CRITERION 731

PORTABLE FIRE EXTINGUISHERS

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TABLE OF CONTENTS

1.0 PURPOSE 1
2.0 SCOPE 1
3.0 ACRONYMS AND DEFINITIONS 1
3.1 Acronyms 1
3.2 Definitions 2
4.0 RESPONSIBILITIES 2
4.1 FWO-Systems, Engineering and Maintenance (SEM) 2
4.2 FWO-Fire Protection (FWO-FIRE) 2
4.3 Facility Manager 2
4.4 Group Leader 3
4.5 Authority Having Jurisdiction (AHJ) – LANL Fire Marshal 3
4.6 Support Services Subcontractor (SSS) 3
5.0 PRECAUTIONS AND LIMITATIONS 3
5.1 Precautions 3
5.2 Limitations 3
6.0 REQUIREMENTS 4
6.1 Operations Requirements 4
6.2 Maintenance Requirements 5
6.3 Testing Requirements 7
7.0 RECOMMENDATIONS AND GOOD PRACTICES 9
7.1 Operations Recommendations 9
7.2 Maintenance Recommendations 9
8.0 GUIDANCE 9
8.1 Operations Guidance 9
8.2 Maintenance Guidance 10
9.0 REQUIRED DOCUMENTATION 10
10.0 REFERENCES 10
11.0 APPENDICES 11

CRITERION 731

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1.0 PURPOSE

The purpose of this Criterion is to establish the minimum requirements and best practices for maintenance of portable fire extinguishers at LANL.

This document addresses the requirements of LIR 230-05-01(Ref 10.1), "Operations and Maintenance Manual."

Implementation of this Criterion satisfies DOE Order 430.1A (Ref 10.2) for the subject equipment/system. DOE Order 430.1A (Ref 10.2) "Life Cycle Asset Management," Attachment 2 "Contractor Requirements Document," Paragraph 2, Sections A through C, which in part requires UC to "…maintain physical assets in a condition suitable for their intended purpose," and employ "preventive, predictive, and corrective maintenance to ensure physical asset availability for planned use and/or proper disposition." Compliance with DOE Order 430.1A is required by Appendix G of the UC Contract.

2.0 SCOPE

The scope of this Criterion includes the routine inspection, testing and preventive and predictive maintenance of portable fire extinguishers. This Criterion does not address corrective maintenance actions required to repair or replace equipment.

3.0 ACRONYMS AND DEFINITIONS

3.1 Acronyms

AHJ	Authority Having Jurisdiction
CFR	Code of Federal Regulations
DOE	Department of Energy
HMIS	Hazardous Materials Identification Systems
ITM	Inspections, Testing, and Maintenance
LIR	Laboratory Implementing Requirement
LPR	Laboratory Performance Requirement

O&M	Operations and Maintenance
PP&PE	Personal Property and Programmatic Equipment
RP&IE	Real Property and Installed Equipment
SSC	Structures, Systems, and Components
SSS	Support Services Subcontractors
UC	University of California

3.2 Definitions

Management Level Determination (ML1, ML2, ML3, ML4)-A classification system for determining the degree of management control applied to facility work. See LIR 230-01-02 for definitions of each ML level.

4.0 RESPONSIBILITIES

4.1 FWO-Systems, Engineering and Maintenance (SEM)

4.1.1 FWO-SEM is responsible for the administrative content of this Criterion and monitoring the applicability and the implementation status of this Criteria and either assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating their concerns to the director(s).

Basis: LIR 301-00-01.11; Issuing and Managing Laboratory Operations Implementation Requirements and Guidance, Section 5.4, OIC Implementation Requirements.

4.1.2 FWO-SEM shall provide technical assistance to support implementation of this Criterion.

4.2 FWO-Fire Protection (FWO-FIRE)

4.2.1 FWO-FIRE is responsible for the technical content of this Criterion and monitoring the proper implementation across the Laboratory.

4.2.2 FWO-FIRE shall provide technical assistance to support implementation of this Criterion.

4.3 Facility Manager

4.3.1 Responsible for operations and maintenance of institutional, or Real Property and Installed Equipment (RP&IE) under their jurisdiction, in accordance with the requirements of this document.

4.3.2 Responsible for operations and maintenance of those Personal Property and Programmatic Equipment (PP&PE) systems and equipment addressed by this document that may be assigned to the FM in accordance with the FMU-specific Facility/Tenant Agreement.

4.4 Group Leader

4.4.1 Responsible for operations and maintenance of those Personal Property and Programmatic Equipment (PP&PE) systems and equipment addressed by this document, which are under their jurisdiction.

4.4.2 Responsible for system performance analysis and subsequent replacement or refurbishment of assigned PP&PE.

4.5 Authority Having Jurisdiction (AHJ) – LANL Fire Marshal

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

4.5.2 The LANL Fire Marshal is the approval authority for all exceptions and variances to this Criterion.

4.6 Support Services Subcontractor (SSS)

4.6.1 Responsible for providing ITM of the fire protection systems addressed in this Criterion at the request of the responsible Facility Manager.

4.6.2 Responsible for coordinating work with the operating group and Facility Manager to conduct ITM in the affected area.

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Precautions

This section is not intended to identify all applicable precautions necessary for implementation of this Criterion. A compilation of all applicable precautions shall be contained in the implementing procedure(s) or work control authorization documents. The following precautions are intended only to assist the author of a procedure or work control document in the identification of hazards/precautions that may not be immediately obvious.

5.2 Limitations

The intent of this Criterion is to identify the minimum generic requirements and recommendations for SSC operation and maintenance 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 4330.4B (Ref. 10.3) as the minimum programmatic requirements for a 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 and exceptions to these requirements shall be prepared and submitted to FWO-SEM in accordance with LIR 301-00-02 (Ref. 10.4), "Variances and Exceptions to Laboratory Operations Requirements," for review and approval. The Criterion users are responsible for analysis of operational performance and SSC replacement or refurbishment based on this analysis. Laws, codes, contractual requirements, engineering judgement, safety matters, and operations and maintenance experience drive the requirements contained in this section.

6.1 Operations Requirements

6.1.1 Monthly Inspections

Inspect portable fire extinguishers to ensure the following:

(a) extinguishers are located in designated place,

(b) extinguishers are accessible and visible,

(c) operating instructions on nameplate are legible and facing outward,

(d) when "hefted" or weighed, extinguisher is determined to be full,

(e) safety seals and tamper indicators are unbroken,

(f) are free from physical damage, corrosion, leakage, or clogged nozzle,

(g) pressure gauge reading or indicator is in operational range or position,

(h) tires, wheels, carriage, nozzle and hose are in good condition (wheeled units only), and

(i) HMIS label is in place.

6.1.1.1 When an inspection of any fire extinguisher reveals a deficiency in any of the conditions listed above, personnel conducting inspections shall take immediate corrective action.

6.1.1.2 When inspection of any rechargeable extinguisher reveals a deficiency in conditions (c), (d), (e), (f), (g) above, the extinguisher shall undergo maintenance as described in Section 6.2 of this Criterion.

6.1.1.3 When an inspection of any nonrechargeable dry chemical fire extinguisher reveals a deficiency in any of the conditions (c), (d), (f), (g) above, it shall be removed form further use, discharged, and destroyed or returned to the manufacturer.

6.1.1.4 When an inspection of any nonrechargeable fire extinguisher containing a halon agent reveals a deficiency in any of the conditions (c), (d), (f), (g) above, it shall be removed from service, not discharged, and returned to the manufacturer. If the fire extinguisher is not returned to the manufacturer, it shall be returned to a fire equipment dealer or distributor to permit recovery of the halon.

6.1.1.5 Fire extinguishers removed from service due to unsatisfactory items discovered during inspection shall be replaced by a fire extinguisher suitable for the type of hazard being protected and shall be of at least equal rating.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4-3.2. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.2 Maintenance Requirements

Fire extinguishers removed from service for maintenance or recharge shall be replaced by a fire extinguisher suitable for the type of hazard being protected and shall be of at least equal rating.

6.2.1 Annual Maintenance

6.2.1.1 Fire extinguishers shall be subjected to maintenance at intervals of not more than 1 year, and at the time of hydrostatic test, and when specifically indicated by an inspection. Maintenance shall include a thorough examination of the following aspects of the extinguisher:

(a) mechanical parts,

(b) extinguishing agent,

(c) expelling means.

Exception: During annual maintenance, it is not necessary to internally examine nonrechargeable fire extinguishers, carbon dioxide fire extinguishers, or stored-pressure fire extinguishers except for those containing a loaded stream agent (see Section 6.2.1.2).

6.2.1.2 Stored-pressure type extinguishers containing a loaded stream agent shall be disassembled on an annual basis and subjected to complete maintenance. Prior to disassembly, the fire extinguisher shall be fully discharged to check the operation of the discharge valve and pressure gauge. The loaded stream charge shall be permitted to be recovered and re-used, provided it is subjected to agent analysis in accordance with manufacturer's instructions.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.2.2 Six Year Maintenance

6.2.3.1 Every 6 years, stored-pressure fire extinguishers that require a 12-year hydrostatic test shall be emptied and subjected to applicable maintenance. The removal of agent from halon agent fire extinguishers shall only be done using a listed halon closed recovery system. When the applicable maintenance procedures are performed during periodic recharging or hydrostatic testing, the 6-year requirement shall begin from that date. Each extinguisher that passes the six year maintenance shall be marked as required in NFPA 10, Chapter 4-4.

Exception: Nonrechargeable fire extinguishers shall not be hydrostatically tested but shall be removed from service at a maximum interval of 12 years from the date of manufacture. Nonrechargeable halon fire extinguishers shall be disposed of as noted above in Section 6.1.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.2.3 Seals or Tamper Indicators

At the time of the maintenance, the tamper seal of rechargeable fire extinguishers shall be removed by operating the pull pin or locking device. After the applicable maintenance procedures are completed, a new tamper seal shall be installed.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.2.4 Recharging

6.2.4.1 All rechargeable-type fire extinguishers shall be recharged after any use or as indicated by an inspection or when performing maintenance. Minimum intervals for recharging are as described in Appendix B to this Criterion.

6.2.4.2 When performing the recharging, follow NFPA 10 guidance and the manufacturer recommendations.

6.2.4.3 The amount of recharge agent shall be verified by weighing. The recharged gross weight shall be the same as the gross weight that is marked on the label.

6.2.4.4 After recharging, a leak test shall be performed on stored-pressure and self-expelling types of fire extinguishers.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.2.5 Maintenance Records

6.2.5.1 Tag or label the extinguisher to indicate what service was performed, service provider, and the date provided (month and year). A Verification of Service shall be placed on the extinguisher.

6.2.5.2 Each extinguisher that has undergone maintenance that includes internal examination or that has been recharged shall have a "Verification of Service" collar located around the neck of the container. The collar shall contain a single circular piece of uninterrupted material forming a hole of a size that will not permit the collar assembly to move over the neck of the container unless the valve is completely removed. The collar shall not interfere with the operation of the fire extinguisher. The "Verification of Service" collar shall include the month and year the service was performed, indicated by a perforation such as is done by a hand punch.

EXCEPTION: Cartridge/cylinder-operated fire extinguishers do not require a "Verification of Service" collar.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4-4. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.3 Testing Requirements

6.3.1 Conductivity Test

1. A conductivity test shall be conducted annually on all carbon dioxide hose assemblies. Hose assemblies found to be nonconductive shall be replaced.
2. Carbon dioxide hose assemblies that pass a conductivity test shall have the test information recorded on a suitable metallic label or equally durable material that has a minimum size of 1/2 in. 3 in. (1.3 cm 7.6 cm). The label shall be affixed to the hose by means of a heatless process. The label shall include the following information:

   (a) Month and year the test was performed, indicated by perforation, such as is done by a hand punch.

   (b) Name or initials of person performing the test, and the name of the agency performing the test.

   Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4. Compliance with this NFPA code is required per Appendix G of the UC contract.

6.3.2 Hydrostatic Testing

6.3.2.1 Hydrostatic testing shall be performed by persons trained in pressure testing procedures and safeguards who have suitable testing equipment, facilities, and appropriate servicing manual(s) available.

6.3.2.2 Hydrostatic testing shall be conducted using water or some other noncompressible fluid as the test medium. Air or other gases shall not be used as the sole medium for pressure testing. All air shall be vented prior to hydrostatic testing to prevent violent and dangerous failure of the cylinder.

6.3.2.3 A hydrostatic test shall always include both an internal and external visual examination of the cylinder. Where a fire extinguisher cylinder or shell has one or more of the following conditions, it shall not be hydrostatically tested, but shall be condemned or destroyed by the owner or at the owner's direction:

- where repairs by soldering, welding, brazing, or use of patching compounds exist,
- where the cylinder threads are worn, corroded, broken, cracked, or nicked.
- where there is corrosion that has caused pitting, including pitting under a removable nameplate or name band assembly,
- where the fire extinguisher has been burned in a fire,
- where a calcium chloride type of extinguishing agent was used in a stainless steel fire extinguisher,
- were the shell is of copper or brass construction joined by soft solder or rivets,
- where the depth of a dent exceeds 1/10 of the greatest dimension of the dent if not in a weld, or exceeds 1/4 in. (0.6 cm) if the dent includes a weld,
- Where any local or general corrosion, cuts, gouges, or dings have removed more than 10 percent of the minimum cylinder wall thickness.
- were a fire extinguisher has been used for any purpose other than that of a fire extinguisher.

6.3.2.4 When a fire extinguisher cylinder, shell, or cartridge fails a hydrostatic pressure test, or fails to pass a visual examination, it shall be condemned or destroyed by the owner or the owner's agent. When a cylinder is required to be condemned, the re-tester shall notify the owner in writing that the cylinder is condemned and that it cannot be re-used.

Condemned cylinders shall be stamped "CONDEMNED" on the top, head, shoulder, or neck with a steel stamp. Minimum letter height shall be 1/8in.

(0.3 cm). A condemned cylinder shall not be repaired. No person shall remove or obliterate the "CONDEMNED" marking.

6.3.2.5 Fire extinguishers shall be hydrostatically tested per guidance in NFPA 10, Chapter 5, and at the intervals indicated in Table 5-2 in NFPA 10 (See Appendix A of this Criterion).

A hydrostatic test shall also be performed on fire extinguisher hose assemblies equipped with a shutoff nozzle at the end of the hose. The test interval shall be the same as specified for the fire extinguisher on which the hose is installed.

6.3.2.6 A permanent record shall be maintained for each cylinder tested.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 5. Compliance with this NFPA code is required per Appendix G of the UC contract.

7.0 RECOMMENDATIONS AND GOOD PRACTICES

The information provided in this section is recommended based on acceptable industry practices and should be implemented by each user based on his/her unique application and operating history of the subject systems/equipment.

7.1 Operations Recommendations

7.1.1 Employee Training

Group leaders should ensure employees receive fire extinguisher familiarization training upon initial employment.

Basis: FWO-FIRE recommendation.

7.1.2 Procurement

FWO-FIRE should pre-approve all purchases of portable fire extinguishers to ensure proper size and type for in the intended application. Portable fire extinguishers are to be approved and listed by a national testing laboratory for their intended use.

7.1.3 Persons other than SSS Fire Protection Maintenance personnel may conduct inspection requirements identified in this document.

7.2 Maintenance Recommendations

7.2.1 Not applicable.

8.0 GUIDANCE

8.1 Operations Guidance

8.1.1 Not applicable.

8.2 Maintenance Guidance

8.2.1 Not applicable.

9.0 REQUIRED DOCUMENTATION

Maintenance history shall be maintained for portable fire extinguishers 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**
Fire Extinguisher Maintenance Activities				
Repair / Adjustments	**X**	**X**	**X**	**X**
PM Activities	**X**	**X**	**X**	**X**
Fire Extinguisher Equipment Problems				
Failure Dates	**X**	**X**	**X**	**X**
Failure Root Cause	**X**	**X**	**X**	**X**
Fire Extinguisher Inspection Results				
Inspection Date	**X**	**X**	**X**	**X**
SSC Condition	**X**	**X**	**X**	**X**

Basis: Documentation of the parameters listed in Table 9-1 above satisfies the requirements of LPR 230-07-00, Criteria 2, (Ref. 10.5) which states; "Maintenance activities, equipment problems, and inspection and test results are documented."

10.0 REFERENCES

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

10.1 LIR 230-05-01.0, Operation and Maintenance Manual.

10.2 DOE O 430.1A, Attachment 2 "Contractor Requirements Document" (Paragraph 2, Sections A through C), a requirement of Appendix G of the UC Contract.

10.3 DOE Order 4330.4B, Maintenance Management Program, Section 3.4.9.

10.4 LIR 301-00-02.0, Variances and Exceptions to Laboratory Operation Requirements.

10.5 LPR 230-07-00, Maintenance History, Performance Criteria [2].

10.6 NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers.

11.0 APPENDICES

Appendix A: Hydrostatic Test Interval for Fire Extinguishers
Appendix B: Recharging Interval for Fire Extinguishers

APPENDIX A

Hydrostatic Test Interval for Extinguishers (NFPA 10, Table 5-2)

Extinguisher Type	Test Interval (Years)
Stored-pressure water, loaded stream, and/or antifreeze	5
Wetting agent	5
AFFF (aqueous film-forming foam)	5
FFFP (film-forming fluoroprotein foam)	5
Dry chemical with stainless steel shells	5
Carbon dioxide	5
Wet chemical	5
Dry chemical, store-pressure, with mild steel shells, brazed brass shells, or aluminum shells	12
Dry chemical, cartridge or cylinder-operated, with mild steel shells	12
Halogenated agents	12
Dry powder, stored-pressure, cartridge or cylinder-operated, with mild steel shells	12

NOTE: Stored-pressure water extinguishers with fiberglass shells (pre-1976) are prohibited from hydrostatic testing due to manufacturer's recall.

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4-5. Compliance with NFPA code is required per Appendix G in the UC contract.

APPENDIX B

Recharging Interval for Fire Extinguishers

Extinguisher Type	Recharging Interval
Pump tank water extinguishers	Annually (new chemicals or water, as applicable)
Pump tank calcium chloride-based antifreeze extinguishers	Annually (new chemicals or water, as applicable)
Stored-pressure wetting agent extinguishers	Replace agent annually
Liquid charge-type AFFF extinguishers	Replace pre-mixed agent at least every three years
Liquid charge-type FFFP extinguishers	Replace pre-mixed agent at least every three years
Solid charge-type AFFF extinguishers	Replace agent once every five years
Non-pressurized AFFF and FFFP fire extinguishers	Agent is subjected to agent analysis per manufacturer's recommendations

Basis: NFPA 10, 1998 Edition Standard for Portable Fire Extinguishers, Chapter 4-5. Compliance with NFPA code is required per Appendix G in the UC contract.