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CONDUCT OF MAINTENANCE (P950)
OPERATIONS AND MAINTENANCE MANUAL
OPERATIONS & MAINTENANCE CRITERION

TITLE: EMERGENCY LIGHTING SYSTEM

Name	Organization	Date	Signature
Criterion Author:			
Duane Nizio Maintenance Manager	MSS-MP	6/30/2010	Signature on File (mm)
Approved by: Charles Anderson NHHO Deputy Associate Director	ADNNHO	07/01/2010	Signature on File (mm)
Issuing Authority: Susanne Waylett MSS Division Leader	MSS-DO	07/01/2010	Signature on File (mm)

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RECORD OF REVISIONS

Revision No.	Date	Description
0	8/27/98	Initial Issue. Reformatted to support LIR 230-05-01 (replaces 3.9-502, Rev. 0).
1	10/26/01	This revision includes the addition of a Table of Contents, the use of Basis statements in Sections 6 and 7; further clarification based on the new criterion 101 Writer's Guide as well as the incorporation of ORPS & NRC lessons learned 1/1/95 to 6/2000.
2	06/23/2010	Changes reflect Division reorganization Change references to reflect IMP 951-1 to P 950 Change all references to ISD 951-1 to P 950 Remove DOE 430.1B references from Section 1 • Added recommendations from EPRI Emergency Battery Lighting Unit Maintenance and Application Guide

TABLE OF CONTENTS

CRITERION 503
EMERGENCY LIGHTING SYSTEM

1.0 PURPOSE

The primary purpose of this unit emergency lighting equipment maintenance document is to reduce hazards to life and property that can result from failure or malfunction of emergency lighting systems in LANL facilities.

This document addresses the requirements of P 315, *Conduct of Operations Manual,* and P 950, *Conduct of Maintenance*, by defining the minimum operations and maintenance criteria for structures, systems, and components that it covers. The criterion lists requirements that are based on codes, standards, contract commitments, lessons learned, or business case. It also lists recommendations based on industry practices, operational experience, or business case. Guidance for implementation of the requirements and recommendations is also provided.

2.0 SCOPE

The scope of this Criterion includes the routine inspection, testing and preventive and predictive maintenance of emergency lighting systems installed per NFPA 101 Life Safety Code and ANSI/NFPA 70, National Electrical Code. This document establishes minimum requirements for the operation, maintenance, and repair of unit emergency lighting systems. . **Note**: Battery maintenance for central station emergency lighting system is covered in Criterion 511, *Stationary System Batteries.* (Ref. 10.11) 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
FOD	Facility Operations Director
LANL	Los Alamos National Laboratory
ML	Management Level
MM	Maintenance Manager
MSS	Maintenance and Site Services

OM	Operations Manager
O&M	Operations and Maintenance
NFPA	National Fire Protection Association
PPE	Personal Protective Equipment
PP&PE	Personal Property and Programmatic Equipment
RP&IE	Real Property and Installed Equipment
SSC	Structures, Systems, and Components
TSR	Technical Safety Requirements

3.2 Definitions

Cleaning - Removing accumulated dirt and other contaminants from lamps, reflectors and lenses.

Emergency Lighting - Illumination of means of egress (corridors, stairways, etc.) or other areas in a building that require illumination during any loss of normal electrical power.

Functional Testing - Checking that unit emergency lighting fixture batteries, charger, and lamps operate properly.

Inspecting - Checking unit emergency lighting fixtures to verify that it is physically intact, securely mounted, directional lamps are properly aimed, lighting distribution is not blocked.

Management Level (ML1, ML2, ML3, ML4) - ML designation is used to grade the structures, systems, equipment, and components and associated activities based on their importance to the protection of the public, environment, and workers, security, and the Laboratory mission. See AP 341-502 for definitions of each ML level.

Unit Emergency Lighting Equipment - Unit emergency lighting equipment consists of: (1) a rechargeable battery, (2) a battery charging means, (3) one or more lamps mounted on the unit or terminals for one or more remote lamps, (4) a relaying device arranged to energize the lamps automatically upon failure of the supply to the unit equipment. The most common examples of unit emergency lighting equipment are (a) wall-mounted, two-lamp incandescent units and (b) battery/inverter/ballast units in ceiling mounted fluorescent fixtures, and (c) internally illuminated exit signs. (NFPA 70 Section 700-12e). (Ref. 10.6)

4.0 RESPONSIBILITIES

4.1 MSS-Division Leader (MSS-DL)

Receives and approves or rejects, in conjunction with the AHJ, requests for variances from this criterion. Maintains the record of decision for all variance requests.

4.2 MSS- Maintenance Programs (MSS-MP)

MSS-MP is responsible for the technical content, monitoring the applicability and the implementation status of this Criterion. MSS-MP will assist organizations that are not applying or meeting implementation expectations or will elevate concerns to the appropriate level of LANL management.

4.3 Facility Operations Director (FOD)

The FOD is responsible for implementation of this O&M Criterion for identified systems/equipment within their facility boundaries.

4.4 Operations Manager (OM)

The OM is responsible to the FOD for implementing operation portions of this Criterion and for coordinating transfer of systems/equipment to the Maintenance Manager for maintenance activities. The OM with concurrence of the FOD will prioritize implementation within budget allocations.

4.5 Maintenance Manager (MM)

The MM is responsible to the FOD and the MSS-Division Leader for implementing the maintenance portions of this Criterion and for coordinating the transfer of systems/equipment to the Operations Manager at the conclusion of maintenance activities. The MM with concurrence of the FOD will prioritize implementation within budget allocations.

4.6 Authority Having Jurisdiction (AHJ)

The AHJ (Point of Contact Chapter 7 Electrical Chapter) of the LANL Engineering Manual) is responsible for providing a decision on specific technical questions regarding the systems or equipment relevant to this criterion.

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Precautions

This section is not intended to identify all applicable precautions necessary for implementation of this Criterion. However, all applicable precautions should 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 and precautions that may not be immediately obvious.

5.1.1 Dispose of unit emergency lighting fixture batteries in accordance with the requirements of P 409 Waste Management.

5.1.2 Work should be performed within the requirements of P 101-13, Electrical Safety Program.

5.2 Limitations

The intent of this Criterion is to identify the minimum requirements and recommendations for SSC operation and maintenance across the Laboratory. Each Criterion 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, manufacturer 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 should implement the requirements of DOE Order 433.1A 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 or the Code of Federal Regulations (CFR) as applicable.

Nuclear facilities, certain high hazard facilities and explosives facilities may have additional facility specific requirements beyond those presented in this Criterion which are contained in the Documented Safety Analysis (DSA), Technical Safety Requirements (TSR), or facility safety plans, as applicable.

6.0 REQUIREMENTS

Minimum requirements for all users are specified in this section. Requested variances to these requirements shall be prepared and submitted to MSS-MP for review and approval. The MSS Division Leader approves or denies variances. The Criterion users are responsible for analysis of operational performance and SSC replacement or refurbishment based on this analysis. Laws, codes, contractual requirements, engineering judgment, safety matters, and operations and maintenance experience drive the requirements contained in this section.

Note: Discovery of SSC with a degraded or non-conforming condition is a triggering input to the Operability Determination and Functional Assessment process defined in AP-341-516. Degraded or non-conforming conditions include, but are not limited to, failed equipment or components, unsatisfactory readings, code or standard violations and fire protection impairments. Personnel performing tests or inspections under this O&M Criterion are not responsible nor authorized to perform the Operability Determination. Any degraded or non-conforming condition discovered under this O&M Criterion shall be

communicated to the FOD Representative for input to the AP-341-516 process. While that process may not apply in Low Hazard Non-Nuclear and Office facilities, the same concept applies. The FOD organization is responsible to determine the response (taking equipment out of service, establishing fire watches, limiting operations, etc.) to SSC degraded and non-conforming conditions

6.1 Operations Requirements

6.1.1 A visual inspection and functional test shall be conducted on every required battery-powered emergency lighting system at 30-day intervals. The functional test shall last a minimum of 30 seconds. Equipment shall be fully operational for the duration of the test. Written records of visual inspections and tests shall be kept by the owner for inspection by the authority having jurisdiction.

Exception: Self-testing/self-diagnostic, battery-operated emergency lighting equipment that automatically performs a minimum 30 second test and diagnostic routine at least once every 30 days and indicates failures by a status indicator shall be exempt from the 30 day functional test, provided a visual inspection is performed at 30 day intervals.

Basis: ANSI/NFPA 101 Section 7. 9. 2. ***Battery powered exit signs require testing as prescribed by 6.1.1 Self illuminated exit signs need only to be visually inspected every 30 days.***

Basis: ANSI/NFPA 101 Section 7.10.9.

6.2 Maintenance Requirements

6.2.1 A visual inspection and functional test shall be conducted on every required battery-powered emergency lighting system annually. The functional test shall be for duration of 90 minutes. Equipment shall be fully operational for the duration of the test. Written records of visual inspections and tests shall be kept by the owner for inspection by the authority having jurisdiction.

Basis: ***ANSI/NFPA 101 Section 7. 9.3.Battery powered exit signs require testing as prescribed by 6.1.2 Self illuminated exit signs need only to be visually inspected every 30 days.***

Basis: ANSI/NFPA 101 Section 7.10.9.

7.0 RECOMMENDED 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 the unique application and operating history of the subject systems/equipment.

7.1 Operations Recommendations

7.1.1 Initial Set-up

7.1.1.1 Perform a "Black out Operational Test" to verify under actual black out conditions that the emergency lighting system can meet its design function and to establish a baseline for future tests and inspections.

Basis: EPRI Emergency Battery Lighting Unit Maintenance and Application Guide Section 7.2

7.2 Maintenance Recommendations

7.2.1 Annually

7.2.1.1 Verify aim of lamps along the means of egress.

Basis: IESNA recommendation (Chapter 29 of Handbook).

Clean fixtures annually.

Basis: O&M Criterion 501 Rev. 0, Interior Lighting Systems

8.0 GUIDANCE

8.1 Operations Guidance

Emergency lighting systems covered by this criteria operate automatically during loss of normal power events.

8.2 Maintenance Guidance

Information on maintaining emergency lighting systems may be found in PMI 40-10-012 Emergency Light Inspection, Testing and Maintenance and EPRI Emergency Battery Lighting Unit Maintenance and Application Guide.

9.0 REQUIRED DOCUMENTATION

Maintenance history shall be maintained for (electric motors) 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**
PM Activities				**X**
Equipment Problems				
Failure Dates				**X**

Failure Root Cause				
Inspection Results				
Inspection Date				**X**
SSC Condition				**X**
Inspection Logs				**X**

Note: The emergency lighting systems covered by this criteria have been determined to be ML 4.

Basis: Documentation of the parameters listed in Table 9-1 above satisfies the requirements of P 950, Section 3.5.15 which states, "A maintenance history and trending program is maintained to document data, provide historical information for maintenance planning, and support maintenance and performance trending of facility systems and components".

Note: Retain written records of monthly inspections of each unit emergency lighting fixture for one year.

Retain written records of annual inspections of each unit emergency lighting fixture as long as the fixture is installed.

10.0 REFERENCES

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

10.1 P 315, Conduct of Operations Manual

10.2 P 950, Conduct of Maintenance

10.3 AP-341-502, Management Level Determination

10.4 DOE Order 433.1A, *Maintenance Management Program for DOE Nuclear Facilities*

10.5 DOE Order 430.1B, Real Property Asset Management (for non-nuclear facilities)

10.6 PD 311 Requirements System and History

10.7 ANSI/NFPA 70, National Electric Code

10.8 ANSI/NFPA 101, Life Safety Code

10.9 P409 Waste Management

10.10 PMI 40-10-01`2 Emergency Light Inspection, Testing and Maintenance

10.11 IESNA, Lighting Handbook, Chapter 29

10.12 O&M Criterion 511 Rev. 0, Stationary System Batteries

10.13 P101-13 Electrical Safety Program

10.14 O&M Criterion 501 Rev. 0, Interior Lighting Systems

10.15 EPRI Emergency Battery Lighting Unit Maintenance and Application Guide

11.0 APPENDICES

None