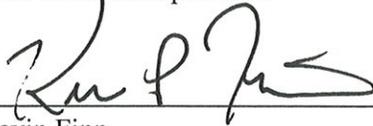


CRITERION 733

FIRE PROTECTION SYSTEM IMPAIRMENT CONTROL PROGRAM

SIGNATURES

 _____ Don Shoemaker Criterion Author	<u>7/19/07</u> _____ Date	<u>MSS-MSE</u> _____ Group	<u>667-4917</u> _____ Phone Number
 _____ Jim Streit Fire Marshal	<u>7/23/2007</u> _____ Date	<u>ADESHQ</u> _____ Group	<u>665-3628</u> _____ Phone Number
 _____ Rob Farris ER-FP Group Leader	<u>7/24/2007</u> _____ Date	<u>ER-FP</u> _____ Group	<u>665-0283</u> _____ Phone Number
 _____ Donald Shoemaker MSS-MSE Group Leader	<u>7/19/07</u> _____ Date	<u>MSS-MSE</u> _____ Group	<u>667-4917</u> _____ Phone Number
 _____ Kevin Finn MSS Division Leader	<u>8/7/07</u> _____ Date	<u>MSS-DO</u> _____ Group	<u>667-6131</u> _____ Phone Number

RECORD OF REVISIONS

Revision No.	Date	Description
0	07/12/02	Initial Issue. This revision reflects the conversion from a WordPerfect document into a Microsoft Word document and additional clarification on how to develop criteria. This revision includes: The addition of a Table of Contents, use of basis statements in Sections 6, 7 and 9, revision to Section 9, "Required Documents," and further clarification in the use of references, changes to Section 4.0 to address O& M Criterion written by groups other than FWO-SEM, changes to Sections 3 and 6, Appendices A and B per comments of FMC subcommittee, Changes to Section 4.0 to include AHJ.
1	07/17/07	Revised document to remove procedural steps, incorporate updated references and align requirements to current standards.

TABLE OF CONTENTS

1.0 PURPOSE..... 3

2.0 SCOPE..... 3

3.0 ACRONYMS AND DEFINITIONS 4

 3.1 Acronyms 4

 3.2 Definitions 5

4.0 RESPONSIBILITIES 7

 4.1 MSS-Maintenance Support and Engineering (MSE) 7

 4.2 Maintenance and Site Services Division Leader 7

 4.3 Emergency Reponse-Fire Protection (ER-FP) 8

 4.4 Facility Operations Director (FOD) 8

 4.5 Maintenance Manager 9

 4.6 Authority Having Jurisdiction (AHJ) – Fire Marshal..... 9

 4.7 Responsible Engineer 10

 4.8 Support Services Subcontractor 10

 4.9 Facility Coordinator / Area Work Coordinator 10

 4.10 LANL Worker 11

 4.11 Impairment Coordinator 11

 4.12 Safeguards Group (SAFE-3) 11

 4.13 Telecommunications Subcontractor 11

5.0 PRECAUTIONS AND LIMITATIONS 11

 5.1 Precautions 11

 5.2 Limitations..... 12

6.0 REQUIREMENTS 12

 6.1 Operations Requirements 12

7.0 RECOMMENDATIONS AND GOOD PRACTICES 15

 7.1 Operations Recommendations..... 15

 7.2 Maintenance Recommendations..... 15

8.0 Guidance..... 15

 8.1 Operations Guidance 15

 8.2 Maintenance Guidance 15

9.0 required DOCUMENTATION..... 15

10.0 REFERENCES 16

11.0 APPENDICES 17

CRITERION 733

FIRE PROTECTION SYSTEM IMPAIRMENT CONTROL PROGRAM

1.0 PURPOSE

The purpose of this Criterion is to establish the minimum requirements and best practices for control of fire protection system impairments at Los Alamos National Laboratory (LANL).

This Criterion establishes the minimum requirements and best practices for a formalized fire protection impairment process at LANL. This process is based on requirements from National Fire Protection Association, NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems, 2002* (Ref 10.08) and NFPA 72, *National Fire Alarm Code, 2006* (Ref 10.09). This document also addresses the requirements of OST 230-05-01, *Operations and Maintenance Manual*. (Ref.10.1), contained within ISD 951-1, *Conduct of Maintenance Manual* (Ref.10.2) and LIR 402-910-01.7, *LANL Fire Protection Program*.

Implementation of this Criterion satisfies DOE Order 430.1B *Real Property Asset Management* (Ref. 10.3), Attachment 2 *Contractor Requirements Document*, Paragraph 3, which in part requires LANL to “to balance acquisition, sustainment, recapitalization and disposal to ensure that real property assets are available, utilized, and in a suitable condition to accomplish NNSA’s missions; and Attachment 3 *Definitions: Maintenance*. “Day to day work that is required to sustain property in a condition suitable for it to be used for its designated purposes, including preventive, predictive, and corrective maintenance”. Implementation of this criterion also satisfies the requirements of DOE Order 420.1B Chapter II 3 b (2) (f), *fire protection system impairments*, for nuclear facilities.

Compliance with DOE Orders 430.1B and 420.1B is required by Appendix G of the LANS Contract.

2.0 SCOPE

This Criterion addresses planned impairments to Fire Protection Structures, Systems, and Components (SSC)s resulting from the installation, alteration, repair, relocation, replacement, addition to, and use or maintenance of fire protection systems. This Criterion also addresses unplanned impairments to Fire Protection SSCs. Fire Protection SSCs are defined in Section 3.0. This Criterion does not address specific corrective maintenance actions required to repair or replace impaired equipment. The elements of this impairment process include; impairment recognition, impairment

determination, notification, documentation, compensatory measures, correction, and closing the impairment.

Fire protection SSCs and related loss control systems shall be taken out of service only when necessary, under carefully controlled conditions, and only in accordance with requirements of this Criterion. Fire Protection SSCs shall be restored to service before the end of the same working day that the planned impairment is initiated, unless extenuating circumstances require a longer period. In keeping with IMP 315-1, *Conduct of Operations Manual*, (Ref 10.18), only authorized personnel can designate a fire protection system as impaired and authorize the system to be returned to service. These activities are to be performed to procedure AP-MNT-014, *Fire Protection Impairments*, (Ref 10.20) which delineates roles and responsibilities for managing impairments. The scope of this Criterion also includes the requirements for defining and performing compensatory or mitigating actions in lieu of a properly functioning fire protection system. Providing notification of an impaired fire protection system is another functional requirement contained within this Criterion. Proper notification is required to assure emergency responders are aware of facility conditions (lack of fire protection) and can provide adequate services and that affected facilities can take required actions during impairment. Correction of impairments, while addressed in this Criterion will follow the process defined in the WORK procedures contained within the ISD 951, COM (Ref 10.17).

Within this Criterion, requirements, which are mandatory, are designated with a SHALL or WILL statement. Where-as, recommendations are designated with a SHOULD statement. Most requirements are derived from contractual and/or recognized codes and standards while others are based on operating experience. In all Central Alarm Stations, requirements are to be complied with and will be auditable through internal and external assessments.

3.0 ACRONYMS AND DEFINITIONS

3.1 Acronyms

CAS	Central Alarm Station
CFR	Code of Federal Regulations
DACS	Digital Alarm Communicator System
DOE	Department of Energy
FOD	Facility Operations Director
IMP	Implementing Procedures
IP	Institutional Policy

IPP	Institutional Policy and Implementation Procedure
ISD	Implementation Support Document
ITM	Inspection, Testing, and Maintenance
LIG	Laboratory Implementing Guidance
LIR	Laboratory Implementing Requirement
LPR	Laboratory Performance Requirement
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
O&M	Operations and Maintenance
PPE	Personal Protective Equipment
PP&PE	Personal Property and Programmatic Equipment
RE	Responsible Engineer
RP&IE	Real Property and Installed Equipment
SSC	Structures, Systems, and Components
SSS	Support Services Subcontractor

3.2 Definitions

Fire Protections SSCs: Systems, Structures and Components associated with: Fire Suppression Systems (sprinklers including anti-freeze loops; gaseous agents; carbon dioxide; dry/wet chemical; etc.); Fire Detection Systems (smoke; heat; flame; pull stations etc.); Fire Protection Water Supplies (storage tanks; valves; hydrants; fire pumps; etc.); Occupant Notification Appliances (a bell, horn, speaker, light, or test display providing audible, tactile, or visible outputs); designated fire doors and smoke control doors; designated fire and smoke dampers; fire barriers (along with installed penetration seals); alarm transmission and receiving capability; and facility life safety provisions (e.g., exit lighting, exit signs, egress paths).

Note: Lightning Protection Systems are addressed in Criterion 507.

Impairment: A broad range of circumstances, planned or unplanned, which renders a fire protection system incapable of performing its intended design or safety function. Performance of routine inspection, testing, and maintenance (ITM) activities are not considered impairments. Minor component inoperability that does not affect the system's performance of its fire protection function (i.e., detection, suppression, fire alarm indication) is not considered system impairment.

Impairment Determination: The process by which a fire protection system or component is determined not to meet the required design or safety function. Refer to Appendix B for additional guidance on this determination.

Impairment Closeout: The process by which an impairment of a fire protection system or component is documented as released from the impairment process after completion of the return to service process.

Impairment Coordinator: A LANL Fire Protection Group member assigned to evaluate and approve requests for fire protection system impairments at the request of FODs, maintenance organizations, or designees. Other functions and duties are as specified in Section 6.0.

Impairment Tag: An approved and pre-printed, 4 part form utilized to document the impairment of a fire protection system or component. The form contains areas for describing the system, component, impairment, time, corrections and post maintenance tests. The form also contains areas for authorization and recognition signatures.

Life Safety: As defined by NFPA Standard 101. NFPA 101, "...addresses those construction, protection, and occupancy features necessary to minimize danger to life from fire, including smoke, fumes, or panic." NFPA 101 also, "...establishes minimum criteria for the designs of egress facilities so as to permit prompt escape of occupants from buildings or, where desirable, into safe areas within buildings."

Management Level Determination (ML 1, ML 2, ML 3, and ML 4): A classification system for determining the degree of management control applied to facility work. See ISD 341-1 (Ref 10.7) for definitions of each ML level.

Mitigating or Compensatory Action: A temporary action taken during the period of fire protection system impairment, to provide an additional level of fire safety during the impairment. Mitigating actions may include but are not limited to; establishing a fire watch, establishment of a temporary water supply, establishment of temporary communications, or other action(s) deemed appropriate by the Fire Marshal's Office to counterbalance the temporary reduction in safety normally provided by an operable fire protection system. Note that Compensatory Actions do not necessarily provide equivalent protection and are by definition temporary.

Notification Appliance: Any device approved by the LANL Fire Marshal, designed to provide audible and/or visual warning to building occupants in the event a fire alarm is initiated automatically or manually.

Notification: The reporting of impairment to the proper authority level within the management chain. (These personnel are authorized to approve corrective and compensatory actions in response to fire protection impairment)

Operability: The capability or capacity of a fire protection to perform its' intended design or safety function when needed.

Operability Determination – Nuclear Facilities: The formal process by which a fire protection system or component is determined and documented not meeting the required design or safety function as defined in the approved authorization documentation for the facility. Refer to Appendix B for additional guidance on this determination.

Operability Determination – Non-Nuclear Facilities: The process by which a fire protection system or component is determined and documented not meeting the required design or safety function. Refer to Appendix B for additional guidance on this determination.

Return to Service: The process by which a fire protection system is determined to meet the design or safety function after completion of corrective repair or modification.

Utility Outage: A planned utility outage is a pre-arranged shutdown of a utility or system supplying a building or structure (fire protection, electrical, steam/condensate, water, natural gas, HVAC, etc.) where interruptions of processes or user operations have been addressed and all affected users have been notified. Refer to Criterion 301, Planned Utility Outages in the LANL Operations and Maintenance Manual.

4.0 RESPONSIBILITIES

4.1 MSS-Maintenance Support and Engineering (MSE)

Responsible for the technical content of this Criterion along with monitoring the applicability and the implementation status of this Criterion. The Group is also responsible for assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating concerns to the appropriate management chain.

Basis: ISD-311-1; Institutional Policies, Implementing Procedures and related Documents.

Provide technical review support to MSS Division Leader and AHJ for variance requests from O&M Criterion.

Provide technical assistance to support implementation of this Criterion.

4.2 Maintenance and Site Services Division Leader (MSS-DL)

Receives, approves (in conjunction with AHJ) or rejects requests for variances from this criterion.

Maintains record of decision for all variance requests.

4.3 Emergency Response-Fire Protection (ER-FP)

Responsible for the assuring technical content of this Criterion meets requirements and monitoring the compliance across the Laboratory.

Provide technical assistance to support implementation of this Criterion.

Responsible for making impairment determinations during conduct of normal fire protection duties.

Responsible for providing technical expertise on fire protection issues and assist users with developing compensatory actions for impairments.

Responsible for operating the impairment program and assigning an Impairment Coordinator.

Responsible for compiling and issuing regular status reports.

Assist in investigating events to identify the root cause and assist in implementing appropriate corrective actions.

Responsible for following the impairment process actions as described in Section 6.1.1 of this Criterion.

Responsible for operability for the LANL DACS.

Responsible for requesting assistance from the Telecommunications Subcontractor as required too correct DACS COMMUNICATION failures.

4.4 Facility Operations Director (FOD)

Responsible for providing funding, work prioritization and support staffing to execute requirements under this criterion.

Responsible for making impairment determinations when responsible engineer is not available.

Responsible for developing and implementing compensatory or mitigating actions resulting from a fire protection system impairment.

Responsible for coordinating with operations managers, other affected FOD areas and building tenants affected by impairment.

Responsible (or authorized designee) for determining repair priority for each impairment under their purview per Section 6.1.1.

Responsible for performing required actions as defined in the facility authorization basis when notified of an inoperable/impaired fire protection system.

Responsible (or authorized designee) for generating requests for variance from this criterion.

Responsible (or authorized designee) for ensuring actions as described in Section 6.1.1 of this Criterion are performed.

4.5 Maintenance Manager (MM)

Responsible for implementing safe, effective maintenance program including the following: Calibrations, preventive and corrective maintenance activities, spare parts maintenance of Real Property and Installed Equipment (RP&IE) under their jurisdiction, to allow optimum availability in accordance with the requirements of this document and IMP 313.0 Roles, Responsibilities, Authorities, and Accountability.

Responsible for following the impairment process actions as described in Section 6.1.1. and 6.1.2 of this Criterion.

Verifies training and qualification of workers performing maintenance functions is appropriate for the task.

Ensures that maintenance activities are performed in a manner which does not violate or alter the design or design basis of systems or equipment.

Assists in investigating maintenance related events to identify the root cause and assist in implementing appropriate corrective actions.

Ensures maintenance work documents are maintained in conformance with maintenance procedures and standards.

Ensures that appropriate prerequisites and facility initial conditions are provided to work planners during the development of work request/work control documents.

Primary point of contact for the FOD to coordinate SSS activities at facility.

4.6 Authority Having Jurisdiction (AHJ) – Fire Marshal

The AHJ is responsible for providing a decision on a specific technical question regarding this criterion.

Responsible for making impairment determinations during conduct of normal fire marshal duties.

Responsible for approving compensatory or mitigating actions for an impaired fire protection system when the impairment will or does last longer than 8 hours.

Responsible for following the impairment process actions as described in Section 6.1.1 and 6.1.2 of this Criterion.

4.7 Responsible System Engineer

Responsible for following the impairment process actions as described in Section 6.1.1 of this Criterion.

Responsible for making impairment determinations for assigned fire protection system(s).

Responsible for assuring ITM activities include provisions for implementing this Criterion.

Responsible for developing facility/system specific ITM processes/procedures.

Responsible for developing, reviewing and trending maintenance history data for assigned fire protection system(s).

Responsible for configuration management of assigned fire protection system(s).

Responsible for periodic review of performance for fire protection systems(s) covered under this Criterion.

4.8 Support Services Subcontractor (SSS)

Responsible for providing Inspection, Test and Maintenance (IT&M) services for the fire protection SSCs addressed in this Criterion.

Responsible for following the impairment requirements as described in Section 6.1.1 of this Criterion.

4.9 Facility Coordinator (FC) / Area Work Coordinator (AWC)

Responsible for following the impairment process requirements as described in Section 6.1.1 of this Criterion.

Responsible for assuring corrective work packages to correct impaired fire protection systems are developed, planned, worked and closed per ISD-951.

4.10 LANL Worker

Responsible for following the impairment process requirements as described in Section 6.1.1 of this Criterion.

4.11 Impairment Coordinator

Responsible for following the impairment requirements as described in Section 6.1.1 of this Criterion.

Responsible for assuring planned impairments receive appropriate review and approvals.

Responsible for records generated by the impairment process.

Responsible for maintaining the database of current and closed impairments.

4.12 Security Subcontractor (PTLA)

Responsible for operation and annunciation of fire alarms from the LANL Central Alarm Station (CAS).

4.13 Telecommunications Subcontractor

Responsible for operability of leased LANL telecommunications system(s) transferring signals to the Central Alarm Station from the LANL fire alarm systems.

Responsible for following the impairment requirements as described in Section 6.1.1.1 of this Criterion.

Responsible for assigning and dispatching of technicians to trouble-shoot leased LANL telecomm circuits upon determination of a COMMUNICATION failure.

5.0 PRECAUTIONS AND LIMITATIONS**5.1 Precautions**

This section is not intended to identify all applicable precautions necessary for implementation of this Criterion. It is intended only to assist the user in the identification of hazards/precautions that may not be immediately obvious.

There are no unique precautions associated with this Criterion; however, personnel responsible for implementation of this Criterion must be cognizant of the extent of the responsibilities and consequences of actions to be taken during an impairment of a

fire protection system. The ultimate goal of this Criterion is to ensure an acceptable level of life safety and property protection is maintained during a planned or unplanned impairment of a fire protection system or component in a LANL facility. Consultation with the LANL Fire Marshal (or designee) and his approval for alternate methods of protection is required for fire protection systems.

5.2 Limitations

The intent of this Criterion is to identify the minimum requirements and recommendations for generating, processing, reporting and clearing impairments for fire protection SSCs across the Laboratory. Each user is responsible for the identification and implementation of additional facility specific requirements and recommendations based on their authorization basis and unique equipment and conditions, (e.g., equipment history, manufacturer warranties, operating environment, vendor O&M requirements and guidance, etc.).

Nuclear facilities and moderate to high hazard non-nuclear facilities will typically have additional facility-specific requirements beyond those presented in this Criterion. Nuclear facilities shall implement the requirements of DOE Order 433.1A (Ref 10.4 and 420.1B (Ref 10.5) as the minimum program requirements for a nuclear facility maintenance program. Additional requirements and recommendations for SSC operation and maintenance may be necessary to fully comply with the current DOE Order identified above.

6.0 REQUIREMENTS

Minimum requirements that Criterion users shall follow are specified in this section. Requested variances to these O&M requirements shall be prepared and submitted to FM-MSE in accordance OST-231-05-01 (Ref. 10.10) and approved following IMP 311 (Ref. 10.11). The Criterion users are responsible for following the impairment process defined in this O&M unless an approved exemption or variance has been granted. Contractual requirements, federal laws, codes, safety compliance, and operations and maintenance experience were utilized to delineate the process contained within the requirements below.

6.1 Operations Requirements

The following requirements are mandatory to meet LANL commitments to the NNSA as described in LIR 402-910-01, *LANL Fire Protection Program*. The basis for each step is found in NFPA 25, 2002 Edition, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* and in NFPA 72, 2007 Edition. Compliance with these NFPA codes is required per Appendix G of the LANS contract. The responsibilities for execution of each step has been defined in AP-

MNT-014, *Fire Protection Impairments*, which conforms to roles and responsibilities defined in IMP 313.

Note: NFPA 25 and NFPA 72 paragraph numbers and reference to the NFPA Equivalency, if applicable, follow each requirement.

6.1.1 Planned Impairments

Planned modifications or corrective repairs to fire protection systems SHALL follow the utility outage process in O&M 301, *Planned Utility Outages*.

Planned fire protection system outages SHALL be authorized by the FOD or designee and the Impairment Coordinator.

Compensatory actions for impairments SHALL be planned and approved.

Notification of the Fire Marshal SHALL be performed for impairments lasting longer than 8 hours.

Notification of a planned impairment SHALL be made to affected parties including FOD, MM, operations, tenants and adjoining of connected facilities no less than 24 hour prior to start of work.

Notification SHALL be made to the Impairment Coordinator and Fire Department no less than 1 business day prior to starting work.

Modifications SHALL follow engineering processes in IMP 341. The Responsible System Engineer SHALL be cognizant of the modification or repair.

The MM SHALL authorize planned repairs or modifications to fire protection systems per ISD 951.

The planned impairment SHALL be documented using the impairment form.

Post maintenance or modification testing SHALL be performed and accepted by the Responsible System Engineer per ISD 951 and ISD 341-1 and documented on the 4 part impairment form.

Planned active impairments SHALL be tracked by the Impairment Coordinator.

A planned impairment SHALL be closed following procedure AP-MNT-014, *Fire Protection Impairments*, (Ref 10.16).

The Impairment Coordinator SHALL keep record copies of completed Part 4 impairment forms for one year. After the one year period, the Impairment Coordinator SHALL archive the forms following IPP 1020, *Document Control and Records Management*, (Ref 10.20).

Completed maintenance or modification work packages SHALL contain a copy of the completed Part 4 impairment form.

6.1.2 Unplanned Impairments

Unplanned corrective repairs to fire protection systems SHALL follow the impairment procedure in AP-MNT-014, *Fire Protection Impairments*, (Ref 10.16).

Determination of impairment to a fire protection system SHALL be performed by persons with the requisite training and authorization following guidelines in Appendix B.

Unplanned impairments SHALL be documented using the 4 part impairment form by authorized personnel.

The Fire Marshal SHALL be notified for impairments to fire suppression/extinguishing systems that affect system operability lasting longer than 8 hours.

Notification of an unplanned impairments SHALL be made to affected parties including FOD, MM, Operations, tenants and adjoining or connected facilities no less than 24 hour prior to start of work.

Compensatory or mitigating actions for impairments SHALL be developed and implemented by the responsible FOD.

MMs SHALL authorize repairs to impaired fire protection systems per ISD 951.

Post maintenance or repair testing SHALL be performed and accepted by the Responsible System Engineer per ISD 951 and ISD 341-1 and documented on the 4 part impairment form.

Unplanned impairments SHALL be closed following procedure AP-MNT-014, *Fire Protection Impairments*, (Ref 10.16).

Unplanned active impairments SHALL be tracked by the Impairment Coordinator.

Impairment Coordinator SHALL keep record copies of completed Part 4 impairment forms for one year. After the one year period, the Impairment Coordinator SHALL archive the forms following IPP 1020, *Document Control and Records Management*, (Ref 10.20).

Completed repair work packages SHALL contain a copy of the completed Part 4 impairment form.

7.0 RECOMMENDATIONS AND GOOD PRACTICES

7.1 Operations Recommendations

There are no operations recommendations requirements beyond those stated in Section 5.2, Limitations.

7.2 Maintenance Recommendations

There are no additional maintenance recommendations beyond those stated in Section 5.2, Limitations.

8.0 GUIDANCE

8.1 Operations Guidance

None.

8.2 Maintenance Guidance

None.

9.0 REQUIRED DOCUMENTATION

Copies of completed Part 4 of Form .008, "Fire Protection System or Component Out of Service" SHALL be kept by the Impairment Coordinator for a minimum of 1 year of the date when the impairment was corrected. (NFPA 72, 4.6.2)

Completed repair or modification work packages for impaired fire protection systems SHALL contain a copy of the completed Part 4 impairment form.

Maintenance history shall be maintained for all fire protection systems to include, as a minimum, the parameters listed in the Table 9-1 below:

Table 9-1 Documentation Parameters

MAINTENANCE HISTORY DOCUMENTATION PARAMETERS				
PARAMETER	ML 1	ML 2	ML 3	ML 4
Maintenance Activities				
Repair / Adjustments	X	X	X	X
PM Activities				
Equipment Problems				
Failure Dates	X	X	X	X
Failure Root Cause	X	X	X	X
Inspection Results				
Inspection Date	X	X	X	X
SSC Condition				

Basis: Documentation of the parameters listed in Table 9-1 above satisfies the requirements of ISD 341-1.

10.0 REFERENCES

The following references, and associated revisions, were used in the development of this document.

- 10.1 OST 231-05-01, *Operations and Maintenance Manual*
- 10.2 ISD 951-1, *Conduct of Maintenance Manual*
- 10.3 DOE O 430.1B, *Real Property Asset Management*
- 10.4 DOE Order 433.1A, *Maintenance Management Program for Nuclear Facilities*
- 10.5 DOE Order 420.1B, *Facility Safety, Chapter II, Fire Protection*
- 10.6 DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*
- 10.7 ISD 341-1, *Engineering Process Manual, Appendix G, ML and QA Guidance for Engineering Work* (replaces LIR 230-01-02, *Graded Approach for Facility Work*)
- 10.8 NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems, 2002*
- 10.9 NFPA 72, *National Fire Alarm Code, 2007*

- 10.10 NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002
- 10.11 IMP 311, *Institutional Policies, Implementation Procedures, and Related Documents*
- 10.12 T ASD: 98-068, *Disposition of LANL Equivalency Requests to NFPA 25- Inspection, Testing, and Maintenance (ITM) Frequencies for Water-Based Fire Protection Systems*, 24 Jul 1998.
- 10.13 OST 402-910-01, *LANL Fire Program Manual*
- 10.14 LIR 402-910-01.7, *LANL Fire Protection Program*
- 10.15 AP-WORK-001, *Work Initiation, Screening and Acceptance*.
- 10.16 AP-MNT-014, *Fire Protection Impairments*
- 10.17 ISD 341-2, *Engineering Standards Manual*
- 10.18 ISD 951, *Conduct of Maintenance Manual*
- 10.19 ISD 315-1, *Conduct of Operations Manual*
- 10.20 DOE-STD-1066-99, *Fire Protection Design Criteria*
- 10.21 IPP, 1020, *Document Control and Records Management*
- 10.22 Occurrence Report ALO-LA-LANL-RADIOCHEM-2001-0002.

11.0 APPENDICES

- Appendix A:** Sample Fire Protection System Impairment Tag
- Appendix B:** Fire Protection Impairment Evaluation and Determination of Compensatory Actions
- Appendix C:** Fire Watch Requirements
- Appendix D:** Fire Protection Impairments Process Flow Chart
- Appendix E:** Fire Protection System Impairment Determination Criteria

APPENDIX A
SAMPLE FIRE PROTECTION SYSTEM IMPAIRMENT TAG

U.S. GPO: 2001-674-263

No. 11500

FIRE PROTECTION SYSTEM OR COMPONENT OUT OF SERVICE

REMOVAL BY AUTHORIZED PERSONNEL ONLY ATTACH TO SYSTEM OR COMPONENT OUT OF SERVICE

TECH AREA: BLDG: FLOOR: WING: FIRE PROTECTION WATER CONTROL VALVE NO: HYDRANT NO: SYSTEM NO:

ALARM INITIATING DEVICES: (CHECK ONE) PS [], FS [], HD [], SD [], MPS [], PIV SWITCH [], OS&Y SWITCH [], LOW AIR SWITCH [], ZONE CIRCUIT NO. [] SPRINKLER SYSTEM [], AREA: HALON SYSTEM [], CO2 SYSTEM [], FIRE DOOR [], FIRE PUMP [], OTHER:

DESCRIPTION OF IMPAIRMENT:

AUTHORIZED BY: SYSTEM OR COMPONENT OUT OF SERVICE

DATE TIME NAME

RESTORED TO SERVICE: DATE TIME SIGNATURE

WORK PERFORMED:

- POST OUTAGE TEST & VERIFICATION: 1. 2" SPRINKLER DRAIN TEST: STATIC PSI, FLOW PSI 2. ALARM INITIATING DEVICE TEST AND ALARM VERIFICATION BRASS NO. ZONE 3. OTHER:

OBSERVERS (OR WITNESSES) VERIFIED FOR SSS BY: DATE SIGNATURE

VERIFIED FOR LANL FIRE PROTECTION: DATE SIGNATURE

APPENDIX B

FIRE PROTECTION SYSTEM IMPAIRMENT DETERMINATION, COMPENSATORY ACTION, AND FIRE WATCH REQUIREMENTS

This appendix was created to provide guidance on how to address fire protection system impairments. Some system impairments necessitate compensatory actions and possibly immediate repairs. Other system impairments, less critical nature, may not require compensatory actions. These conditions are defined in this attachment. It must be stressed that the following information does not address every fire protection system condition that may be encountered. When in doubt, it is recommended that the users of this appendix be conservative and take appropriate precautions. Where additional guidance is needed, contact ER-FP at 7-9045 or the Fire Marshal's Office.

In ALL cases, contact the Central Alarm Station (7-7080) if any portion of a fire alarm system or sprinkler system or gaseous suppression system is considered impaired or out of service. Request that this information be immediately relayed from the Central Alarm Station to the Los Alamos Fire Department.

In ALL cases, compensatory actions such as Fire Watches are not required until the system/component has been out of service for more than four hours.

In ALL cases, personnel in normally-occupied portions of a building can serve as the fire watch during normal working hours provided that they are aware of this duty and have the requisite training. See Appendix C of this Criterion.

In ALL cases, structures with operable manual pull stations only do NOT require a fire watch.

Table of Contents:

A. Impairment Determinations	– Page B-2
A.1. Fire Alarm Systems	– Page B-2
B. Fire Suppression Systems	
B.1 Water-Based Suppression Systems	– Page B-6
B.2 Gaseous Systems	– Page B-10
B.3 Other Types of Fire Suppression	– Page B-11
C. Hydrants and Standpipes	– Page B-11
D. Fire Barriers, Fire Dampers, Fire Barrier Penetration Seals, and Fire Doors	– Page B-12
E. Fire Prevention Mechanisms	– Page B-16

A. IMPAIRMENT DETERMINATIONS

A fire protection system or component which is found to be functionally deficient per design requirements must be evaluated to determine if the impairment process is applicable. Guidance resources are available to assist in this determination; Appendix B and E of this document. Appendix B contains definitions of operability based on NFPA 25 and NFPA 72. Note that these do not necessarily correspond to the operability statements in facility specific authorization basis documentation. These definitions are to be used to determine if the system is operable from an NFPA stand point and are used to make an impairment determination. These are not to be utilized to meet an operability statement in the facility specific authorization basis documents. Appendix E is designed to give the user a fast way to determine if the impairment process is applicable. By looking up the Component Type on the horizontal axis and matching with the System Type on the vertical axis, an X in the intersecting column/row indicates the impairment process is applicable.

If the System is determined to be impaired, then procedure AP-MNT-014 SHALL be followed to document, track and make notification of impairment. Priority designations are based on the priorities specified in AP-WORK-001, *Work Initiation, Screening and Acceptance*.

A 1. FIRE ALARM SYSTEMS:

The functions of a fire alarm system include:

- (1) Detecting a fire condition,
- (2) Initiating any required actions that may be built into the system (such as closing doors, dampers, turning off ventilation systems, actuating suppression systems, etc.), following detection of a fire condition.
- (3) Relaying fire alarm signals back to the Central Alarm Station following detection of a fire condition.
- (4) Activating local fire alarm notification devices (horns/strobes/etc.) for local evacuation of building occupants following detection of a fire condition.
- (5) Relaying a system actuation signal back to the Central Alarm Station following actuation of an associated fire system.
- (6) Monitoring the condition and integrity of associated system circuits and components (detectors, tamper switches, ac power, etc.) during normal (non-fire) conditions and indicating problems via a "Trouble" and/or "Supervisory" signal, and relaying those signals back to the Central Alarm Station.

NOTE: When a fire alarm system cannot fulfill the above functions, it is IMPAIRED.

The following are examples of abnormal conditions that may be encountered in association with a fire alarm system. Compensatory actions and repair priority varies based on the above criteria. Again, the following list does not address every possible condition that may be encountered. For additional guidance, contact ER-FP at 7-9045.

A.1 Fire alarm system outages are permitted under controlled conditions initiated through the Utility Outage Permit process with compensatory actions as defined by ER-FP on the Outage Permit). Fire alarm system outages are authorized for various reasons; the following are the most common:

- Fire alarm system modification.
- Fire alarm system must be temporarily disabled to allow for a building modification.
- Testing of fire alarm system equipment.
- Replacement of fire detector or other system component.

A.2 TROUBLE INDICATION on the fire alarm panel. (Monitored faults or circuit problems within the panel and wiring to field devices.)

Suggested immediate action:

- Attempt to “Reset” the panel.
- Determine the cause of the trouble indication.

➤ IF it is determined that the trouble condition is the result of an internal fire control panel fault, THEN:

- Establish a fire watch with a 2-hour minimum frequency for the affected area(s) or at the frequency established in the facility authorization basis document. The affected components should be considered IMPAIRED until the trouble indication is corrected.
- Personnel in an occupied building can serve as the Fire Watch if they are directed to call 911 if fire or smoke is detected in the facility. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.

NOTES:

1. If the DACS communication circuits (telephone lines) are in trouble, subsequent FACP “trouble” signals may also not be reported.

REPAIR PRIORITY: Priority 2. This type of impairment should be addressed rapidly since the fire control panel is not functioning and will not send a signal to the Central Alarm Station.

A.3 SUPERVISORY ALARM indication on the fire alarm panel. (Monitored fire suppression systems or equipment or maintenance features of related systems.) Suggested immediate action:

- Determine the cause of the supervisory trouble signal.

➤ IF it is determined the supervisory trouble signal was the result of a PIV or OS&Y

monitor switch, THEN:



- Immediately ensure the PIV and OS&Y's involved are in the open position and locked or sealed. A fire watch is not required. If the problem cannot be corrected in a timely manner, documented weekly inspections must be performed to verify proper valve position.

REPAIR PRIORITY: Priority 2.

➤ IF it is determined that the supervisory signal was the result of a dry pipe sprinkler system low "air" condition, THEN:

- Determine what caused the loss of supervisory air or nitrogen and initiate corrective actions.
- During freezing weather, close the system main control valve to avoid tripping the valve and allowing water to enter the system. This course of action should only be taken AFTER determining the loss of air or nitrogen in the system was not caused by a sprinkler head fusing as a result of heat caused by a fire.
- If the dry pipe system main control valve is closed, establish an hourly fire watch, for the area protected by the dry pipe system or at the frequency established in the facility authorization basis document. Personnel in an occupied building can serve as the fire watch if they have the requisite training and are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.

REPAIR PRIORITY: Priority 2. This type of impairment should be addressed rapidly since the suppression system has been isolated.

- If there is no danger of freezing, the dry pipe valve can be left in a tripped position (i.e., with water in the system piping) and no fire watch is required while the building is occupied. However, the sprinkler system flow alarm will be isolated (valved-off) and will not actuate a building or remote alarm to the CAS in this configuration – so a fire watch must be established on a minimum 2 hour frequency when the building is not routinely occupied.

REPAIR PRIORITY: Priority 2

- If the system is shut off and no other alarm systems exist in the area (ex, fire detection), occupants should be notified that automatic fire alarms are also IMPAIRED.

➤ IF it is determined that the supervisory signal was the result of a low "air" condition in a rate-of-rise deluge system, deluge pilot head operated system, rate-of-rise pre-action system or electrically activated pre-action system, THEN:

- Verify that the loss of air was not a result of a fire condition.
- If loss of supervisory air or nitrogen is not due to fire condition, then:

1. Close the water control valve;
2. Setup a fire watch surveillance at 1-hour intervals for the area protected by the system involved (or the frequency established in the facility authorization basis document). Personnel in an occupied building can serve as a fire watch if they have the requisite training and are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.

REPAIR PRIORITY: Priority 2. This type of impairment should be repaired rapidly since the suppression system has been isolated.

➤ IF it is determined a sub panel is the cause of the supervisory signal (ex. gaseous or other chemical extinguishing agent), THEN:

- Determine the cause of the supervisory signal and initiate corrective actions.
- If the sub-panel is associated with a gaseous or chemical fire extinguishing system that protects an area also protected by a sprinkler system, and is fully operational, then a fire watch is not required.
- Otherwise, establish compensatory actions including a fire watch for the affected area at 1-hour surveillance intervals (or at the frequency established in the facility authorization basis document). Personnel in an occupied building can serve as the fire watch if they are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.
- Once a fire watch is established, it may be prudent to isolate the gaseous or chemical extinguishing system until the supervisory signal is repaired, to prevent inadvertent system actuation and release of the agent.

REPAIR PRIORITY: Priority 2. This type of impairment should be repaired rapidly since the operability of the extinguishing system is in question even if the system is not isolated.

➤ IF it is determined that the supervisory trouble signal is associated with a Key Lock Box (Knox Box), THEN:

-
- Verify that the Key Box (Knox Box) is secure and has not been tampered with. Report any tampering to Security (7-5911) and FOD or designee immediately.
 - Initiate corrective actions.

REPAIR PRIORITY: Priority 2. This type of impairment is not an impairment of the fire protection system, but represents a weakness in facility security. Therefore, rapid repair is required.

- IF it is determined that the supervisory trouble signal is a result of a monitored low temperature condition within a building area such as loss of heat in sprinkler valve enclosure or heat tape monitoring, THEN:
- Determine what area is covered by the loss of heat.
 - Initiate corrective actions to repair the heat source.
 - Establish compensatory actions to provide an alternate heat source if possible. A fire watch would not be required if temporary heat is provided.
NOTE: The heat source should be checked at intervals that are dictated by the weather and location.
 - If temporary heat cannot be provided, the control valve for the system should be isolated and the system should be drained to prevent freezing and breaking of system piping. This action will impair the sprinkler system. Establish a fire watch for the affected area at 1-hour surveillance intervals or at a frequency prescribed by the facility's authorization basis document. Personnel in an occupied building can serve as the fire watch if they have the requisite training and are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.

REPAIR PRIORITY: Priority 2 if temporary heat is provided. Otherwise, Priority 1. Without temporary heat, and in potentially freezing conditions, the suppression system is in danger of freezing, which will at least prevent the system from operating as designed, and at worst will break system piping, causing facility damage and requiring system repair. Therefore, immediate repair is required.

A.4. COMMUNICATION FAILURE indication at the panel: Alarm, trouble, and supervisory signals cannot be transmitted from fire control panel to Central Alarm Station.

- Suggested immediate actions:
 - Troubleshoot:
 - First, verify that the FACP is operating properly (SSS).
 - If FACP is operating properly, then call ER-FP to verify that DACS and FACP equipment is working correctly.
 - If FACP and DACS are determined to be OK, then ER-FP will contact the communications subcontractor (QWEST) personnel to troubleshoot their communications circuits.
 - Initiate rapid corrective action as a **Priority 2**.
 - Compensatory Actions: Establish a fire watch at 2-hour surveillance intervals for the area protected by the panel or at a frequency prescribed by the facility's authorization

basis document. Fire watch duties shall include monitoring the panel for alarms and notifying the Central Alarm Station if the fire control panel initiates a fire alarm.

NOTES:

1. Suppression and detection and alarm systems are still in service when this condition exists.

REPAIR PRIORITY: Priority 2. This type of impairment should be repaired rapidly since the alarm system is not capable of performing its function of early notification of fire or indication of suppression/extinguishing system actuation.

NOTE: At a nuclear facility, the Technical Safety Requirement(s) (TSR) actions may take precedence over the above.

B. FIRE SUPPRESSION SYSTEMS

B.1 Water-Based Suppression Systems

Water-based fire suppression systems are defined as any automatic or manually actuated system that is designed to apply water or foam (water + chemical) to a fire. This includes all types of wet pipe, dry pipe, pre-action, and deluge fire suppression systems, and can include systems that apply fire fighting foam to a fire.

The functions of a water-based suppression system include:

- 1) Detecting a fire condition such as high ambient temperature.
- 2) Applying water or foam (water + foam) to the fire.
- 3) Providing an indication of system actuation (normally sent via a fire alarm panel to a central station to allow notification of the fire department along with a local alarm such as a water motor-gong).

Some water-based suppression systems will include a local control panel to accomplish actions necessary to apply water to the fire. These actions, such as opening a deluge valve, are also required functions of the suppression system. In order for function (2) to be accomplished, the suppression system must have a reliable water supply, with adequate pressure, flow, and quantity available to supply water to the protected area. Therefore these aspects of the suppression system are also required for the system to be considered OPERABLE.

When a water-based suppression system cannot fulfill the above general functions and conditions, it must be considered IMPAIRED.

The following are examples of some possible abnormal conditions that might be encountered in association with a water-based suppression system. For additional guidance, contact ER-FP at 7-9045 during normal working hours.

a. Planned System Outages:

System outages are permitted under controlled conditions initiated through the Utility Outage Permit system (i.e., no Impairment tag is required; compensatory actions are as defined by ER-FP on the Utility Outage Permit). Sprinkler system outages are authorized for various reasons. The following most common conditions are:

- System modification due to building modification,
- Repair of damaged or leaking piping or sprinklers/nozzles,
- Repair of system components (flow switches, inspector test valves, fire department connection check valves and interior inspection or repair of alarm check valves),
- Testing back flow prevention devices,
- Repairing main drain valve, and
- Annual system alarm testing.

b. System or Component Impairments:

1. When unsatisfactory or deficient conditions associated with components of a water-based suppression system are discovered, the suppression system is not considered IMPAIRED UNLESS the following conditions exist:
 - (a) 10 % or more of the system sprinklers/nozzles, pilot heads, or detectors (ex. for deluge or preaction systems) in a 1500 square foot area protected by the same system are incapable of detecting high ambient temperatures; or
NOTE: In a building required to be fully sprinklered, an unsprinklered modular clean room, screen room, experimental enclosure or office space might constitute an impairment to the buildings sprinkler system.
 - (b) 10% or more sprinklers or nozzles in a 1500 square foot area protected by the same system are incapable of applying water to a fire; or
 - (c) System actuation cannot be detected or an actuation signal cannot be transmitted via the fire alarm system back to the Central Alarm Station (this condition will require compensatory actions as defined in Section A. Fire Alarm Systems, above).
 - (d) The water supply to the system is IMPAIRED, such that adequate water pressure/flow is NOT available to the sprinkler system.

NOTE: In the above Central Alarm Station, [(a), (b), (c), and (d)], at a nuclear facility the Technical Safety Requirement(s) (TSR) actions may take precedence over the above criteria.

2. IF conditions exist such that the affected system is IMPAIRED as defined above, THEN:
 - Establish a fire watch with a 1-hour frequency for the affected area or at a frequency prescribed by the facility's authorization basis document. Personnel in an occupied building can serve as the fire watch if they are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be

provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.

- Prohibit hot work or other increased fire hazard activities in the affected area until the system can be repaired (unless such activities are required to repair the system and adequate protective measures are established).

REPAIR PRIORITY: Priority 2.

3. IF the a system outage is required for a condition that does not render the system IMPAIRED, as defined above, THEN no compensatory actions are required until the system outage is completed

REPAIR PRIORITY: Priority 2.

- Outages must be planned to minimize system down time.
- Suggested compensatory actions during water-based suppression system outages:
 - Establish a fire watch with a 1 hour surveillance interval (or at a frequency prescribed by the facility's authorization basis document);
 - Prohibit hot work such as welding and metal cutting or other increased fire hazard operations in the protected area while the sprinkler system is out of service unless required to repair the system and adequate protective measures are established.
 - Personnel in an occupied building can serve as the Fire Watch if they are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.

- c. **Water Supply:** Water supply system impairments prevent the underground water supply piping from providing the design pressure and gallons per minute required at the base of the fire protection riser.

Suggested compensatory measures to provide an alternate water supply to the water-based suppression system affected by an underground water supply outage include the following:

- Route 2½" fire hose from an operable fire hydrant to the sprinkler system fire department connection (FDC) or the 2" sprinkler main drain whose normal underground water supply is IMPAIRED. If freezing is a concern, the hose(s) should be connected, but the hydrant may be left in the closed position and the fire watch should be instructed to open it in the event of a fire.
- Where an alternate water supply cannot be provided, the affected suppression system(s) must be considered IMPAIRED, and compensatory actions as follows must be instituted.
 - Establish a fire watch with a 1 hour surveillance interval (or at a frequency prescribed by the facility's authorization basis document);
 - Prohibit hot work such as welding and metal cutting or other increased fire hazard operations in the protected area while the sprinkler system is out of service unless required to repair the system and adequate protective measures are established.

- Personnel in an occupied building can serve as the Fire Watch if they are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas

Water flow alarm considerations:

The temporary water supply described above will by-pass the pressure switch (normal indicator of riser water flow) on the suppression system riser. Water flow indication is required, and must be considered if this compensatory action is used. Options include the following:

- If there are flow switches downstream of the temporary water supply connection (e.g., downstream of the alarm check valve), they will operate normally to indicate system actuation, thus alerting the Central Alarm Station.
 - If there are no flow switches installed downstream of the temporary connection, a flow switch installed in the temporary water supply hose line may be used to provide a flow alarm. The flow switch installed in the hose line should be located near the riser, regardless of where the connection is made (FDC or 2" drain). The alarm tie-in for the flow switch alarm is also required to be consider operable and alleviate requirements for fire watch.
 - Description of the flow switch mounting device: A piece of pipe approximately 18 inches long with a male and female hose thread on either end, with an appropriate female threaded outlet fitting or hole saw installed in the middle of the pipe section to receive the flow switch. Flow switches approved for fire service with normally open (NO)/normally closed (NC) contacts should be used.
- d. **Other Circumstances:** Other circumstances, such as a major modification to a building that is protected by an automatic sprinkler system, may require innovative thinking to provide sprinkler protection to the facility while construction is occurring. For example, it may be necessary to place a portion of the sprinkler system out of service during construction activities, review the piping main, branch lines etc. If the section of the sprinkler system to be worked on can be isolated from the rest of the system (e.g., by removing a section of piping and capping the end of the piping so it can be pressurized), then a portion of the sprinkler system can be placed back into service while the remainder of the system is worked on. This will allow continued protection for the area not under construction. For this sort of planned activity, consult ER-FP and the Fire Marshal to define appropriate compensatory actions.

B.2 Gaseous Fire Extinguishing Systems

Fixed gaseous fire extinguishing systems at LANL are generally limited to remaining Halon 1301 and FM-200 clean agent fire extinguishing systems. A gaseous fire extinguishing system will:

- (1) Detect a fire condition (smoke, heat, or flame) via a fire detector.
- (2) Initiate any necessary automatic actions prior to releasing gaseous fire suppressant into the fire area (such as isolating ventilation systems, automatically closing doors and dampers to ensure that the protected room is relatively gas-"tight", etc.)
- (3) Release the required quantity of gaseous fire extinguishing agent into the protected area. (The quantity of gaseous agent will vary depending on the configuration of the protected room.)
- (4) Maintain the required concentration of gaseous fire extinguishing agent in the protected room for the required time period. (The concentration and resident time may vary depending on the specific agent used, the hazard protected, and the configuration of the room.)
- (5) Relay an indication of system actuation through the fire alarm panel to the Central Alarm Station.

When a gaseous fire extinguishing system cannot fulfill the above functions, it must be considered IMPAIRED.

The following list outlines considerations associated with gaseous fire extinguishing systems, including some abnormal conditions that may occur. However every possible condition is not addressed. When in doubt, err on the side of safety and take extra precautions. For additional guidance, contact ER-FP at 7-9045 or the Fire Marshal.

- (a) Impairments or system trouble(s) involving gaseous fire extinguishing systems must be evaluated IMMEDIATELY to determine if the system is impaired. This type of extinguishing system is installed in areas or buildings that are of high value or mission critical. With the exception of agent container weight (required quantity), trouble analysis should follow the same steps and guidance provided in this document for fire alarm systems.
- (b) A fire watch shall be established immediately upon determining that the gaseous fire extinguishing system cannot perform its required functions as defined above. The fire watch surveillance intervals must meet the minimum 1-hour surveillance requirement or more frequently as required in the facility's authorization basis document. Personnel in an occupied building can serve as the fire watch if they are directed to call 911 if smoke or fire is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.
- (c) Note that the inability of the protected room or space to contain the extinguishing agent for the required resident time (remain relatively gas-"tight") renders gaseous fire extinguishing system IMPAIRED. Therefore, unsealed penetrations or unclosed doors into a room protected with a gaseous fire extinguishing system will render the system IMPAIRED, and

must be sealed/closed before the system can be considered operable again and the impairment removed.

- (d) Some areas protected with gaseous fire extinguishing systems are also protected with automatic sprinklers. In these cases, if the automatic sprinkler system protects the same physical space as the gaseous extinguishing system, a fire watch can be eliminated if the sprinkler system and all associated alarm capabilities are verified to be in working order. However, this is a temporary compensatory action until the system is repaired.

B.3 Other Types of Fire Extinguishing Systems

Other types of fire extinguishing systems employed at LANL include wet and dry chemical systems. The functions of these types of systems include:

- Detecting fire conditions (if automatically actuated)
- Initiating special actions prior to releasing fire extinguishing agent (e.g., ventilation shutdown, shut-down power, etc.)
- Releasing fire extinguishing agent in the affected area or onto the protected hazard.

If any of the above functions cannot be fulfilled the system must be considered IMPAIRED, and the following actions SHOULD be taken:

1. IF an operable automatic sprinkler system protects the same area as the impaired other fire extinguishing system, THEN no compensatory actions are required. For chemical extinguishing systems that protect specific hazards, such as kitchen grease hoods and cooking oils, automatic sprinkler protection for the general building and kitchen areas is not an acceptable compensatory action for an impaired chemical extinguishing system. Building automatic sprinkler protection does not provide equivalent personnel protection from fire hazards involved with high temperature cooking oils → cessation of cooking activities protected by the chemical extinguishing system is the appropriate action until the system is returned to service.

REPAIR PRIORITY: Priority 2

3. IF there is no operable automatic sprinkler system protecting the same area as the impaired fire extinguishing system, THEN:
- Establish a Fire Watch with a 1-hour frequency for the affected area (or at a frequency prescribed by the facility's authorization basis document). Personnel in an occupied building can serve as the fire watch if they are directed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas.
 - Restrict hot work such as welding and metal cutting or other increased fire hazard activities in the affected area until the system can be repaired unless such activities are required to repair the system and adequate protective measures are established.

REPAIR PRIORITY: Priority 2**C. HYDRANTS AND STANDPIPES**

The function of a fire hydrant or standpipe includes the ability to provide a ready source of water at an adequate water pressure and flow, and with appropriate hardware (e.g., hose connections) to enable firefighting personnel to manually fight a fire.

When the above conditions cannot be met, the affected hydrant or standpipe must be considered IMPAIRED.

The water supply associated with a fire hydrant or standpipe may include a water flow signal device such that a signal will be relayed to the Central Alarm Station upon use of the standpipe or hydrant. Normally, flow switches which signal to the fire alarm panel are located on system risers. Where a standpipe is supplied off of a riser equipped with a flow switch, use of the standpipe will actuate the flow switch. Where a facility water supply system includes one or more diesel or electric fire pumps, use of a fire hydrant will result in actuation of a fire pump and send a signal through the fire alarm panel to the Central Alarm Station indicating fire pump operation.

If a fire hydrant or standpipe must be considered IMPAIRED, no compensatory actions are required unless mandated by the facility authorization basis document. Repair must be initiated unless a more immediate response is required by the facility authorization basis document.

REPAIR PRIORITY: Priority 3

If a hydrant or standpipe must be considered IMPAIRED, notify the Los Alamos Fire Department immediately, since they may have preplanned to use the IMPAIRED equipment to fight a fire at the facility.

If a hydrant or standpipe will be IMPAIRED for more than 14 days, contact ER-FP for guidance on appropriate compensatory actions.

REPAIR PRIORITY: Priority 3

A fire hydrant is sometimes used for non-fire fighting purposes (ex. filling up a tanker truck used to mitigate dust at a construction site). In such cases, it is necessary to get approval from ER-FP and MSS-UI prior to use. No compensatory actions are typically necessary, although MSS-UI typically requires the use of a backflow preventer for hydrant use other than fire protection.

D. FIRE BARRIERS, FIRE DAMPERS, SMOKE DAMPERS, FIRE BARRIER PENETRATION SEALS, and FIRE DOORS

1. The functions of a FIRE BARRIER include the ability to:

- (a) Prevent or retard the spread of fire beyond the room or area of fire origin. This is both a Loss Prevention function and a Life Safety function. Fire barriers are typically used to separate areas of higher fire hazard from areas of lower fire hazard, or to separate large facilities into sections so the consequences of a fire will be minimized.
- (b) Provide building occupants with a safe exit path from the building. This is a Life Safety function. Enclosed stairwells and floors/ceilings between building elevations should be considered to be fire barriers required for Life Safety.
- (c) Provide building occupants with an area of refuge within the building, such that they need not exit the building but will still be safe from fire in designated areas of the building. This is a Life Safety function. Enclosed stairwells in some buildings fulfill this function. Other areas of refuge are defined by the current building emergency exit plan.
- (d) Provide a containment boundary around a room protected by a gaseous fire extinguishing agent such as Halon 1301 or FM-200. This is a Loss Prevention function. This function of a fire barrier is required to ensure that the appropriate concentration of the gaseous fire extinguishing agent will be maintained in the protected room for the duration required to extinguish the fire.

When a fire barrier cannot fulfill the above functions and conditions, it must be considered IMPAIRED.

REPAIR PRIORITY: Priority 3

2. SUB-COMPONENTS of a FIRE BARRIER include fire doors, fire dampers, smoke dampers, and penetration seals. The fire protection function of these sub-components is primarily to maintain the fire protection function of the fire barrier in which they are installed. Following are additional functions of the sub-components of a fire barrier:
 - a. FIRE DAMPERS are installed in ventilation ductwork where the ducts penetrate fire rated barriers (exceptions per NFPA 90A). The functions of fire dampers include the following:
 - (1) Remaining in the open position during normal operation, so as not to adversely affect normal operation of the ventilation systems in which the dampers are installed.
 - (2) Automatically closing when exposed to fire effects. Fire damper actuation is typically by melting of a fusible link on the fire damper, resulting in automatic closure of the fire damper. Fire dampers must be able to successfully close under normal ventilation system airflow unless the actuating alarm or smoke management system also shuts down the ventilation system.
 - (3) When in the closed position, preventing spread of flames, heat and significant hot gases through the ductwork, across the fire barriers in which the dampers are installed, so that fire spread from one side of a fire barrier to the other through the ductwork is prevented or retarded.
 - (4) Fire dampers DO NOT prevent spread of smoke through ductwork.

When a fire damper cannot fulfill the above functions and conditions, it is considered IMPAIRED.

REPAIR PRIORITY: Priority 3

- b. SMOKE DAMPERS are installed in HVAC ductwork and ventilation openings to resist spread of smoke through the ducts during a fire in the facility. The functions of smoke dampers include the following:
- (1) Remaining in the open position during normal operation, so as not to adversely affect normal operation of the ventilation systems in which the dampers are installed.
 - (2) Automatically closing when closure is initiated by a control system. A smoke damper is closed when a device on the damper is activated by an associated fire alarm system or by an associated smoke management system. (Damper closure devices can be electro thermal, electromagnetic, pneumatic, or hydraulic.) Smoke dampers must be able to successfully close under normal airflow, unless the actuating alarm or smoke management system also shuts down the ventilation system.
 - (3) When in the closed position, preventing the spread of smoke through the ductwork.

When a smoke damper cannot fulfill the above functions and conditions, it is considered IMPAIRED.

REPAIR PRIORITY: Priority 3

- a. COMBINED FIRE AND SMOKE DAMPERS are installed in HVAC ductwork to resist spread of smoke through the ducts which penetrate a fire barrier. The function of the combined fire a smoke damper includes the following:
- (1) Remaining in the open position during normal operation, so as not to adversely affect normal operation of the ventilation systems in which the dampers are installed.
 - (2) Automatically closing when exposed to fire effects or when closure is initiated by a control system. Fire and smoke damper actuation is typically by melting of a fusible link or actuation by a motor/control unit reading the signal of duct mounted smoke detector. Activation of either of these actuators results in closure of the fire smoke damper. Fire smoke dampers must be able to successfully close under normal ventilation system airflow unless the actuating alarm or smoke management system also shuts down the ventilation system.
 - (3) When in the closed position, preventing spread of flames, smoke, heat and significant hot gases through the ductwork, across the fire barriers in which the dampers are installed, so that fire spread from one side of a fire barrier to the other through the ductwork is prevented or retarded.

When a combined fire and smoke damper cannot fulfill the above functions and conditions, it is considered IMPAIRED.

REPAIR PRIORITY: Priority 3

- b. FIRE-STOP SYSTEMS or PENETRATION SEALS are installed in fire-rated barriers that have been penetrated. A penetration through a fire barrier may contain pressurized piping, cable trays, conduit, structural elements, power or signal cabling, etc. All penetrations of a fire barrier must be sealed appropriately. The functions of a penetration seal include the following:
- (1) Remaining in place in the wall or floor during normal ambient conditions and during a fire event.
 - (2) Preventing spread of fire through the fire rated barrier by preventing/retarding passage of flames, heat, hot gases and smoke through the penetration.

When a penetration seal cannot fulfill the above functions and conditions, it must be considered IMPAIRED.

REPAIR PRIORITY: Priority 3

- c. FIRE DOORS are installed in fire rated barriers equipped with openings allowing passage of people and equipment. The functions of a fire door include the following:
- (1) Returning to the closed and latched position when released from an open position, if the door is in the normally closed position.
 - (2) Automatically closing and latching when fire conditions are present on either side of the doorway, if the door is normally in the open position. The automatic actuation can occur when heat melts a fusible link on the door hardware, or it may occur when smoke actuates a smoke detection system adjacent to the doorway, which electrically releases magnetic switches that hold the door normally open.
 - (3) Preventing spread of significant flames, smoke, and hot gases from one side of the door to the other, thereby preventing or retarding spread of fire through the doorway to the non-fire side. Approval tests of fire doors per Underwriters Laboratories and NFPA standards allow some minimal flaming through the gap at the bottom of the door. NFPA 80 specifies the maximum allowable gap at the bottom of the door. This allowance for minimal flaming on the non-fire side is based on the expectation that a personnel access doorway will be clear of combustible materials on either side of the door – minimal flames under the door are therefore not expected to propagate the fire to the non-fire side.
 - (4) Remaining in a closed position in the wall where installed during fire conditions on either side of the door. NFPA 80 requires that the latch on a standard personnel fire door extend at least ½” and specified the maximum allowable gap between the edge of the door and the doorframe to ensure that the door will stay in the closed position during a fire.

When a fire door cannot fulfill the above functions and conditions, it must be considered IMPAIRED.

REPAIR PRIORITY: Priority 3

3. Possible abnormal circumstances and the appropriate actions to take if they occur are outlined below. However, every possible fire barrier condition that may occur is not addressed. When in doubt, err on the side of safety and take extra precautions. If additional guidance is needed, contact ER-FP at 7-9045.
 - a. If a normally closed or open fire door cannot close on its own, but once in the closed position will remain closed, and is otherwise unimpaired, no compensatory actions are required as long as the door is left in the closed position and some means is enforced to ensure that the door remains in the closed position unless in use (e.g., a sign on both sides of the door stating that it must be returned to the fully closed and latched position following use, and a periodic visual check during normal working hours to verify position).
 - b. If a fire door must be propped open for longer than 4 hours, then the restrictions identified in Section e below apply.
 - c. It is acceptable for a fire door to have up to three small electrical cords temporarily running beneath it for up to 8 hours. This does not make the fire door IMPAIRED as long as the door is able to close and latch. If the duration must extend beyond 8 hours, then the door should be considered IMPAIRED and the restrictions identified in Section e below apply.
 - d. If a fire barrier or sub-component of a fire barrier associated with a gaseous fire extinguishing system is damaged, modified or IMPAIRED such that the required concentration of gaseous extinguishing agent cannot or might not be maintained in the protected room for the required duration, then the associated gaseous fire extinguishing system it must be considered IMPAIRED. See the section above on gaseous fire extinguishing systems.
 - e. If fire doors, fire damper, smoke damper, fire/smoke damper or penetration seal is damaged or IMPAIRED such that it represents a breach in the fire barrier, compensatory actions may be required:
 - (1) If the damaged/IMPAIRED component is located in a fire barrier that forms a stairwell, or if it is located in a floor/ceiling between elevations of a multi-story building, then the item must be repaired as soon as possible, since these barriers are Life Safety Barriers. Impairments to these barriers are considered Fire Protection System Impairments, and should be documented in accordance with this Impairment Criterion. If the damaged/IMPAIRED component cannot be repaired within 10 working days, then an hourly fire watch is required on both sides of the affected barrier until repair/replacement. If the damaged/IMPAIRED component can be repaired/replaced within 10 working days, then no additional actions are required.
REPAIR PRIORITY: Priority 3
 - (2) If the damaged/IMPAIRED component is located in a fire barrier that separates a higher fire hazard from a lesser fire hazard, then the following applies:

- (a) If the area on either side of the affected fire barrier is protected by a sprinkler system, and that sprinkler system is operable, then no additional actions are required. Repair the damaged/IMPAIRED component as soon as possible. This type of impairment should be documented via the normal work control process to ensure that it is repaired in a timely manner.
REPAIR PRIORITY: Priority 3
- (b) If there is no sprinkler system on either side of the affected barrier, then repair the damaged/IMPAIRED component as soon as possible. If the damaged/IMPAIRED component is not repaired within 10 working days, then an hourly fire watch is required on both sides of the barrier during non-normal work hours. Otherwise, no additional actions are required. This type of impairment should be documented via the normal work control process to ensure that it is repaired in a timely manner.
REPAIR PRIORITY: Priority 3
- (3) If the damaged/IMPAIRED component located in a fire barrier is credited by a Fire Hazards Analysis for separation within a building to maintain potential loss due to a fire at less than \$3 million, then the following applies:
- (a) If the area on either side of the affected fire barrier is protected by a sprinkler system, and that sprinkler system is operable, then no additional actions are required. This type of impairment should be documented via the work control process to ensure that it is repaired in a timely manner.
REPAIR PRIORITY: Priority 3
- (b) If there is no sprinkler system on either side of the fire barrier, then an hourly fire watch on both sides of the barrier is until the damaged/IMPAIRED component is repaired (or at the frequency established by the facility's authorization basis document). Personnel in an occupied building can serve as the Fire Watch if they are directed/instructed to call 911 if fire or smoke is detected. Note that unoccupied areas of an otherwise occupied building must be provided with a Fire Watch, since personnel in the rest of the building will be unable to detect a fire in the unoccupied areas. This type of impairment should be documented via the normal work control process to ensure that it is repaired in a timely manner.
REPAIR PRIORITY: Priority 3

NOTE: At a nuclear facility the Technical Safety Requirement(s) (TSR) actions if applicable, may take precedence over the above criteria

E. FIRE PREVENTION MECHANISMS

Many LANL facilities employ fire prevention mechanisms as part of a Defense in Depth program of fire protection. These mechanisms do not constitute fire protection systems,

therefore are not directly covered by this Criterion. These mechanisms include such things as:

- Process monitoring and interlocks (ex. high temperature monitoring of exothermic processes).
- Diking/drainage providing containment for stored liquids including flammable/combustible liquids.
- Fail-safe design of processes (ex. fail-safe settings including heat sources off, agitation systems running, cooling water valves open, ventilation operating).
- Combustion safeguards for fuel-fired equipment.
- Programmatic combustible loading controls.

When the above types of mechanisms are temporarily impaired or suspended, consideration should be given to taking compensatory actions until these mechanisms can be returned to operable status. There is no requirement to initiate impairment as described by this Criterion, but compensatory actions are strongly recommended. EO-FIRE can provide guidance.

Appendix C Fire Watch Requirements

1.0 Scope

This procedure contains the requirements for providing a fire watch in facilities where automatic fire suppression or alarm systems are installed but are out of service and the affected area is unattended.

2.0 Requirements

The Facility Manager shall ensure that the following requirements are accomplished:

1. Fire watch personnel understand the specific nature of the impairment and the specific area affected.
2. Fire watch personnel for fire system impairments shall cover all areas affected by the impairment.
3. Fire watch personnel have been instructed in the appropriate emergency actions, including the best method for sounding an alarm, manually activating a suppression system if in service, a method for notifying the Fire Department of an emergency, and the proper use of a portable fire extinguisher.
4. Fire watch personnel have been instructed in the proper frequency of tours. Frequency of tours shall be:
 - a. Continuous when required by facility process standards or process controls.
 - b. Hourly when automatic suppression systems are out of service.
 - c. Once every 2 hours if only automatic alarm capability is out of service.
 - d. As amended by the Fire Protection Group or Fire Marshal.
5. Fire watch personnel shall be informed of unusual conditions (i.e. presence of combustible liquids) and any safety related items that are applicable to accomplishing the fire watch tasks safely.
6. Fire watch personnel have received formal Fire Extinguisher Hands-On Training within the last 12 months.

3.0 Records

A record of fire watch tours shall be maintained for two years or longer as directed by the Facility Manager. The record shall note the following, at a minimum:

- A. Name and organization of fire watch personnel.
- B. Date and time of required fire watch.
- C. Any unusual conditions observed.
- D. Description of any event requiring emergency response.

4.0 References

- A. NFPA 25, 2002 Edition,

Appendix D Fire Protection Impairments Process Flow Chart

