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

**TITLE: EMERGENCY EYE WASH AND SHOWER EQUIPMENT**

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 <p><b>Los Alamos</b> NATIONAL LABORATORY EST. 1943</p>	<p><i>Conduct Of Maintenance (P 950)</i> Operations And Maintenance Manual Emergency Eye Wash and Shower Equipment</p>	<p>Criterion 407, R2 Page 2 of 13</p>
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## RECORD OF REVISIONS

<b>Revision No.</b>	<b>Date</b>	<b>Description</b>
0	12/17/98	Initial Issue
1	12/06/02	Revision incorporating ANSI Z358.1-1998 Standard for Emergency Eyewash and Shower Equipment and formatting based on 101 Criterion Writer's Guide Rev. 3.
2	3/31/10	Revised document to reflect current LANL organizations, update references and align requirements to current expectations contained within ANSI Z358.1-2009, American National Standard for Emergency Eyewash and Shower Equipment as modified by P 101-14 Chemical Management Revision 1. Note P101-14 Chemical Management Revision 2 Provisional Document becomes effective 10/11/2010. This document addresses the changes in safety shower flow test frequency invoked by this revision.

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## CRITERION 407

### EMERGENCY EYE WASH AND SHOWER EQUIPMENT

#### 1.0 PURPOSE

The purpose of this Criterion is to establish the minimum requirements and best practices for operation and maintenance of emergency eyewash and shower equipment at LANL.

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 operation, inspection, testing and preventive maintenance of emergency eyewash and shower equipment. 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
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
DOE	Department of Energy
FOD	Facility Operations Director
LANL	Los Alamos National Laboratory
MM	Maintenance Manager
MSS	Maintenance and Site Services
OM	Operations Manager
O&M	Operations and Maintenance
PPE	Personal Protective Equipment
SSC	Structures, Systems, and Components

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### 3.2 Definitions

**Bump Test** - A momentary activation (on/off) of an eyewash activation lever to verify flow.

**Combination Unit** - An interconnected assembly of emergency equipment supplied by a single source of flushing fluid.

**Emergency Shower** - A device specifically designed and intended to deliver flushing fluid in sufficient volume to cause that fluid to cascade over the entire body.

**Eye/Face Wash**- A device used to provide fluid to irrigate and flush both the face and the eyes simultaneously.

**Eyewash** - A device used to provide fluid to irrigate and flush the eyes.

**Drench Hose** - A supplemental device consisting of a flexible hose connected to a flushing fluid supply used to provide fluid to irrigate and flush face and body areas.

**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.

**Plumbed** - A term used to describe equipment that is connected to a continual source of potable water.

**Self-Contained** - A term used to describe a stand-alone device containing flushing fluid.

**Tepid** - A flushing fluid temperature conducive to promoting a minimum 15 minute irrigation period. A suitable range is 16 - 38° C (60 – 100° F).

## 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 (MP)

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)

Responsible for implementation of this O&M Criterion for identified systems/equipment within their facility boundaries.

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**4.4 Operations Manager (OM)**

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)**

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 for the Mechanical 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.

**4.7 Employees**

Employees who may be exposed to hazardous materials shall know the location and operation of nearest eyewash/emergency shower.

**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 Flowed water generated during test actuation of safety showers/eye washes in locations with potential contamination must be disposed of properly.
- 5.1.2 Outdoor eye wash stations with potential for freezing must comply with O&M Criterion, 401 Freeze Protection.
- 5.1.3 Water temperature at safety showers and eyewash stations should never be more than tepid (lukewarm).
- 5.1.4 A means shall be provided to ensure that a controlled flow of flushing fluid is provided at a velocity low enough to be non-injurious to the user.

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## 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 433.1B 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 Surveillance Requirements (TSR), or facility safety plans, as applicable.

## 6.0 REQUIREMENTS

Minimum requirements for all Criterion 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

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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.

Requirements for Criterion 407: *Emergency Eyewash and Shower Equipment* are based on ISEA/ANSI Z358.1-2009, American National Standard for Emergency Eyewash and Shower Equipment with the following exceptions/clarifications:

- A. Tepid requirement applies only to new installations after 2002.
- B. No weekly emergency shower activation requirement Reference 6.2.2 below for Quarterly Emergency Shower Requirement.

*Basis: Approved change to Work Smart Standards (WSS) by Change Control Board (CCB) on 4/23/02. In accordance with P 101-14 Chemical Management, 2010.*

## 6.1 Operations Requirements

### 6.1.1 Weekly

6.1.1.1 Plumbed eyewashes shall be activated weekly for a period long enough to verify operation and ensure that flushing fluid is available.

6.1.1.2 Plumbed eye/face washes shall be activated weekly for a period long enough to verify operation and ensure that flushing fluid is available.

6.1.1.3 Plumbed combination units shall be activated weekly for a period long enough to verify operation and ensure that flushing fluid is available.

6.1.1.4 Plumbed drench hoses shall be activated weekly for a period long enough to verify operation and ensure that flushing fluid is available.

*Basis: ANSI Z358.1-2009, American National Standard for Emergency Eyewash and Shower Equipment, Sections 4.6.2, 5.5.2, 6.5.2, 7.5.2, and 8.2.4.2.*

6.1.2 Employees who may be exposed to hazardous materials shall be instructed in the location and proper use of emergency showers, eyewashes, eye/face washes, combination units, and drench hoses.

*Basis: ANSI 2358 1-2009 American Standard for Emergency Eyewash And Shower Equipment, Sections 4.6.4, 5.5.4, 6.5.4, 7.5.4, and 8.2.4.4. And in accordance with, P 101-14 Chemical Management, 2010, Page 12*

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## **6.2 Maintenance Requirements**

### **6.2.1 Self-Contained**

6.2.1.1 Self-Contained emergency showers, eyewashes, eye/face washes, combination Units, and drench hoses shall be visually checked to determine if flushing fluid needs to be changed or supplemented. Such inspections shall be conducted in accordance with manufacturer's instructions.

6.2.1.2 Self-contained units include either being filled with water and bacteriostatic solution, with the solution being changed at least every six months, or installed with an eyewash cartridge which has a shelf life of 2 years, which must be replaced on or before the manufacturer's expiration date

*Basis:* ANSI Z358.1-2009 American National Standard for Emergency Eyewash and Shower Equipment, Sections 4.6.3, 5.5.3, 6.5.3, 7.5.3, and 8.2.4.3. and Select Safety Sales .com (SSS) April 22, 2009.

### **6.2.2 Monthly Emergency Showers (effective until 10/10/2010)**

6.2.2.1 Plumbed Emergency Showers shall be activated monthly for a period long enough to verify operation and ensure that flushing fluid is available.

*Basis:* P 101-14 Chemical Management, Rev. 1, Section 1.10

### **6.2.3 Quarterly Emergency Showers (becomes effective 10/11/2010)**

6.2.3.1 Plumbed Emergency Showers shall be activated quarterly for a period long enough to verify operation and ensure that flushing fluid is available

*Basis:* P 101-14 Chemical Management, Rev. 2, Section 1.10, which becomes effective on 10/11/2010.

### **6.2.4 Annual Emergency Showers**

6.2.4.1 All emergency showers shall be inspected annually to assure conformance with the following requirements:

- With the unit correctly connected to the flushing fluid source and the valve(s) closed, visually check the piping connections for leaks.
- Open the valve to the full open position. The valve shall remain open without requiring further use of the operator's hands.
- With the valve in the fully opened position, measure the diameter of the spray pattern. It shall be a minimum of 50.8 cm (20in.) at 152.4 cm (60in) above the standing surface. The flushing fluid shall be substantially dispersed throughout the pattern.



- Using the flowmeter or other means, determine that the rate of flow is at least 75.7 liters per minute (20gpm)
- Using a temperature gauge or other means, determine that the flushing fluid is tepid.

*Basis:* ANSI Z358.1-2009 *American National Standard for Emergency Eyewash and Shower Equipment*, Section 4.5.7.

### **6.2.5 Annual Eyewash Equipment**

6.2.5.1 All eyewashes shall be inspected annually to ensure conformance with the following requirements:

- With the unit correctly connected to the flushing fluid source and the valve(s) closed, visually check the piping connections for leaks.
- Open the valve to the full open position. The valve shall remain open without requiring further use of the operator's hands.
- With the valve in the fully open position, make sure that both eyes will be washed simultaneously at a velocity low enough to be non-injurious to the user.
- Using the flowmeter or other means, determine that the rate of flow is at least 1.5 liters per minute (0.4 gpm). A test gauge can be used to verify minimum flow characteristics.
- Using a temperature gauge or other means, determine that the flushing fluid is tepid.

*Basis* ANSI Z358.1-2009 *American National Standard for Emergency Eyewash and Shower Equipment*, Section 5.4.7.

### **6.2.6 Annual Eye/Face Wash Units**

6.2.6.1 All eye/face washes shall be inspected annually to assure conformance with the following requirements:

- With the unit correctly connected to the flushing fluid source and the valve(s) closed visually check the piping connections for leaks.
- Open the valve to the full open position. The valve shall remain open without requiring further use of the operator's hands.
- With the valve in the fully opened position make sure that both eyes and face will be washed simultaneously at a velocity low enough to be non-injurious to the user.

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- Using the flowmeter or other means, determine that the rate of flow is at least 11.4 liters per minute (3.0gpm). A test gauge can be used to verify minimum flow characteristics.
- Using a temperature gauge or other means, determine that the flushing fluid is tepid.

*Basis* ANSI Z358.1-2009 American National Standard for Emergency Eyewash and Shower Equipment, Section 6.4.7.

### **6.2.7 Annual Combination Units**

6.2.7.1 All combination units shall be inspected annually to assure conformance with the following requirements:

- With the unit correctly connected to the flushing fluid source and the valve(s) closed, visually check the piping connections for leaks.
- Open the emergency shower and eyewash or eye/face wash valves to the full open position. The valves shall remain open without requiring further use of the operators hands.
- Activate the valves and check the performance of the emergency shower, eyewash, and eye/face wash valves as described in sections 6.2.2, 6.2.3, 6.2.4 respectively , while operating simultaneously.
- Using a temperature gauge or other means, determine that the flushing fluid is tepid.

*Basis:* ANSI Z358.1-2009 American National Standard for Emergency Eyewash and Shower Equipment, Section 7.4.6

### **6.2.8 Annual Drench Hoses**

6.2.8.1 All drench hoses shall be inspected annually to assure conformance with the requirements in section 6.2.4.

*Basis:* ANSI Z358.1-2009 American National Standard for Emergency Eyewash and Shower Equipment, Section 8.2.1.

## **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**

Bump test eyewash units and eye-face wash units weekly to verify flow.

**7.2 Maintenance Recommendations**

- 7.2.1 Individual(s) performing maintenance should be familiar with the recommended supporting information of ANSI Z358.1-2009 *American National Standard for Emergency Eyewash and Shower Equipment* and the manufacturer’s recommendations.
- 7.2.2 Repair or replace damaged or worn components as soon as possible. Replace spray covers, filters and flow controls as recommended by the manufacturer.
- 7.2.3 Use ANSI approved eyewash tester gauges to verify that the flow pattern is correct.

**8.0 GUIDANCE**

**8.1 Operations Guidance**

No Operations Guidance

**8.2 Maintenance Guidance**

The most recent version of PMI 40-35-016, *Safety Shower Inspection and Testing* may be used to meet the requirements of this O&M Criterion.

**9.0 REQUIRED DOCUMENTATION**

Test and Inspection records shall be maintained to verify ANSI Z358.1-2009 requirements are met.

**Table 9-1 Documentation Parameters**

<b>MAINTENANCE HISTORY DOCUMENTATION PARAMETERS</b>				
<b>PARAMETER</b>	<b>ML 1</b>	<b>ML 2</b>	<b>ML 3</b>	<b>ML 4</b>
<b>Flow Activation</b>				
Eyewash	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Safety Shower	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Annual Inspection</b>				
Inspection Date	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

*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*

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*information for maintenance planning, and support maintenance and performance trending of facility systems and components”*

## **10.0 REFERENCES**

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

- 10.1** ANSI Z358.1-2009, American National Standard for Emergency Eyewash and Shower Equipment
- 10.2** AP 341-502, Management Level Determination
- 10.3** AP-341-502, Management Level Determination
- 10.4** P 315, Conduct of Operations Manual
- 10.5** P 950, Conduct of Maintenance
- 10.6** O&M Criterion, 401 Freeze Protection
- 10.7** P 101-14 Chemical Management Revision 1
- 10.8** P101-14 Chemical Management Revision 2 Provisional Document, effective on 10/11/2010
- 10.9** PMI 40-35-016, Safety Shower Inspection and Testing

## **11.0 APPENDICES**

None