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

**TITLE: CRANES, HOISTS,  
LIFTING DEVICES, AND RIGGING**

<u>Name</u>	<u>Organization</u>	<u>Date</u>	<u>Signature</u>
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## RECORD OF REVISIONS

Revision No.	Date	Description
0	12/17/98	Initial Issue
1	03/01/05	This revision incorporates the formatting in Revision 3 of <i>O&amp;M Criterion Writer's Guide</i> .
	03/01/05	Update maintenance and operator qualification requirements
	03/01/05	Incorporate Lessons Learned in crane strike of 113.2 kV overhead power line during transport
2	6/1/2010	This revision reflects current organizational structure and responsibilities, corrections, clarifications and examples.



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## CRITERION 601 CRANES, HOISTS, LIFTING DEVICES, AND RIGGING

### 1.0 PURPOSE

The purpose of this Criterion is to establish the minimum requirements and best practices for operation and maintenance of cranes, hoists, lifting devices, and rigging 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. This 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 operator certification and training, operations, and inspection, testing, preventive maintenance of cranes, hoists, lifting devices, and rigging. This Criterion does not address corrective maintenance actions required to repair or replace equipment.

Specific equipment covered by this Criterion includes overhead and gantry cranes, slings, articulating boom cranes, monorails and underhung cranes, mobile cranes, forklift trucks, and hoists. Engine and/ or motor maintenance of mobile cranes and forklift trucks is not covered in this Criterion. Electric motor maintenance is addressed in Criterion 510, *Electric Motors*.

### 3.0 ACRONYMS AND DEFINITIONS

#### 3.1 Acronyms

ADESHQ	Associate Director for Environmental, Safety, Health & Quality
AHJ	Authority Having Jurisdiction
ANSI	The definition for ANSI goes here
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
DOE	Department of Energy
DSA	Documented Safety Analysis
FOD	Facility Operations Director
GPILD	General Purpose Installed Lifting Device
LANL	Los Alamos National Laboratory
LANSS	Los Alamos National Security, LLC
ML	Management Level

#### 3.2 Definitions

For more detail on definitions shown below, refer to P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging*.

**Below-hook Lifting Device-** A device used in lifting/ lowering operations which, used singularly or in combination, alters or transfers the direction or sequence of loading from the lifting device to the load.

**Certified or licensed-** Possessing a license or certificate issued by a recognized authority attesting that a worker has been trained and/ or tested and is competent and qualified to perform specific tasks or operate specific equipment.

**Note:** Physical barricades, posting, or continuous monitoring may be used to designate the area.

**Corrective Maintenance-** The repair of defective, failed, malfunctioning equipment to restore the intended function or design condition. This form of maintenance may not result in a significant extension of the expected useful life.

**Crane Operator (Mobile Cranes)-** A person certified or licensed to operate designated mobile and/ or overhead cranes for ordinary and critical lifts

**Critical Lift-** Also known as a high-consequence lift. Parts, components, assemblies, or lifting operations designated by the management or customer that, if involved in an accident, could

1. present a significant risk of personal injury or property damage,

2. cause a release of significant amounts of hazardous material,
3. cause undetectable damage resulting in future operational or safety concerns at a facility, or
4. cause an unacceptable operational or programmatic impact.

All of the following should be considered when designating a critical lift:

1. Any lift exceeding 75% of the manufacturer's rated capacity for the crane, hoist, or mechanized equipment to be used in the lift.
2. Any item that requires special care in handling because of weight, size, asymmetrical shape, undetermined center of gravity, installation tolerances, or other unusual factors.
3. Any lift using two or more cranes, hoists, pieces or mechanized equipment, or a combination of such equipment.
4. An otherwise non-critical lift that must be made in close proximity to critical or expensive items which could be damaged as a result of contact with a hoisted load.
5. Any lift where the crane, hoist, or mechanized equipment could at any time come in contact with an energized high voltage power line.
6. Any lift that requires personnel to be hoisted.

**Critical Lift Plan-** A written document that contains elements outlined in P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging*.

**Designated Leader-** The responsible person designated for each project who is responsible for all aspects of an Ordinary Lift and who is trained as an incidental crane operator, qualified crane operator or a rigger.

**Formally Removed from Active Service-** Units locked, tagged out of service, de-energized, and removed from the active service list.

**General Purpose Installed Lifting Device (GPILD)-** Cranes and hoists installed as part of the original building construction, or commercially available cranes and hoists that are attached to a building or other structure.

**Hoist-** A powered or manual device used to raise and lower a load. A hoist may be fixed or an integral part of a crane mechanism.

**Hoisting and Rigging (H&R)-** The use of mechanical advantage to vertically lift and lower loads. Includes fork-style lift operations that require an off-set center of gravity, under-slung lifting or exceed 75% of the manufacturer's rated capacity.

**Hoisting and Rigging Person in Charge (H&R PIC)-** A person who is responsible for all aspects of the ordinary lift plan and/ or critical lift plan of a particular project. The PIC is designated by the Responsible Line Manager (RLM), with assistance as needed from the LANL Crane Coordinator.

**Hoisting and Rigging Subject Matter Expert (H&R SME)-** A person designated by MSS senior management, who is qualified in hoisting and rigging who has the appropriate training, experience and authority to make decisions and take actions relative to hoisting and rigging operations.

**Incidental Crane Operator-** A person who is certified to operate overhead cranes and hoists in routine work activities for ordinary lifts that are usually of low weight relative to the crane's rated capacity.

**Note:** Routine work activities do not include critical lifts or operation of mobile cranes.

**Jack and Roll Operations-** Tasks that utilize hydraulic jacks, mechanical jacks, rollers, skates, or special designed mechanical devices as a means for raising, lowering or moving heavy objects such as lathes, machines, laser tables, etc. Jack and roll operations may be classified as "critical lifts" by the H&R SME.

**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, *Management Level Determination* for definitions of each ML level.

**Mobile Crane-** A machine with a mechanism for travel that allows loads to be lifted and swung at various radii. Mobile cranes include crawler cranes, wheel-mounted truck or self-propelled cranes, and other cranes with similar characteristics.

**Mobile Crane Operator-** A person who possesses a State of New Mexico license to operate mobile cranes based on completion of requirements listed in the Hoist Operator Safety Act.

**Non-Installed Lifting Device (NILD)-** Commercially available or laboratory-built lifting devices such as come-alongs, chain falls, tuggers, shop cranes, block and tackle devices, and specially built onsite devices that are used to lift or lower equipment or materials.

**Ordinary Lift (Mobile Cranes)-** A lift that occurs at different locations and/ or occurs under different conditions. An ordinary lift is a lift that does not meet the criteria of a critical or routine lift.

**Ordinary Lift (Stationery Equipment)-** Any lift that does not meet the criteria of a critical lift and is not required to be documented unless otherwise required by P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging*.

**Overhead Crane-** A machine that uses a hoist and rigging to lift, lower, or horizontally move a load. Overhead cranes include overhead bridge, monorail, and jib cranes.

**Person-in-Charge-** The responsible person, trained as a qualified crane operator and rigger, appointed by the owning Division Group Leader for the safe handling of critical loads, and for the safe handling of non-critical loads in, around, or above critical items.

**Qualified Crane Operator (Stationary Equipment)-** A person certified or licensed to operate all types of overhead cranes and hoists.



1. A qualified crane operator may perform the duties of the PIC for critical lifts, although he/ she shall not operate equipment during the critical lift.
2. Authorization for laboratory-wide crane operation must be approved by the LANL Crane Coordinator.

**Qualified Person-** One who possesses a recognized degree, certificate, or professional standing or has extensive knowledge, training, and experience in a related or applicable field, and who has successfully demonstrated his/ her ability to solve or resolve complex issues related to the subject matter, the work, or the project.

**Qualified Rigger (Mobile Cranes)-** A person qualified to inspect rigging equipment and perform the tasks associated with hoisting and rigging operations under the direct supervision of a H&R PIC.

**Rigger-** A person who is authorized to inspect rigging equipment, performs the tasks associated with hoisting and rigging operations and has at a minimum completed the rigging and incidental crane operator's safety course.

**Rigger-In-Training-** A skilled person who needs to acquire the required experience necessary to obtain a LANS Qualified Rigger Certification. The craft person will work under the direct supervision of an H&R PIC.

**Rigging-** Wire rope slings, alloy steel chains, synthetic rope or web slings, shackles, eyebolts, and special devices, such as below-hook lifting devices that are used either singularly or in combination to attach a load to a lifting device.

**Routine Lift (Mobile Cranes)-** Lift performed by an incidental crane operator or digger derrick operator that is

1. routine (the same work area, lift equipment, and lift object),
2. repetitive in nature,
3. low object weight (50% or less of lifting device rated capacity), and
4. does not involve complex rigging.

The H&R SME will approve routine lift operations

**Safety factor-** The ratio of the ultimate breaking strength of a member or piece of material or equipment to the actual working stress or safe working load when in use.

## 4.0 RESPONSIBILITIES

### 4.1 MSS-Division Leader (MSS-DL)

In conjunction with the AHJ, receives and approves or rejects requests for variances from this Criterion. The DL maintains the record of decision for all variance requests.

### 4.2 MSS- Maintenance Programs (MSS-MP)

The MSS-MP is responsible for the technical content, applicability and 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.

#### **4.2.1 Facility Operations Director (FOD)**

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

#### **4.2.2 Operations Manager (OM)**

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

#### **4.2.3 Maintenance Manager (MM)**

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

#### **4.2.4 Authority Having Jurisdiction (AHJ)**

The AHJ (which is the POC 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.

#### **4.2.5 Qualified Crane Operator**

Responsible for compliance with the DOE STD-1090, *Hoisting and Rigging Standard*, and P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging Equipment*.

Must possess a current MSS qualified crane operator qualification or State of New Mexico hoisting operator license.

Inspects and operates H&R equipment.

Performs duties of the MSS H&R PIC for critical lifts, although he/ she shall not operate a crane while performing these duties.

Knows and understands the hazards that may be encountered during H&R operations.

Alerts the MSS H&R PIC when a condition(s) that is not being implemented in accordance with the requirements of the hoisting operations schedule/ plan and/ or critical lift plan.

**Note:** The crane operator verifies that annual inspections have been performed on all below-the-hook lifting devices before each use.

#### **4.2.6 Hoisting and Rigging Person in Charge (PIC)**

Responsible for compliance with the DOE STD-1090, *Hoisting and Rigging Standard*, and P 101-25 *Cranes, Hoists, Lifting Devices, and Rigging Equipment*.

Possesses a current MSSH&R PIC Certification.

Reviews the hoisting operations schedule/ plan and/ or critical lift plan with the craft superintendent and the MSSH&R SME, and returns the plan to the responsible supervisor (with or without comments) before the start of the project.

Provides the MSScraft superintendent with technical assistance or resource materials as necessary to support the informational and instructional requirements of the work to be accomplished.

Prepares and implements each requirement of the hoisting operations schedule/ plan and/ or critical lift plan.

Ensures that a pre-job briefing is conducted with the employees designated to work at or around the H&R operation. Topics for the briefing shall include, but are not limited to, anticipated hazards, controls to be implemented, communications, required PPE, and a thorough review of the hoisting operations schedule/ plan and/ or critical lift plan.

Provides constant supervision and training of MSSqualified riggers and riggers-in-training.

#### **4.2.7 Qualified Rigger (Mobile Cranes)**

Responsible for compliance with the DOE STD-1090, *Hoisting and Rigging Standard*, and P 101-25, *Cranes, Hoists, Lifting Devices and Rigging Equipment*.

Possesses a current MSSqualified rigger certification.

Operates non-installed lifting device and general purpose installed lifting devices for routine and ordinary lifts.

Performs tasks associated with H&R operations under the direct supervision of a MSS H&R PIC.

Performs the duties of signal person for H&R tasks.

Provides knowledge and on-the-job training for riggers-in-training.

Performs inspections of rigging equipment, hardware, and attachment points prior to use.

#### **4.2.8 Hoisting and Rigging Subject Matter Expert (SME)**

Assesses and assures compliance with the DOE STD-1090, *Hoisting and Rigging Standard*, and P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging Equipment*.

Reviews hoisting operations schedule/ plan and/ or critical lift plan and all other safety-related documents and returns comments to the MSSH&R PIC before the start of the project.

Provides guidance with regard to alternate methods, required PPE, etc.

Provides approval of ordinary or critical lift designation and assists with preparation of ordinary or critical lift planning when required.



Conducts and documents inspections of H&R operations and reviews findings with the Department Manager.

Review and approve all mobile and stationary lift equipment testing, maintenance, repair and inspections.

## 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.

### 5.2 Limitations

The intent of this Criterion is to identify the minimum requirements and recommendations for structures, systems, and components (SSCs) 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, *Maintenance Management Program for DOE Nuclear Facilities* 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 (TSRs), 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 (Stationary Equipment)**

### **6.1.1 Critical Lifts**

All critical lifts require a written critical lift plan. Ordinary lifts may require a written ordinary lift plan as determined by the designated leader or operator/ rigger. Critical lifts must be approved by a qualified person as designated by the RLM, with assistance as needed from the LANL Crane Coordinator.

*Basis:* P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging.*

### **6.1.2 Operational Tests**

All new, modified, reinstalled, or repaired cranes, hoists, or lifting devices shall be inspected by a qualified inspector, operationally tested per ASME B30 series (Operational Tests) and load tested at 100% of manufacturer's load ratings.

### **6.1.3 Non-Repairable Equipment**

Cranes, hoists, lifting devices or rigging which is non-repairable, failed or which cannot be tested to ASME B-30 series or ASME/ PALD-12 must be locked out of service or destroyed and may not be sold to the public as a lifting device.

*Basis:* ASME B30 Series, DOE-STD-1090, P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging.*

### **6.1.4 Operator Inspections**

Operator inspections of cranes are based on the following definition of crane service:

1. Normal Service: Operating at less than 85% of rated load and not more than 10 lift cycles/ hr except for isolated instances.
2. Heavy Service: Operating at 85 to 100% of rated load or in excess of 10 lift cycles/ hr as a regular procedure.
3. Severe Service: Operating at normal or heavy service under abnormal operating conditions (extreme temperatures, corrosive atmospheres).

Frequent visual inspections by the operator, records not required, are conducted as follows:

1. Normal service: Inspected monthly
2. Heavy service: Inspected weekly to monthly
3. Severe service: Inspected daily to weekly

Frequent inspections shall include observations during operations and include the following:

1. Operating mechanisms for proper operation, adjustment, and unusual sound.
2. Upper limit devices in accordance with ASME B30.16
3. Leakage from hydraulic/ air system
4. Hooks and hook latches in accordance with ASME B30.10
5. Hoists in accordance with ASME B30.16

*Basis:* ASME B30.2 and B30.17 *Inspection, Testing, And Maintenance*

**6.1.5 Periodic inspections by a qualified crane inspector, with records of conditions, are conducted as follows:**

1. Normal service: Yearly
2. Heavy service: Yearly
3. Severe service: Yearly

Periodic inspections shall include frequent inspection items plus the following:

1. Deformed, cracked, or corroded members
2. Loose or missing bolts, nuts, pins, or rivets
3. Cracked or worn sheaves and drums
4. Worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers, and stops
5. Excessive wear and brake system parts
6. Excessive wear of drive chain sprockets and excessive drive train stretch
7. Deterioration of controllers, master switches, contacts, limit switches, and push button stations
8. Wind indicators for proper operation
9. Gasoline, diesel, electric, or other power plants for proper operation
10. Motion limit devices that interrupt power or cause a warning to be activated for proper performance. Each motion shall be inched or operated at low speed into the device with no load on the crane

11. Controller function labels for legibility and replacement
12. Hoists in accordance with ASME B30.16

The qualified crane inspector shall determine whether conditions found during inspection constitute a hazard and disassembly is required for additional inspection.

*Basis:* ASME B30.2 and B30.17 *Inspection, Testing, And Maintenance*

#### **6.1.6 Idle Machinery**

Cranes, hoists or lifting devices which have been idle for more than one month, but less than one year shall be subject to a complete operator frequent inspection prior to being placed in service. A periodic inspection is required for units idle more than one year.

*Basis:* ASME B30.2 and B30.17 *Inspection, Testing, And Maintenance*

#### **6.1.7 Demolition Duty**

Installed cranes are often idle for months before use in demolition activities. Demolition activities that precede crane use may result in unintentional modifications to the crane or its support structure. The demolition project must determine whether such cranes have been modified and must therefore be inspected by a qualified inspector before use.

### **6.2 Operations Requirements (Mobile Cranes)**

#### **6.2.1 Critical Lifts**

All critical lifts and ordinary lifts require a written plan. Critical lifts must be approved by a qualified person as designated by the RLM, with assistance as needed from the LANL Crane Coordinator.

*Basis:* Required by P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging Equipment*.

All new, modified, reinstalled, or repaired cranes, hoists, or lifting devices shall be inspected by a qualified mobile crane inspector, operationally tested per ASME B30.5 (Operational Tests) and load tested at 100% to 110% manufacturer's load ratings.

*Basis:* ASME B30.5 2004

#### **6.2.2 Operator Inspections**

Operator inspections of cranes are based on the following definition of crane service:

Frequent visual inspections by the operator, records required, are conducted as follows:

1. Normal service: Daily – Weekly
2. Heavy service: Daily

Frequent inspections shall include observations during operations and include the following:

1. Operating mechanisms for proper operation, adjustment, and unusual sound.
2. Upper limit devices in accordance with ASME B30.5

3. Leakage from hydraulic/ air system
4. Hooks and hook latches in accordance with ASME B30.10
5. Hoists in accordance with ASME B30.5

*Basis: ASME B30.5 Inspection, Testing, and Maintenance*

### **6.2.3 Periodic Inspections**

Periodic inspections by a qualified mobile crane inspector, with records of conditions, are conducted as follows:

1. Normal service: Yearly
2. Heavy service: Yearly
3. Severe service: Monthly

Periodic inspections shall include frequent inspection items plus the following:

1. Deformed, cracked, or corroded members
2. Loose or missing bolts, nuts, pins, or rivets
3. Cracked or worn sheaves and drums
4. Worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers, and stops
5. Excessive wear and brake system parts
6. Excessive wear of drive chain sprockets and excessive drive train stretch
7. Deterioration of controllers, master switches, contacts, limit switches, and push button stations
8. Wind indicators for proper operation
9. Gasoline, diesel, electric, or other power plants for proper operation
10. Motion limiting devices that interrupt power or cause a warning to be activated for proper performance. Each motion shall be inched or operated at low speed into the device with no load on the crane
11. Controller function labels for legibility and replacement
12. Hoists in accordance with ASME B30.16

The qualified mobile crane inspector shall determine whether conditions found during inspection constitute a hazard and disassembly is required for additional inspection.

*Basis: ASME B30.5 Inspection, Testing, and Maintenance*

#### **6.2.4 Idle Equipment**

Cranes, hoists or lifting devices which have been idle for more than one month, but less than one year shall be subject to a complete operator frequent inspection prior to being placed in service. A periodic inspection is required for units idle more than one year.

*Basis:* A SME B30.17 (Stationary Equipment) A SME B30.5 (Mobile Cranes) *Inspection, Testing, and Maintenance*

### **6.3 Maintenance Requirements**

#### **6.3.1 Hazardous Conditions**

Any condition disclosed by the operation inspections (frequent/ periodic) that is determined to be a hazard to continued operation shall be corrected by adjustment, repair, or replacement before continuing to use the unit.

*Basis:* A SME B30 17 2.3 series (Stationary Equipment) A SME B30.5 (Mobile Cranes)

#### **6.3.2 Adjustments**

Adjustments, repairs, and replacements shall be performed by qualified personnel.

#### **6.3.3 Ongoing Repairs**

Components shall be adjusted or repaired as needed. Examples are; all operating mechanisms, limit switches, control systems, and brakes.

#### **6.3.4 Chains and Ropes**

Chains and ropes shall be inspected, replaced, and maintained according to A SME B30.16. (Stationary Equipment) A SME B30.5 (Mobile Cranes)

### **6.4 Personnel Requirements**

#### **6.4.1 Crane Mechanic**

Must have 80 hours of classroom training on operations and maintenance including licensure as an incidental crane operator and must have 80 hours of on-the-job training.

#### **6.4.2 Crane Electrician**

Must have 80 hours of class room training on operations and maintenance including licensure as an incidental crane operator and must have 80 hours of on-the-job training.

#### **6.4.3 Incidental Crane Operator**

Must possess a current LANL incidental crane operator and rigger license.

#### **6.4.4 Mobile Crane Operator**

Must possess a current State of New Mexico license to operate mobile cranes.

For mobile crane operation and critical lifts, this person must possess a current State of New Mexico hoisting operator license. This person may perform duties of the MSS H&R PIC for ordinary and critical lifts, although he/ she may not operate a crane while performing these duties.



#### **6.4.5 Qualified Crane Operator**

Must possess a current LANL qualified crane operator and rigger license.

#### **6.4.6 Hoisting and Rigging Person in Charge**

Must possess a current LANL qualified crane operator's license.

Shall have a minimum of three years experience and 500 hours of documented hands-on crane operation/ rigging experience and must pass a hands-on practical examination.

*Basis:* P 101-25 *Cranes, Hoists, Lifting Devices and Rigging Equipment.*

#### **6.4.7 Rigger**

Must possess a current LANL incidental crane operators and rigger license.

#### **6.4.8 Qualified Rigger (Mobile Cranes)**

Shall complete the MSS 8 hour qualified rigger course, 8 hour qualified mobile crane operations course, and the LANL incidental crane operator course and must possess a current MSS qualified rigger certification. A qualified rigger may operate non-installed lifting devices and general purpose installed lifting devices for routine and ordinary lifts as defined in this section.

#### **6.4.9 Forklift truck operator**

Must have basic training as specified in DOE-STD-1090.

#### **6.4.10 Crane Inspector**

Crane Inspectors shall have completed a minimum of 80 hours of classroom training and be certified Level I, II, and III in accordance with QA-PM-AP-004.000, *Qualifications of Inspection, Examination & Testing Personnel.*

The MSS-DL approves personnel for the designation as a crane inspector (Level 1, 2, or 3.) in accordance with QA-PM-AP-004.000.

*Basis:* The ASME B30 Standards, *DOE Hoisting and Rigging Standard*, and OSHA do not list specific requirements for qualification of Crane Inspectors. MSS Division has determined that the above requirements are necessary to insure the inspection quality of cranes at LANL. This is based partially on previous Support Services Subcontractor experience and information from training vendors. Training plan numbers 10467, 10733, 10734 may be used to fulfill these requirements.

#### **6.4.11 Mobile Crane Inspector**

The H&R SME shall document the training and experience qualifications of a mobile crane inspector in accordance with QA-PM-AP-004.000, *Qualifications of Inspection, Examination & Testing Personnel.*



The MSS-DL approves personnel for the designation as a qualified mobile crane inspector (Level 1, 2, or 3.) in accordance with QA-PM-AP-004.000.

mobile crane inspectors must have completed OSHA accredited classroom training and examination, and or approved (by the H&R SME) experience in the proper operation and inspection of mobiles cranes, light duty lift devices, and below-hook lifting devices.

Only qualified mobile crane inspectors certified Level 2 or 3 are allowed to field direct inspection of mobile cranes, light duty lift equipment, and below-hook lifting devices in accordance this instruction.

*Basis:* The ASME B30 Standards, DOE *Hoisting and Rigging Standard*, and OSHA do not list specific requirements for qualification of mobile crane inspectors. MSS Division has determined that the above requirements are necessary to insure the inspection quality of cranes at LANL. This is based partially on previous Support Services Subcontractor experience and information from training vendors.

## 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

Facility management personnel, operators, and inspectors should familiarize themselves with the DOE *Hoisting and Rigging Standard* (DOE STD-1090-2004) as well as P 101-25, *Cranes, Hoists, Lifting Devices, and Rigging*.

### 7.2 Maintenance Recommendations

#### 7.2.1 Preventative Maintenance

A preventative maintenance program should be established. The program should be based on the recommendations outlined in the manufacturer's manual and for the application as reviewed by a qualified person. Dated history and records should be maintained.

#### 7.2.2 Lubrication

All moving parts for which lubrication is specified should be regularly lubricated. Lubrication means should be checked for delivery of lubricant. Care should be taken to follow recommendations stated in the manufacturer's manual as to points and frequency of lubricant levels and types of lubricant. Wire rope is also a moving part and requires lubricant to prevent wear and corrosion.

*Basis:* ASME B30 section 17, 2.3.1 and 2.3.4.

## 8.0 GUIDANCE

### 8.1 Operations Guidance

PMI 46-00-013, *Hoisting and Rigging Requirements*, may be used to implement the requirements of this document.

ADESHQ provides qualified personnel to review critical lift plans. Critical lifts must be approved by a qualified person as designated by the RLM, with assistance as needed from the LANL Crane Coordinator.

### 8.2 Maintenance Guidance

#### 8.2.1 Preventative Maintenance Instructions

The following PMIs (Preventive Maintenance Instructions) may be used to implement the requirements of this document:

1. PMI 40-25-035 *Inspection of Fixed Cranes And Hoists*
2. PMI 40-25-038 *Inspection of Lifting Devices Other Than Cranes*
3. PMI 40-25-037 *Inspection of Monorail Cranes*
4. PMI 40-25-034 *Inspection of Overhead And Gantry Cranes*
5. PMI 47-00-001 *Mobile Cranes, Light Duty Lift Equipment and Below Hook Lift Devices – Inspections and Performance Tests*
6. PMI 40-25-033 *Crane Load Test Procedure*
7. PMI 40-25-036 *Inspection of Jb Cranes*
8. PMI 40-25-001 *Fixed Crane Maintenance, Repair, and Testing*

### 8.3 Personnel Requirements Guidance

#### 8.3.1 Crane Electrician

Training plans 122 and 10465 may be used to fulfill the training requirements for crane electricians.

#### 8.3.2 Crane Mechanic

Training plans 122 and 10466 may be used to fulfill the training requirements for crane mechanics.

#### 8.3.3 Crane Inspector

Training plan 10467 may be used to fulfill the requirements for crane inspectors

#### 8.3.4 Hoisting and Rigging Person-in-Charge (PIC)

Training plan 122 or 8815 may be used to fulfill the requirements for this position.

#### 8.3.5 Qualified Rigger (Mobile Cranes)

Training plans 122 and 8815 may be used to fulfill the requirements for this position.



## 9.0 REQUIRED DOCUMENTATION

Maintenance history shall be maintained for hoisting machinery, sheaves, hooks, chains, ropes, and other lifting devices to include, as a minimum, the parameters listed in the Table 9-1 below:

Table 9-1: Maintenance History Documentation Parameters				
Parameter	ML 1	ML 2	ML 3	ML 4
<b>Maintenance Activities</b>				
Repair / Adjustments	Required	Required	Required	Required
PM Activities	Required	Required	Required	Required
<b>Equipment Problems</b>				
Failure Dates	Required	Required	Required	Required
Failure Root Cause	Required	Required	-	-
<b>Inspection Results</b>				
Inspection Date	Required	Required	Required	Required
<i>'-' indicates documentation is not required.</i>				

*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."

### 9.1 General Records

Maintain auditable records of all maintenance, repairs, tests and inspections.

## 10.0 REFERENCES

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

### 10.1 ANSI/ ASME B30 Series

- B30.1 *Jacks*
- B30.2.0 *Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*
- B30.3 *Hammerhead Tower Cranes*
- B30.4 *Portal, Tower, and Pillar Cranes*
- B30.5 *Crawler, Locomotive, and Truck Cranes*
- B30.6 *Derricks*
- B30.7 *Base Mounted Drum Hoists*

- B30.8 *Floating Cranes and Floating Derricks*
- B30.9 *Slings*
- B30.10 *Hooks*
- B30.11 *Monorails and Underhung Cranes*
- B30.12 *Handling Loads Suspended from Rotor Craft*
- B30.13 *Controlled Mechanical Storage Cranes*
- B30.14 *Side Boom Tractors*
- B30.16 *Overhead Hoists (Underhung)*
- B30.17 *Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)*
- B30.18 *Overhead Stacker Cranes (Top Running Bridge, Multiple Girder)*
- B30.19 *Cableways*
- B30.20 *Below the Hook Lifting Devices*
- B30.21 *Manually Lever Operated Hoists*
- B30.22 *Articulating Boom Cranes*
- 10.2 *AP-341-502, Management Level Determination*
- 10.3 *AP-341-516, Operability Determination and Functionality Assessment*
- 10.4 *ASME/ PALD-12 Shop Cranes*
- 10.5 *DOE Standard Hoisting and Rigging 1090-2007*
- 10.6 *DOE Order 433.1A, Maintenance Management Program for DOE Nuclear Facilities*
- 10.7 *DOE Order 4330.4B, Maintenance Management Program, Section 3.4.9*
- 10.8 *LANL AR 13.2, Cranes, Hoists, Lifting Devices, and Rigging*
- 10.9 *P 951, Conduct of Maintenance*
- 10.10 *PD 311, Requirements System and Hierarchy*
- 10.11 *OSHA 1910.179 Overhead and Gantry Cranes*
- 10.12 *P 315, Conduct of Operations Manual*
- 10.13 *P 950, Conduct of Maintenance*

## **11.0 APPENDICES**

None.