

 <p>Los Alamos NATIONAL LABORATORY EST. 1943</p>	<p><i>Conduct of Maintenance (P 950)</i> Operations and Maintenance Manual Roll-Up/Overhead Doors</p>	<p>Criterion 605, R1 Page 2 of 16</p>
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RECORD OF REVISIONS

Revision No.	Date	Description
0	01-03-01	Initial Issue - Reviewed DOE complex operating experiences from January 1995 to May 2000.
1		Updated format, updated organization names, reviewed DOE complex operating experience from 2001 to 2010.

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CRITERION 605

ROLL-UP/OVERHEAD DOORS

1.0 PURPOSE

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 all LANL facility and programmatic roll-up/overhead doors with the exception of fire doors. Responsible organizations that operate and maintain SSCs addressed by this Criterion must establish appropriate implementing processes and procedures to meet the stated requirements. AP-MNT-006 Rev.3, "Predictive and Preventive Maintenance", provides guidance on the creation and management of predictive and preventive maintenance procedures. The Operation and Maintenance Criterion for Fire Doors is in the Section 700 Criterion series with the AHJ being the LANL Fire Marshal. Maintenance of the drive motors for doors is covered separately in Criterion 510 "Electric Motors".

3.0 ACRONYMS AND DEFINITIONS

3.1 Acronyms

AHJ	Authority Having Jurisdiction
CFR	Code of Federal Regulations
CMMS	Computerized Maintenance Management System
DOE	Department of Energy
FOD	Facility Operations Director
LANL	Los Alamos National Laboratory
MM	Maintenance Manager
MSS	Maintenance and Site Services
MSS-MP	Maintenance and Site Services - Maintenance Programs
OM	Operations Manager
O&M	Operations and Maintenance
PMI	Preventative Maintenance Instruction
SSC	Structures, Systems, and Components

3.2 Definitions

Chain Hoist Assembly: This is a manually driven mechanism that is attached to the shaft of the door assembly and provides a method for opening and closing non-electric roll-up/overhead doors.

Door Cycle: Positioning of the door from closed to open and then closed again.

Electric Operator: These devices are mechanisms that include an electric motor, gear reducers and drive links that open and close overhead and roll-up doors.

Emergency Release: This release is a manual lever that allows an overhead door to be opened and closed manually. This device is a standard requirement for electric-powered overhead doors. It is utilized during emergencies such as electrical power outages, flooding conditions and equipment failures.

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.

Overhead Door: A type of large opening door that consists of separate horizontal panels that are hinged together to form a complete door enclosure. This configuration of panels is also known as a sectional door. Either an electric motor or a manual chain hoist that drives a geared mechanism operates them.

Roll-up Door: These devices are doors that consist of separate horizontal thin panels that are fastened together and can be rolled up into a housing above the door opening. Either an electric motor or a manual chain hoist drives a geared mechanism for operation.

Track: Tracks are steel structures that guide the moving rollers attached to the door section or panels. These tracks are solidly mounted to the adjacent structure that outlines the opening for overhead doors.

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.

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.

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.

The following precautions should be used when preparing work documents for roll-up/overhead doors:

- A. Do not operate a manual overhead door having damage to the door and/or track and requires any degree of additional effort to completely open or close. Have the unit repaired.
- B. Do not operate an electric powered door where the controls are not labeled properly. Confusion with equipment operating switches can cause unanticipated system failures and potentially result in serious injury or property damage.
- C. Do not stand under or near any overhead door during its activation. Notify personnel in the area to stand clear when operating doors. Lessons Learned ID 1997-007-WS: Roll-Up Door Safety Awareness.

- D. Do not use the electric operator to power open or close a poorly operating or damaged door.
- E. Do not attempt to wind, unwind or otherwise tamper with a torsion spring counterbalance. Contact a qualified service person. Repairs and adjustments to torsion springs should be made by a trained service person using proper tools and instructions.
- F. Unplug electric operator or turn circuit breaker off before making any adjustments to limit switches or driving mechanisms. Use LANL lockout, tag-out procedures.
- G. Maintenance and inspection of the subject doors often requires work at elevations greater than six feet. In these situations, a Safety professional should review the work scene before the work is started.
- H. Since some roll-up doors are opened and closed several times per day, the life expectancy for the spring mechanism of 10,000 cycles (opened and closed) will be met sooner than those doors that are cycled fewer times per day. See DOE OESH, ORPS Report ID-BBWI-LANDLORD-2003-003.

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 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 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) identified above.

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.

Criterion users must review the manufacturer operation and maintenance information, if available, for requirements that may exceed those listed below. This is especially important for units that are under warranty.

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 Designee 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

Inspect the floor area directly under the door and on the sides for tripping hazards that may create hazards to personnel. Inspect the areas affected by the operation of the door for obstructions that may interfere with normal operation of the door. These inspections should be performed every time the door is opened or closed. (Appendix A)

NOTE: Documentation supporting execution of this requirement may be required for ML1 and ML2 door systems or as defined in a facility Authorization Basis. As a minimum, personnel that operate roll-up/overhead doors must be able to demonstrate knowledge of this requirement.

Basis: These inspections are required to assure personnel safety and are based, in part, on DOE Lessons Learned ALO-LA-FIRNGHELAB-1995-0002 Wear of obsolete floor guides and other surrounding structures may become damaged and cause personnel injuries. Obstructions that may interfere with the normal operation of the door may cause personnel injury or damage to the door.

6.2 Maintenance Requirements

6.2.1 Semi-Annual Intervals

Unless otherwise noted, users should apply a graded approach to determine the frequency for maintenance evolutions based on normal usage and impact to the mission and safety of the facility.

- A. Visually inspect critical welds between the curtain or panel support shaft and end-plates for damage or cracking.

Basis: This inspection is required to assure personnel safety and is based on DOE Lessons Learned ALO-LS-LANL-PHYSCOMPLX-1997-0003. Damaged welds can lead to failure and allow the door to fall uncontrollably. Several DOE locations have experienced near-miss accidents that could have been prevented by performing this inspection.

- B. Inspect labels on the door control switches. Verify that the labels provide clear guidance for the operation of the door and cannot be confused with other equipment in close proximity to the operating door such as a dock leveler.

Basis: This inspection is required to assure personnel safety and based on Lessons Learned 1998-LA-LANL-ESH7-0009 and vendor instruction, i.e., Overhead Door Company; Recommended Preventive Maintenance - Rolling Doors 1994

- C. Inspect drive chain and sprockets. Verify alignment. Verify that the collar that locks the drum shaft is in place and not loose or slipped out of place. Verify that the setscrews for locking collars are tight. Verify that there are no loose parts on the operating mechanism.

Basis: This inspection is required to assure personnel safety and based on DOE OES ORPS Report ALO-AO-BWXP-PANTEX-2002-0059 and DOE OESH Operating Experience Summary 2002-25 and DOE OESH Operating Experience Summary ORPS Report ID-BBWI-TAN-2002-0001.

- D. Inspect sprocket bolts for corrosion and looseness. Verify that the sprocket bolts are not corroded and have not become loose.

Basis: This inspection is required to assure personnel safety and based on DOE OES ORPS Report ORO-BJC-PORTENVERS-2000-0013.

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

- A. Operate in accordance with manufacturer's guidelines.
- B. New roll-up doors should have critical welds inspected for flaws prior to installation and operation.

7.2 Maintenance Recommendations

7.2.1 Semi-Annual Intervals

Unless otherwise noted, users should apply a graded approach to determine the frequency for maintenance evolutions based on normal usage and impact to the mission and safety of the facility.

- A. Visually inspect cables and wire rope clamps for damage or deterioration that can cause potential failure of the cable.

Basis: This inspection is recommended to assure personnel safety and is based on DOE Lessons Learned NVOO-EGGO-NLVO-1994-0002 and Lessons Learned RL-PNNL-PNNLBOPER-1996-0021. Breaking or separation of the cables or clamps can cause the door to free-fall in an uncontrollable fashion. Several DOE locations have experienced near-miss accidents that could have been prevented by performing this inspection.

- B. Visually inspect the slats, sections and panels, especially near the top of the door, for deformation of the interlocking grooves.

Basis: This inspection is recommended to assure personnel safety and is based on Lessons Learned ALO-LA-LANL-WASTEMGT-1997-0001. Distortion of these grooves can cause serious failure of the door assembly. Several DOE locations have experienced near-miss accidents that could have been prevented by performing this inspection.

- C. Perform the following maintenance tasks for sectional, panel, slated, and curtain door drive and track mechanisms:

1. Visually inspect the operating chain for loose or worn cotter pins in the master link.
2. Visually inspect the door guide for missing or broken pieces that can cause the door to hang up during operation.
3. Verify that the track surface is free of oil and grease.
4. Check the tightness of track bolts to angles and fasteners for snugness.
5. Visually inspect the alignment of the door to insure proper operation
6. Disconnect operator and operate door manually to check for smooth operation.
7. Lubricate and inspect door rollers, hinge points and bearings.
8. On the chain hoist assembly, inspect the chain and the drive wheels for excessive wear and damage. Lubricate the chain hoist.
9. Verify that the emergency release mechanism is functional.

Basis: These tasks are based on LANL O&M experience, vendor instructions, and DOE Lessons Learned, i.e., Item E - NVOO-REEC-EHDO-1992-0002, and Item F - ALO-LA-LANL-SHOPSFAC-1997-0001.

- D. Perform the following maintenance tasks for all electrical operators:

1. Check button station controls for proper function.
2. Visually inspect wiring and conduit for damage and corrosion.
3. Check and test limit and proximity switches for proper function; adjust if necessary.
4. Visually inspect and lubricate roller chain.
5. Check the roller chain for excessive looseness or over-tension.
6. Inspect and test the brake; adjust if necessary.
7. Verify that the motor mounting structure is secure.
8. On operators so equipped, lubricate drive link limit switch shaft threads.
9. Lubricate all non-sealed bearings.

Basis: These tasks are based on LANL O&M experience and vendor instructions

E. Perform the following maintenance tasks for all door panels and associated hardware:

1. Inspect and adjust the roller assembly holder as necessary.
2. Check all hardware fasteners for tightness.
3. Visually inspect bottom seal of door assembly for damage and replace as necessary.
4. Inspect the door bottom safety edge device for proper function.

Basis: These tasks are based on LANL O&M experience and vendor instructions

F. Perform the following maintenance tasks for counterbalances:

1. Check drum and collar set screws for tightness and corrosion or slippage.
2. Visually inspect the tension wheel (drum) and shaft for excessive wear and/friction damage.

Basis: These tasks are based on DOE Lessons Learned ID1995-SR-WSRC-LL-0003.

7.2.2 Annual Intervals

Unless otherwise noted, users should apply a graded approach to determine the frequency for maintenance evolutions based on normal usage and impact to the mission and safety of the facility.

A. In addition to the 6 month maintenance, perform the following tasks for sectional, panel, slated, and curtain door drive and track mechanisms:

1. Visually inspect torsion and tension spring fasteners for secure mounting.
2. Visually inspect the ends of tension springs for wear or damage.

3. Verify that safety cables are installed and secure on tension spring applications.
4. Visually inspect weather-strip for wear or damage.
5. Visually inspect door section assembly for proper side clearance and level and levelness.

Basis: These tasks are based on LANL O&M experience and vendor instructions

B. In addition to the 6 month maintenance, perform the following tasks for electric operators:

1. Visually inspect and adjust or replace the belts as necessary.
2. Visually inspect and test clutch assembly; adjust if necessary.
3. Visually inspect for physical damage and functionally test electrical disconnects.
4. Inspect and check tightness of all sprockets.
5. Check the gear reducer assembly for oil leakage and oil level. Repair and refill as required.
6. Verify that all electrical panel covers are installed and secure.
7. Verify that the proper fuses and circuit breakers are installed.
8. Visually check the integrity of all wiring terminations for looseness or signs of excessive heat. Additionally, a scan with an Infrared instrument can be very useful in this inspection.

Basis: These tasks are based on LANL O&M experience and vendor instructions, and DOE July 2009 Electrical Safety Occurrences, Item F, Report EM-RL-PHMC-FSS-2009-0007.

C. In addition to the 6 month maintenance, perform the following tasks for counterbalances:

1. Lubricate spring attachment points .
2. Visually check for track damage.
3. Inspect locks for proper operation.
4. Lubricate shaft bearings and torsion spring attachment points.

Basis: These tasks are based on LANL O&M experience and vendor instructions.

8.0 GUIDANCE

8.1 Operations Guidance

None

8.2 Maintenance Guidance

An acceptable program for overhead door maintenance may be found in Preventive Maintenance Instruction (PMI) Number 40-25-009, "Roll-up & Overhead Door Equipment Maintenance and Repair"

9.0 REQUIRED DOCUMENTATION

Maintenance history shall be maintained for roll-up and overhead doors 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				
"As-found" conditions	X	X	X	X
Repair / Adjustments	X	X	X	X
PM Activities	X	X	X	X
Equipment Problems				
Failure Dates	X	X	X	X
Failure Root Cause	X	X		

Basis: Documentation of the parameters listed 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"

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 Rev. 1, Management Level Determination
- 10.4 AP-341-516 Rev. 1, Operability Determination and Functional Assessment
- 10.5 PMI Number 40-25-009, "Roll-up & Overhead Door Equipment Maintenance and Repair." Rev. 2, Dated January 2008.
- 10.6 Overhead Door Company Recommended Preventive Maintenance- Roll-up Doors 1994.



- 10.7 Lessons Learned ID1995-SR-WSRC-LL-0003: Roll-Up Door Component Falls at Savannah River.
- 10.8 Lessons Learned ID 1998-LA-LANL-ESH7-0009: Employee Pinned Against Dock When Incorrect Equipment Switch Operated.
- 10.9 Lessons Learned ID 1997-007-WS: Roll-Up Door Safety Awareness.
- 10.10 Lessons Learned ALO-LA-FIRNGHELAB-1995-0002: Employee Injured by Fall Caused by Tripping on Protruding Edge of Metal Cover in Rolling Door Track.
- 10.11 Lessons Learned ALO-LS-LANL-PHYSCOMPLX-1997-0003: Roll-up Door Fell to Closed Position in an Uncontrolled Fashion.
- 10.12 Lessons Learned NVOO-REEC-EHDO-1992-0002: Overhead Door Fell Due to Cotter Pin Failure in Gear Chain.
- 10.13 Lessons Learned ALO-LA-LANL-SHOPSFAC-1997-0001: Electric Drive for Rollup Door Failed.
- 10.14 Lessons Learned ALO-LA-LANL-WASTEMGT-1997-0001: Roll-up Door Separated From Top Slat And Fell To The Floor.
- 10.15 Lessons Learned NVOO-EGGO-NLVO-1994-0002: Roll-up Door Failure.
- 10.16 Lessons Learned RL-PNNL-PNNLBOPER-1996-0021: Roll-up Door Fails at the PDLW Facility Resulting in Safety Concern.
- 10.17 DOE July 2009 Electrical Safety Occurrences EM-RL-PHMC-FSS-2009-0007: Outer Panel Cover Missing from 480/277 VAC Power Distribution Panel.
- 10.18 DOE OESH, Operating Experience Summary, ORPS Report BBWI-LANDLORD-2003-003. Roll-Up Door Had Been Cycled Far Beyond the Life Expectancy of the Spring Mechanism.
- 10.19 DOE OESH, Operating Experience Summary, ORPS Report ORO-BJC-PORTENVRES-2000-0013. Sprocket Bolts Failed From End-Of-Life and Corrosion.
- 10.20 DOE OESH, Operating Experience Summary, ORPS Report ALO-AO-BWXP-PANTEX-2002-0059. Five Pound Chain Sprocket for a Roll-Up Door Fell to the Floor and Landed One Foot from a Security Police Officer.
- 10.21 DOE OESH, Operating Experience Summary, OE Summary 2002-25. Occurrence Reporting and Process System Search For Similar Events Identified 12 Roll-Up Door Failures With Falling Doors and Parts.
- 10.22 DOE OESH, Operating Experience Summary, ORPS Report ID-BBWI-TAN-2002-0001. Bearing Locking Collar Falling from Roll-Up Door Due to Loose Set Screws.

11.0 APPENDICES

Appendix A: Warning Notice for Overhead Door Operators

 <p>Los Alamos NATIONAL LABORATORY EST. 1943</p>	<p><i>Conduct of Maintenance (P 950)</i> Operations and Maintenance Manual Roll-Up/Overhead Doors</p>	<p>Criterion 605, R1 Page 15 of 16</p>
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APPENDIX A

WARNING NOTICE FOR OVERHEAD DOOR OPERATORS

CAUTION

Keep Clear of Personnel
and
Equipment/Materials