense-in-depth.

Although the applicable LIRs and supporting documents define fire safety responsibilities of management and organizations, they do not address responsibilities of the Los Alamos County Fire Department (LAFD). Nor do they delineate expectations of the LAFD to implement industry standards within a defined timetable, such as the recently promulgated NFPA Standard 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. The delineation of such responsibilities could be satisfactorily accomplished in contract-related documentation. However, for the past several years, there has been no formal contract between LANL and Los Alamos County for emergency services. The consequences of this condition are that minimum expectations regarding the capability of the LAFD to respond to emergencies in a timely and effective manner are not clearly defined, documented, agreed upon, and therefore, may not be met. A recently completed (fire department) assessment concluded that the LAFD was significantly understaffed. Fire department representatives also report significant "dead zones" for radio communications within facilities.

Much has been done at LANL to address the lessons learned from the Year 2000 Cerro Grande wildfire. This includes vegetation removal around facilities to create "defensible zones" and the expansion of the fire safety surveillance program, among other programs and activities, to help ensure adequate protection from wildfires. However, there is no explicit criteria within LANL program documents that define the extent, nature, and maintenance of vegetation free areas around facilities. The Urban Wildland Interface Code, published by the International Fire Code

Institute, is being utilized at LANL, but is not institutionalized as are other fire safety and emergency services standards. The consequence of this condition is that adequate defensible zones may not always be maintained over time.

Issues or Concerns:

- The Los Alamos County Fire Department may not have sufficient capabilities (e.g. staff and radio communications) to respond in a timely and effective manner to credible site emergencies.

Opportunities for Improvement:

- Completion of contract negotiations with Los Alamos County for emergency services on site that sets forth expectations, responsibilities, capabilities, and applicable standards will help ensure effective response to fires and related events.
- Issuance of a revision to LANL Program criteria (LPR/LIR as appropriate) to adopt the Urban Wildland Interface Code for facilities will help ensure preservation of required defensible zones around critical facilities.

## Comprehensive FHA and Self-Assessment

### Objective:

Fire and related safety hazards within the facility have been identified and evaluated in conjunction with a current and comprehensive FHA and self-assessment.

### Criterion 1:

Current FHAs and facility fire protection self-assessments have been performed.

### Is the Criterion met?

Yes.

### How the Review was Conducted:

Interviews were conducted with LANL FWO-FIRE Protection Group personnel, facility senior level management and other resident systems engineering staff, and DOE personnel from OLASO and AL, including Facility Representatives, fire protection engineers, and other subject matter experts. Additionally, the following relevant documents were reviewed:

- Fire Hazards Analysis TA-48/RC-1, October 17, 2000
- LA-CP-02-113, TA-55 Fire Hazard Analysis, April 2002.
- OLASO Office of Facility Operations Appraisal Plan, Calendar Year 2001
- OLASO Office of Facility Operations Appraisal Plan, Calendar Year 2002

### Discussion of Results:

OLASO prepares an annual appraisal schedule addressing a broad range of fire protection program elements, including fire hazard analysis (FHAs), training, water supply, wildland, alarms, flammable storage, fire extinguishers, safety systems, evacuations, and trend analysis. Most of these appraisals are either not being performed or the results are not documented for trend analysis. Facility representatives are not addressing fire safety during their periodic walk-throughs with sufficient rigor to compensate for the lack of appraisals. Due to the lack of a full-time OLASO fire protection engineer there is a significant gap between the oversight that can be performed by the sole AL fire protection engineer and what is needed at LANL. Further, the lack of an OLASO counterpart to the AL fire protection engineer contributes to weak communication on fire safety issues between these two organizations. Although a computer-based framework exists within OLASO (referred to as WINTREND) to track and trend deficiencies from DOE oversight activities, Facility Representatives often do not provide input to this system. Accordingly, efforts to develop trend analyses are based on incomplete information.

Although current FHAs do not exist for all nuclear facilities or other "significant" facilities (as defined by DOE), FHAs have been recently completed for TA-48, RC-1 and TA-55, PF-4, and are up-to-date. A performance directive in the UC contract governs this activity. Annual fire

safety reviews under the long-established surveillance program have been performed for both TA-48 and TA-55.

Prior to 2000, a facility safety self-assessment plan did not exist. Pursuant to the development of the NMT Division Performance Assurance Program Plan, effective May 2001, facility self-assessments are scheduled to be performed in July 2002 and July 2004. Less formal, management walk-arounds also address fire safety and the findings from these activities are recorded and tracked to closure; however, trend analysis is not performed on the data.

Issues or Concerns:

The DOE is not performing effective oversight of LANL and facility-specific fire protection programs.

**Criterion 2:**

The FHAs and self-assessments address all essential elements for a complete analysis.

Is the Criterion met?

Yes, with Opportunities for Improvement.

How the Review was Conducted:

See Comprehensive FHA and Self-Assessment Criterion 1 above for documents reviewed, and personnel interviewed.

Discussion of Results:

Both the FHAs and fire safety surveillance reviews nominally address all of the essential elements of a comprehensive evaluation as required by DOE O 420.1 and its Implementation Guide. Performed by experienced engineers with knowledge of appropriate codes and standards, the FHAs exhibit a high degree of thoroughness and a reasonably conservative approach to fire protection. The FHAs adequately address wildfire safety. The scope of the fire safety surveillance program was recently expanded to address wildfire risks.

The FHAs for TA-48 and TA-55 conclude there is no concern with regard to the adequacy of the response by the LAFD. This conclusion is neither substantiated by written analysis nor does it reflect the lack of a current Baseline Needs Assessment for the fire department. In fact, a recently completed analysis of fire department staffing by a nationally recognized expert concludes that the LAFD is significantly understaffed. Additionally, the requirements of NFPA Standard 1710, which pertains to minimum emergency response capabilities, has not yet been addressed. The FHA does not mention the emergency communication difficulties experienced by the fire department. Despite the availability of judgment and historic information, there is insufficient technical basis to conclude that the LAFD will be capable of responding effectively and in a timely manner to credible future emergencies within these facilities. It is anticipated

that this issue will be addressed through an updated Baseline Needs Assessment/ NFPA code compliance review, but that effort is pending completion of a new contract between LANL and the County.

The fire safety surveillance reports for TA-48 and TA-55 that were reviewed in conjunction with this assessment reveal several inconsistencies. They do not manifest awareness of the fire safety deficiencies noted in the FHAs, nor do they reflect fire protection trends, such as if an increased rate of fire protection system failures were to occur. Most significantly, they do not address the spectrum of fire protection administrative controls, such as ignition source and combustible material controls within the facility. The (surveillance) program manager is aware of these weaknesses and has developed a plan to strengthen the effort to be more comprehensive and to address fire protection engineering issues. This plan should be adopted.

Issues or Concerns:

- Facility fire safety surveillance reviews may not identify all significant hazards or changes that have adversely affected fire safety.

Opportunities for Improvement:

- Complete a Baseline Needs Assessment and a review against current NFPA codes and standards governing fire departments to provide reasonable assurance that the LAFD will be able to respond effectively to fires and related emergencies in this facility.
- Implement the proposed plan to augment the fire safety surveillance program to ensure that fire safety reviews address administrative controls, issues or concerns identified in facility FHAs, findings from LANL and facility surveillances, inspections, assessments, and management walk-arounds (including analysis of root cause), and significant hazards, trends, and precursors.

**Criterion 3:**

The information contained in the FHA and self-assessment is accurate.

Is the Criterion met?

Yes, with Opportunity for Improvement.

How the Review was Conducted:

See Comprehensive FHA and Self-Assessment Criterion 1 above for personnel interviewed, and documents reviewed in addition to those listed below.

Documents:

- Property Loss and Risk Evaluation for TA-48-0001, March 7, 2001
- Property Loss and Risk Evaluation for TA-48-0001, December 14, 1999

Discussion of Results:

The FHAs for both TA-48 and TA-55 are thorough, conservative, and generally complete. The format for the FHA for TA-48 differs significantly from that of TA-55. While this does not detract from the individual efforts, a "standard" format for FHAs across the site would offer significant advantages, such as ease of comparison, data retrieval and cost effectiveness in future revisions. FWO-FIRE is planning to adopt a standard FHA format in the future.

Both FHAs succeeded generally in addressing deviations from established DOE and industry fire safety criteria. However, the FHA for TA-55 does not fully address the deviations in the context of the safety margin. (While "deficient" from a code compliance standpoint, some conditions that were noted may be considered satisfactory in light of existing defense-in-depth.) Thus, the FHA gives the false impression of an insufficient margin of fire safety.

The FHA for TA-48 also gives the false impression of an insufficient margin of fire safety. For example, the Executive Summary states: "Fire spread throughout the facility is expected to result in a total loss, including the exposed support structures also evaluated by this analysis." This statement, and others in the document, are misleading and inaccurate.

The TA-48 FHA does not address the lack of a completely redundant water supply. The building features a single feed into the looped yard main.

Issues or Concerns: None

Opportunity for Improvement:

- Revise the subject FHAs to clearly establish the adequacy of the safety margin as it relates to the threat from fire to avoid potential misunderstanding by stakeholders of the nature of fire risk at these facilities.

**Criterion 4:**

Fire modeling or other analytical tools used in the assessment of (fire) risk are appropriate, validated and reach conservative conclusions.

Is the Criterion met?

Yes, with Opportunity for Improvement.

How the Review was Conducted:

See Comprehensive FHA and Self-Assessment Criterion 1 above for documents reviewed, and personnel interviewed.

Discussion of Results:

This criterion is not applicable as fire modeling/analytical tools were not used at TA-48.

The fire models used in the preparation of the TA-55 FHA (CFAST and others) were applied by an experienced fire protection engineer and were subjected to an independent peer review. These analytical tools were not utilized as a basis for reducing defense-in-depth, but to provide supplementary analysis to confirm the judgement of engineers as to the consequences of fire under various scenarios. All assumptions and technical bases for the use of the models were identified and justified. Bracketing calculations were performed for given fire scenarios to validate conclusions reached. The results of the application of the models were not used as the sole basis for deciding levels of fire protection. (Other bases included established fire safety criteria and the judgment and experience of qualified fire protection engineers.)

Issues or Concerns: None

Opportunity for Improvement:

- Support the acquisition of fire modeling skills by other members of the staff of FWO-FIRE to enhance the capability of LANL to perform these calculations "in house."

Noteworthy Practice:

- The application of fire modeling techniques by an "in-house" staff of engineers and analysts has resulted in significant savings in developmental costs for the TA-55 FHA. Use of this staff avoided delays and potential inaccuracies associated with reliance on non-resident personnel, who may not possess an intimate knowledge of the facility and its associated operations.

## Fire Prevention Procedures and Fire Safety Features

### **Objective:**

Fire prevention procedures have been implemented and fire safety features have been installed to mitigate fire risk.

### **Criterion 1:**

A complete spectrum of fire prevention controls and procedures are in existence and have been implemented.

Is the Criterion met?

Yes, with Opportunity for Improvement.

### How the Review was Conducted:

See Facility Fire Safety Program Criteria 1 and 2 above for documents reviewed, facility tours/walk-downs conducted, and personnel interviewed.

### Discussion of Results:

Both TA-48 and TA-55 manifest, to a significant degree, fire safety defense-in-depth. Protection includes: fire resistive construction, a high degree of compartmenting, noncombustible interior finish, an emergency egress capability, automatic fire suppression, fire detection, an alarm and emergency communication system, combustible materials and ignition control procedures, a change control process, experienced management, knowledgeable employees, and a dedicated and experienced staff of fire safety professionals (including fire department staff). This multi-faceted array of safeguards has resulted in a long history of minimal fire loss within the facility.

The FHA for TA-55 identified a range of deficient conditions that require corrective action. Some of these actions have been addressed in the FSAR. Resolution of the remaining fire safety issues is pending further analysis. Though the FHA has just been formally issued to DOE, the conditions have been noted in previous drafts of the FHA for approximately two years.

TA-48 benefits from a multi-faceted program to control combustible materials, including those within gloveboxes. This includes periodic inspections by a fire protection engineer. These inspections are subjective in nature in that there are no explicit criteria governing acceptable quantities of combustibles in either the open areas or within gloveboxes. An exception is the limit on flammable liquids in laboratory units. A program based on defined quantities of combustible materials is not considered cost-effective or practical.

TA-55 also benefits from a multi-faceted program to control combustible materials, including those within gloveboxes, that includes periodic inspections by operations personnel. This includes implementation of a formal procedure restricting quantities of combustibles in general

areas and limits on flammable and combustible liquids in laboratory units. Discussions are underway to implement a more rigorous combustible control procedure in certain gloveboxes. A final decision is pending. If adopted, consideration should be given to a simple routine "housecleaning" of all gloveboxes at certain defined intervals. Such programs have been implemented elsewhere within the DOE Complex with significant success.

Issues or Concerns:

- Because of the lack of consensus regarding the need for complete remediation of FHA recommendations at TA-55, identified deficiencies may remain unmitigated for the foreseeable future.

Opportunity for Improvement:

- Implementation of a formal corrective action plan addressing all recommendations from the TA-55 FHA would help to expedite their remediation.

**Criterion 2:**

All fixed fire protection features (appropriate construction types, fire barriers, fire alarm and signaling systems, manual and automatic fire suppression systems, etc.), that are required by authorization basis documents and FHAs have been designed and installed and are being maintained.

Is the Criterion met?

Yes, with Opportunities for Improvement.

How the Review was Conducted:

See Facility Fire Safety Program Criteria 1 and 2 above for documents reviewed, facility tours/walk-downs conducted, and personnel interviewed.

Discussion of Results:

The DOE Complex can be characterized, in part, by aged automatic fire protection systems. Some of the systems were installed almost 50 years ago. DOE has experienced a range of operational difficulties with automatic (fire) sprinkler systems over the past several years, including defective automatic sprinkler heads and obstructed piping. In 1999 and 2000, DOE Headquarters issued Safety Alerts that advised field elements of these problems and recommended that all sites implement a program of inspections particularly focusing on potentially defective sprinkler heads. A recommendation was also made to inspect representative samples of the interior of sprinkler piping. LANL has not addressed these issues, although the fire safety surveillance program is structured to include visual inspections of sprinkler hardware. There is no program in place to ensure the interior integrity of sprinkler

pipng. A more aggressive program of destructive examination is warranted given the age of the TA-48, RC-1 facility and its fire protection systems.

As previously discussed, the recent FHA and fire safety surveillance reviews have identified a number of deficiencies from established fire safety criteria, including DOE directives and NFPA codes and standards. At TA-48, the most significant of the deficiencies have been corrected.

The remaining deficiencies are being tracked by the Facility Manager pending receipt of sufficient funds to complete work requests. At TA-55, the inventory of FHA recommendations has yet to benefit from a corrective action plan. Some of the noted deficiencies can be resolved on the basis of equivalency determinations and approved variances. The remaining deficiencies should be corrected expeditiously. No consensus presently exists as to what course of action to take, despite the fact that these conditions have been known for almost two years.

At TA-48 the looped water main is supplied from a single "feed." DOE Order 420.1, its Implementation Guide, and DOE Standard 1066-97 stipulate that the water supply to nuclear facilities must be redundant. These criteria are not being met directly, although efforts are underway to reconfigure the facility in such a manner as to allow for reclassification as a "radiological facility," which would not require such redundancy. It is noted that the site operates under an impairment program that would prompt remedial action in the event of an interruption of the fire protection water supply.

#### Issues or Concerns:

- The fire sprinkler systems are not inspected to ensure that performance is not degraded due to interior obstructions.
- Because of an insufficiency of funding at TA-48, a significant number of deficiencies identified in the FHA and fire safety surveillance reviews may remain unmitigated for the foreseeable future.
- Because of the present lack of consensus regarding the need for complete remediation of FHA recommendations at TA-55, significant deficiencies may remain unmitigated for the foreseeable future.

#### Opportunities for Improvement:

- Provision of additional funding, through an increase in the "space tax" (for example), would help to eliminate the inventory of needed safety-related work requests at TA-48.
- Implement a formal corrective action plan encompassing recommendations from the TA-55 FHA to ensure their expeditious remediation.

#### **Criterion 3:**

A process exists to assure that all fire prevention and protection features (including modifications to these systems) are reviewed and approved by a qualified fire protection engineer.

This criterion is addressed under Facility Fire Safety Program Criteria 1, 2, and 4 above.

**Criterion 4:**

Applicable industry standards (NFPA, ASTM, etc.) were used in the design, installation and testing of the fire protection features.

Is the Criterion met?

Yes.

How the Review was Conducted:

See Facility Fire Safety Program Criteria 1 and 2 above for documents reviewed, facility tours/walk-downs conducted, and personnel interviewed.

Discussion of Results:

The documents reviewed and facility tours revealed a generally satisfactory application of the range of applicable DOE fire safety criteria and NFPA codes and standards. This is not to say that there are no instances where deviations from these criteria exist. For TA-55, some of these deviations are being addressed through work requests and operational changes, or are being resolved through a process of approved variances (equivalencies or exemptions). The remainder are pending further review as noted previously.

Issues or Concerns: None.

## Personnel Qualification and Training

### **Objective:**

Personnel are appropriately qualified and trained to perform their work safely and responsibly when confronted by fire hazards and related dangers.

### **Criterion 1:**

All employees receive an applicable level of "general" training in (fire) hazard recognition, appropriate safeguards, and emergency response.

### **Criterion 2:**

Employees who are exposed to "special" fire hazards are provided with appropriate initial training and "refresher" training.

Criteria 1 and 2 are addressed together below.

### Are the Criteria met?

Yes, with Opportunities for Improvement.

### How the Review was Conducted:

Interviews were conducted with facility management and training staff. Additionally, the following relevant documents were reviewed:

- General Employee Training
- Wildfire Precautions
- Fire Extinguisher Training: Designated Worker and Fire Watch (Self-Study)
- Fire Extinguisher Hands-On Training (Student Manual)
- TA-48 Fire Safety Refresher Training Briefing Slides
- TA-48 Student Orientation Fire Safety Briefing Slides
- Employee Handbook (LA-UR 01-3127)
- Emergency Procedures and Abnormal Conditions at TA-55, EDS Course #212891 (Annual)
- Emergency Procedures and Abnormal Conditions at TA-55, EDS Course #212891 (Biennial)
- Fire Fighting at NMT
- System Engineer Training/Qualification Record (Draft)
- Team Leader — Engineering Training/Qualification Record (Draft)
- NMT-8 Qualification Matrix
- NMT Employee Development Course Status (for selected personnel)
- NMT Employee Resumes (for selected employees with fire safety duties)

### Discussion of Results:

All personnel entering TA-55, PF-4, and all resident, tenant, and contractor personnel working at TA-48, RC-1 are required to complete General Employee Training prior to performing work. This training focuses on fire classification, preventing fires, building emergency plans, individual response to fire emergencies (including alarm recognition and appropriate evacuation action), and portable fire extinguishers. Fundamental elements of fire safety, such as combustible loading, receive cursory discussion.

Individuals working in TA-48 generally do not receive any formal specialized fire safety training in case of a fire emergency. They are directed to notify the fire department and evacuate the facility. Twice annually resident management and tenant personnel are offered non-mandatory facility-specific fire safety refresher training. Further, summer students at TA-48 are provided with a fire safety orientation at least twice during their summer residence at TA-48 that includes combustible loading, emergency response, and fire notification and alarms. A division-level computer-based system, monitored by division-level training personnel and the facility manager, is maintained to track employee training.

Some initial and refresher facility-specific fire safety training is provided to all resident and contractor personnel performing work in TA-55, PF-4. Further, all resident personnel receive fire extinguisher training, which includes practical application at their assigned work area. Records are maintained and administrative controls are established that preclude resident employee and contractor access to TA-55, PF-4 without current and appropriate fire safety training.

Programs exist that identify specific employees and emergency responders who are subjected to fire safety hazards that present a unique risk. These individuals receive training commensurate with that risk. An example is individuals who are involved with hot work. They receive appropriate instruction in hazard recognition, use of appropriate PPE, response to fires, and other relevant information. Training programs are reviewed by FWO-FIRE to ensure that they are adequate.

Although the Facility Representative assigned to TA-48 has received additional fire safety training as part of the qualification program, Facility Representatives do not necessarily receive in-depth fire safety training. Therefore, additional subject matter expertise is sometimes required. Currently, a fire protection engineer is not resident at OLASO, and the support available from the one subject matter expert available from AL is limited. Occasionally, Facility Representatives have called upon LANL FWO-FIRE Protection Group personnel for assistance, which is inconsistent with the DOE oversight function. OLASO has funding available for, and is pursuing, hiring a full-time fire protection engineer.

### Issues or Concerns:

- There is no fire protection engineer at OLASO to support the fire safety oversight function.
- Facility-specific fire safety refresher training is not mandatory at TA-48, RC-1.

Opportunities for Improvement:

- Consider making facility-specific fire safety refresher training a mandatory requirement.
- OLASO should expedite the hiring of a full-time fire protection engineer to oversee LANE and facility-specific fire safety activities.

**Criterion 3:**

The fire safety staff (engineers, technicians, managers) are appropriately educated, trained and certified.

Is the Criterion met?

Yes.

How the Review was Conducted:

See Personnel Qualification and Training Criteria 1 and 2 above for documents reviewed and personnel interviewed.

Discussion of Results:

The individuals of concern currently possess the knowledge and experience required to successfully implement their fire safety responsibilities. A professional development program exists that enables individual engineers, technicians, and managers to identify and complete needed training and supplemental education. No expressions of dissatisfaction with training and educational opportunities were identified.

Issues or Concerns: None.

## Lessons Learned and Feedback

### **Objective:**

Data, statistics, "lessons learned," and other "feedback" from the facility fire safety program are disseminated on site and within the DOE (fire) safety community.

### **Criterion 1**

Performance data and statistics related to the fire protection program are collected and reported.

### **Criterion 2:**

Fire safety-related "near misses" and "lessons learned" are routinely disseminated internally to the DOE community.

Criteria 1 and 2 are addressed together below.

### Are the Criteria met?

Yes, with Opportunities for Improvement.

### How the Review was Conducted:

Interviews were conducted with LANL FWO-FIRE Protection Group personnel, facility senior level management and other resident systems engineering staff, and DOE personnel from OLASO and AL, including Facility Representatives, fire protection engineers, and other subject matter experts.

### Discussion of Results:

At TA-48, RC-1, the facility manager conducts meetings, as needed, to address lessons learned from the DOE complex. Special lessons learned meetings are conducted as a result of major fire safety-related events, such as the fatalities at the East Tennessee Technology Park and the Idaho National Engineering and Environmental Laboratory. There is no indication that lessons learned from minor incidents within the facility, LANL, or complex-wide are being championed by resident staff.

At TA-55, PF-4 there is a division-level Worker Safety Committee representing all worker groups that devotes one meeting each month to lessons learned. TA-55 performance personnel tasked with disseminating lessons learned information focus on capturing major events from across the complex and seldom capture minor incidents from within the facility or site-wide. Generally, lessons learned are disseminated using the DOE computer-based listings.

At both facilities, weaknesses in performing trend analysis on information from fire safety inspections, assessments, and walk-arounds preclude the exchange of lessons learned from fire protection program performance information.

Issues or Concerns: None.

Opportunities for Improvement:

- Ensure that FWO Fire Protection Group personnel take a more proactive role in conducting briefings with facility personnel to convey important fire safety lessons learned.
- Establish a lessons learned champion at TA-48, and task this individual with responsibility for disseminating information from throughout LANL and the balance of the DOE complex on all (i.e., major and minor) relevant lessons learned.