

## Section 3.04 Mobile Cranes

### 1. Scope

This section sets forth safety requirements for mobile cranes the safety roles and responsibilities for Bureau of Reclamation (Reclamation) personnel and other government employees or contractors using Reclamation equipment. Reclamation Safety and Health Standard (RSHS) Section 3.03, Permanently Installed (Fixed) Cranes, covers safe practices for permanently installed cranes. Section 3.03, Appendix 3.03-A, Riggers and Signalpersons, covers rigger and signalpersons requirements. Section 3.03, Appendix 3.03-B, Hoists, covers safe hoisting practices.

### 2. General Requirements

The American Society of Mechanical Engineers (ASME) B30 standards and the Occupational Safety and Health Administration (OSHA) regulations 1910 Subpart N and 1926 Subpart CC govern mobile crane use. Reclamation Facilities Instructions, Standards, and Techniques (FIST) 4-1A, Maintenance Scheduling for Mechanical Equipment, covers the maintenance, operation, inspection content and requirements, removal from service, record keeping for inspection and testing, load testing, equipment design, performance, and modification.

### 3. Responsibilities

#### a. Regional Safety Managers

- Shall conduct periodic reviews of local mobile crane safety programs as a part of their normally scheduled safety and occupational health program evaluations.

#### b. Area Office Managers

- Shall designate a qualified evaluator, or third-party evaluator, to assess operators, signalpersons, and riggers on Reclamation's behalf.

#### c. Area Office Safety Professionals

- Shall review critical lift plans.

#### d. Facility Managers

- Shall select qualified personnel to maintain and repair mobile crane equipment and components.
- Shall ensure proper maintenance, testing, and repair/replacement of equipment by qualified personnel and will make the respective documentation available for review.
- Shall ensure mobile crane equipment have preventive maintenance schedules established, as well as detailed and accurate maintenance job plans are prepared in accordance with FIST4-1A, Maintenance Scheduling for Mechanical Equipment.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

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- Shall ensure maintenance and repair personnel follow applicable safety procedures and have the tools and documentation, including equipment manuals, necessary to accomplish their work.
- Shall verify that a third-party evaluator or qualified person evaluates equipment operators, signalpersons, and riggers.
- Shall verify that a qualified inspector or third-party evaluator completes crane inspections, per paragraph 3.04.7.b, Crane Inspections, of this section.

### **e. First-Line Supervisors**

- Shall provide or coordinate mobile crane operator training to ensure operators under their supervision meet the requirements set in 3.04.4, Training Requirements, of this section.
- Shall document the operator evaluation to include the name of the certifying organization; operator's name; evaluator's name and signature; date of the evaluation; and the make, model, and configuration of the equipment used in the evaluation.
- Shall make the operator evaluation documentation available digitally or on the worksite for as long as the operator is employed.
- Shall provide or coordinate retraining and re-evaluation if an operator is not competent in a necessary aspect of safe crane operation.
- Shall determine if a load is a critical lift and designate someone other than the crane operator to supervise the planning and execution of the critical lift (see paragraph 3.04.6.f, Critical Lifts, of this section) per FIST 4-1A, 6.9.3, Designated Person.
- Shall develop a job hazard analysis (JHA) and ensure that all staff follow the JHA for all crane assembly/disassembly, inspection, maintenance, hoisting, and rigging operations.
- Shall ensure all staff operate equipment safely.
- Shall ensure all staff use preplanned and approved hoisting and rigging instructions when necessary, and always for critical and engineered lifts.
- Shall ensure all operators resolve or properly tag equipment problems if found to be unsafe or requiring restrictive use.
- Shall assign a qualified lift supervisor to critical lift operations.
- Shall ensure any signalpersons are qualified and trained for the task assigned, prior to giving any signals.
- Shall provide crane operators the time and resources necessary to receive required medical surveillance examinations.
- Shall maintain an inventory of their employees who are qualified mobile crane operators, signalpersons, and riggers. Inventory shall include dates of training and/or certification, retraining where required, and dates of medical clearance.

### **f. Lift Supervisors for Critical Lifts**

- Shall be designated by the first-line supervisor as the person to supervise the planning and execution of the critical lift.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

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- Shall ensure that all members participating in the critical lift completely understand the work instruction and any revisions to those instructions for the critical lift.
- Shall ensure qualified persons perform the activities listed in FIST 4-1A, 6.9, Critical Lifts.

### **g. Mobile Crane Operators**

- Shall complete all training, designations, and evaluations for the skills, knowledge, and ability to recognize and avert risk for operating the specific type of crane or device they will be operating.
- Shall ensure that equipment is current on all inspections prior to lifting and ensure that all members participating in a lift completely understand the work instruction for the lift.
- Shall not assume the role of a qualified rigger, unless specifically trained and qualified as a rigger, as a certified operator does not necessarily meet the requirements of a qualified rigger.
- Shall visually inspect equipment prior to or during each shift when the equipment is in use, per paragraph 3.04.7.b, of this section.

### **h. Signalpersons**

- Shall be trained and qualified prior to giving any signals.
- Shall agree upon and understand communication signals and radio standards with the mobile crane operator and other personnel involved.

### **i. Riggers**

- Shall participate in assembly/disassembly activities, and, whenever workers are within a fall zone, hooking/unhooking/guiding a load or performing the initial connection of a load to a component or structure.
- Shall perform the duties commensurate with their level of certification or qualification, including assembly/disassembly of rigging, inspection of rigging prior to lift, hooking/unhooking and guiding a load.
- Shall understand and familiarize themselves with RSHS Section 3.02, Slings, Rigging Hardware, and Wire Rope.

### **j. Crane Inspectors**

- Shall inspect cranes prior to initial use and any equipment that has had professional engineer-approved modifications or additions which affect the safe operation of the equipment or capacity, per paragraph 3.04.7.b, of this section.
- Shall inspect equipment on an annual basis per 29 CFR 1926.1412(e) and (f).

### **k. Crane Maintenance and Repair Persons (Reclamation Employee)**

Shall only operate equipment to the extent necessary to perform maintenance, inspect equipment, or verify performance.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

Applicability: Reclamation Employees, Facilities, Operations, and Contractors

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### I. Designated Evaluators (Reclamation Employee)

- The area office manager shall designate evaluators based on qualifications of knowledge, training, and verifiable experience.
- Shall evaluate the skills, knowledge, experience, and ability of mobile crane operators, signalpersons, and riggers to recognize and avert risk when performing their respective duties.

## 4. Training Requirements

### a. Initial

- Mobile Crane Operators. First-line supervisors shall provide training for operators-in-training through a combination of formal and practical instruction so that they may develop the knowledge, skills, and abilities to recognize and avert risks associated with equipment and tasks. Operators-in-training may only operate equipment under supervision of a certified crane operator. Training shall include:
  - 29 CFR 1926 Subpart CC and the associated Appendix C,
  - safe operation of specific type(s) of equipment they will be operating (e.g., controls and operation, use and calculation of load/capacity information for various configurations of the equipment),
  - technical knowledge of surfaces operating on,
  - equipment manuals,
  - inspections,
  - operational and maneuvering skills,
  - load chart application,
  - procedures for preventing and responding to powerline contact,
  - safe shut-down procedures, and
  - electrical safety.
- Crane Inspectors. An accredited organization or qualified in-house resource shall provide training and certification and shall include information specific to the type of mobile crane(s) to be inspected.
- Riggers and Signalpersons. Refer to Appendix 3.03-A of this section, Riggers and Signalpersons, for requirements.

### b. Proficiency Qualification for Mobile Crane Operators

In accordance with 29 CFR 1926.1427, the following elements must be in place before operating mobile cranes:

- trained for the specific type of crane they will be operating,
- certified by either the National Center for Construction Education and Research or the National Commission for the Certification of Crane Operators,

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

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- be evaluated by a qualified evaluator, and
- medically cleared.

Exception is recognized for operation of derricks, side boom cranes, and equipment with a maximum manufacturer rated lifting capacity of 2,000 pounds or less.

### c. Refresher/Recertification

Mobile crane operators shall be re-certified every 5 years which shall include both a written and practical examination. First-line supervisors shall provide or coordinate retraining for staff based on their performance, and/or if there is any indication that retraining is necessary. First-line supervisors shall re-evaluate riggers every 5 years to verify skill and identify need for more extensive training.

### d. Recordkeeping

The first-line supervisor will keep a list of operators, riggers, and signalpersons up to date. All Reclamation training records shall be kept in the Department of the Interior official repository.

## 5. Hazardous Environmental Conditions

### a. Wind

Outdoor crane activities shall have means for monitoring local weather conditions, including a wind speed device located where it can measure maximum wind speed for the area. The crane operator, supervisor, or qualified person all have the authority to cease operations if they identify hazardous conditions.

- **Prior To Operation.** Prior to setting up a lift, a reliable weather source must confirm the wind conditions. There shall be no immediate threat of wind speeds reaching 20 miles per hour (mph) or greater. Operators shall record these wind speeds at 30 feet above open ground. Cranes subjected to high winds shall have travel restraints when not in use.
- **During Operations.** Operators shall not conduct hoisting operations when wind speeds, including gusts, at the site reach 25 mph. At 20 mph or more, operators must evaluate wind loading on the crane for safety. This determination will be based on wind calculations per manufacturer's recommendations.
- **Postponing Operation.** First-line supervisors must consult manufacturer recommendations for storing the crane/boom during high-wind events. When high wind/gust conditions postpone crane operations, operators must land and secure loads, and stow cranes/booms.

## b. Lightning

First-line supervisors must shut down crane and hoisting operations when lightning occurs or is forecasted within 5 nautical miles. Employees in affected locations shall cease all outside activity and seek shelter.

## 6. Other Safety Equipment

### a. Fire Extinguishers and Maintenance

Facilities shall provide fire extinguishers and provide training specific to the type of fire extinguisher provided. Facilities and operators shall not use carbon tetrachloride extinguishers. Facilities shall install a portable fire extinguisher, with a basic minimum extinguisher rating of 10 BC, in crane cab/operator station. Facilities shall maintain and inspect portable fire extinguishers monthly per RSHS Section 1.09, Fire Prevention and Protection.

### b. Lighting

Cab lighting, either natural or artificial, shall provide a level of illumination that enables the operator to observe the operating controls as well as the load and rigging when they are in operator's line of sight.

### c. Self-Rescue Devices for Cab Operated Cranes

Mobile crane operators working in a cab operated crane shall have means for self-rescue in place. There should be a means of egress from cab-operated cranes to permit departure under emergency conditions.

## 7. Safe Practices

### a. Authority to Stop Operation

Whenever there is a concern as to safety, employees must have the authority to stop work until a qualified person assures safety. Other onsite personnel will alert the operator if they believe unsafe operating conditions exist. Reclamation Policy, Safety and Occupational Health Program (SAF P01), Appendix A, Stop Work Procedures, and Appendix B, Stop Work Action Procedural Checklist, describe Reclamation stop work procedures. If the crane operator observes an adverse operating condition, the operator has the authority to suspend operations and notify the supervisor for resolution.

### b. Crane Inspections

Refer to 29 CFR 1926.1412 and FIST 4-1A, 6.5, Inspections. Facilities and crane operators shall follow any part of a manufacturer's procedures regarding inspections that relates to safe operation that is more comprehensive or has a more frequent schedule of inspection than requirements of this section. Previous inspection documents produced must be available to crane inspectors.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

**Applicability: Reclamation Employees, Facilities, Operations, and Contractors**

---

- Initial/Startup. Operators shall perform initial/startup before initial use and when cranes have been altered in a manner that affects safe operation or load handling equipment components.
- Frequent. The operator or other qualified personnel shall inspect crane equipment, prior to each use on each shift. The inspection shall include:
  - all functional operating mechanisms for maladjustment interfering with proper operation,
  - deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems,
  - hooks with deformation or cracks,
  - hoist chains, including end connections, for excessive wear, twist, distorted or stretched links,
  - all functional operating mechanisms for excessive wear of components, and
  - rope reeving.
- Periodic. The operator or other qualified personnel shall inspect all mobile cranes in regular use monthly, or more frequently as conditions require. Inspection shall include:
  - deformed, cracked, or corroded members,
  - loose bolts or rivets,
  - cracked or worn sheaves and drums,
  - worn, cracked or distorted parts,
  - excessive wear on brake system parts,
  - load, wind, and other indicators over their full range, for any inaccuracies,
  - gasoline, diesel, electric, or other powerplants for improper performance or noncompliance with safety requirements,
  - excessive wear of chain drive sprockets and chain stretch, and
  - electrical apparatus, for signs of pitting or deterioration.
- Periodic/Annual. Operators shall perform inspections annually or more frequently as conditions require by a qualified person or third-party evaluator.
- Standby Cranes. Qualified personnel shall inspect standby cranes at least semi-annually in accordance with periodic inspection requirements. Standby cranes that are returned to service, which have not been in use for more than 1 month, but less than 6 months, shall be inspected per the frequent inspection requirements as well as a thorough rope inspection. When an inspector returns equipment to use after an idle period of six or more months, it shall be inspected per the frequent and periodic inspection requirements as well as a thorough rope inspection. A thorough rope inspection shall include any types of deterioration and a certification for continued use (including date, signature of inspector, and identifier of the specific rope).

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

**Applicability:** Reclamation Employees, Facilities, Operations, and Contractors

- Third-party Inspection. A third-party qualified inspector may be a Reclamation employee outside the chain of command of the crane's facility or maintenance manager. A third-party may also be a contracted person/entity that specializes in the inspection of cranes and holds the required certifications specific to the inspected type of the crane.
- Load Testing. Refer to FIST 4-1A, 6.7.2, Periodic Load Tests, and FIST 6.13.7, Testing, for additional guidance. Facilities shall conduct load tests in accordance with applicable ASME standards and manufacturer's recommendations. The load test shall be conducted prior to use when any load bearing or load-controlling component has been altered, replaced, or repaired. In accordance with RSHS Section 1.11, Walking and Working Surfaces, paragraph 1.11.9.t.(3), Additional Inspections and Tests, inspectors shall also perform load tests prior to lifting personnel in an approved Personnel Lifting Platform at 150 percent of the intended load of the personnel platform.

### c. Medical Surveillance

Qualified medical personnel shall conduct medical surveillance of mobile crane operators per the Interior Office of Occupational Health and Safety, Medical Program Handbook, Crane Operators (page 215-224). Medical personnel shall conduct medical evaluations both as pre-placement for crane operators as well as every 3 years thereafter, or more frequently, as required. The employee's local HR office shall manage all medical clearances.

### d. Electrical Safety

For Reclamation's electrical safety standards refer to RSHS Section 1.10, Electrical Safety Requirements. In accordance with 29 CFR 1926.404 and 1926.406, cranes shall have a disconnecting means, a limit switch to prevent passing the safe upper limit of travel, shall meet the minimum clearance, and have proper grounding. The control circuit voltage shall not exceed 600 volts for AC or DC current. The voltage at pendant pushbuttons shall not exceed 150 volts for AC and 300 volts for DC. Where a multiple conductor cable is used with a suspended pushbutton station, the station must be supported in a satisfactory manner that will protect the electrical conductors against strain. Operators shall only use pendant control boxes that prevent electrical shock and are clearly marked for identification of functions.

### e. Duty Periods

Operators will not work, or be at the jobsite, more than 12 hours in any 24-hour period. The operator will not engage in any activity that will divert their attention while operating the equipment, nor will the operator leave their position while a load is suspended.

### f. Critical Lifts

A critical lift is a nonroutine lift requiring detailed planning and additional or unusual safety precautions. Refer to FIST 4-1A, 6.9, Critical Lifts, for critical lift plan content, approval, pre-lift meeting, and documentation. Dependent upon the situation, the facility manager, a qualified engineer, and the area office safety manager shall review critical lift plans. The first line-supervisor to supervise the planning and execution of the critical lift shall identify the critical lift



# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

**Applicability: Reclamation Employees, Facilities, Operations, and Contractors**

---

supervisor. The designated person shall have an understanding and familiarity with the equipment, inspections, load tests (if required), and the work instruction so that they can clearly communicate and coordinate during the execution of the critical lift.

### **g. Engineered Lifts**

Operators shall plan engineered lifts that exceed the crane's rated capacity in accordance with ASME B30. Engineered lifts shall not exceed 110 percent of the rated capacity.

### **h. Powerline Safety**

Before assembling, operating, and disassembling equipment, first-line supervisors must determine if any part of the equipment, load line, or load could get closer than 20 feet to a power line. Before operating equipment, operators must identify the work zone by demarcating operating boundaries or must define the work zone as the area 360 degrees around the equipment, up to the maximum working radius. First-line supervisors shall contact and inform the owner of the power line of work near the power line. All employees shall assume all power lines are energized until the utility owner/operator confirms that the line has been, and continues to be, deenergized and visibly grounded.

- Power Lines Up to 350 Kilovolts. Operators and employees shall maintain a clearance of 20 feet between the power lines and the equipment's maximum operating radius. If equipment operation could get closer than 20-foot of a power line, one of the following three requirements must be met.
- Deenergize and Ground. The first-line supervisor shall confirm the owner/operator has deenergized and visibly grounded the line at the worksite.
- 20-foot Clearance. Operators shall ensure that no part of the equipment, load line, or load gets closer than 20 feet by implementing the following preventative measures:
  - conduct a meeting to review the location of the power line(s) and steps to be taken to prevent encroachment or electrocution,
  - use nonconductive tag lines, if using tag lines,
  - erect and maintain an elevated, high visibility warning line, barricade, or line of signs that are visible to the operator, and
  - at least one of the following measures: a proximity alarm, a dedicated spotter, a range control warning device, a range limiting device, and/or an insulating link/device between the load and end of the load line.
- Minimum Clearance. Qualified personnel shall determine the line's voltage and minimum clearance distance permitted under table 19B-1, in conjunction with measures listed in paragraph 3.04.7.h.(1)(b), 20-foot Clearance of this section.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

Applicability: Reclamation Employees, Facilities, Operations, and Contractors

TABLE 3.04-1 Minimum Clearance Distances

Voltage (nominal, kV, alternating current)	Minimum Clearance Distance (feet)
Up to 50	10
Over 50-200	15
Over 200-350	20
Over 350-500	25
Over 500-750	35
Over 750-1,000	45
Over 1,000	As established by the utility owner or engineer who is a qualified person with respect to electrical power transmission and distribution.

Note: kV=kilovolts. Where it is determined infeasible to do the work without breaching the minimum clearance distance, see 29 CFR 1926.1410(c).

- Voltage Information. The utility owner or operator shall provide voltage information within 2 working days of the employer's request as required by 29 CFR 1926.1407(e).
- Communications/Transmitter Tower. Operators shall deenergize the transmitter where equipment is close enough for an electrical charge to be induced.
- Specific Training. Each operator and crew member who works adjacent to power lines shall be trained on 29 CFR 1926.1408 through .1411, as well as the following:
  - procedures to follow in the event of electrical contact with a power line,
  - electrocution hazard created if the operator simultaneously touches the equipment and the ground,
  - importance of the operator staying in the cab unless there is an imminent danger of fire, explosion, or another emergency,
  - safe evacuation methods for exiting the cab,
  - danger of the potentially energized zone around the equipment (step potential),
  - danger of the crew approaching the equipment or touching the equipment or load,
  - safe clearance distances, and
  - the presumption that all power lines are energized.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

**TABLE 3.04-2 Minimum Clearance Distance While Traveling with No Load**

Voltage (nominal kV alternating current)	While Traveling—Minimum Clearance Distance (feet)
Up to 0.75	4
Over 0.75-50	6
Over 50-345	10
Over 345-750	16
Over 750-1,000	20
Over 1,000	As established by the utility owner or engineer who is qualified with respect to electrical power transmission and distribution

- **Restriction of Lifting Personnel.** Unless there is a specific variance issued in accordance with the RSHS and meeting OSHA defense for infeasibility or increased safety in its reasoning, no person may ride loads, blocks, buckets, hooks, scaffolding, boatswain’s chairs, cages, or other devices attached to hoist lines, booms, or attachments of any crane, derrick, or materials hoist. Designated maintenance personnel may ride the carriage service platform of a cableway to perform inspection testing or maintenance. Operations using crane-supported personnel platforms are considered critical lifts. Employees may only ride in/on a personnel platform specifically manufactured for lifting personnel. Refer to RSHS 1.11, Walking and Working Surfaces, paragraph 1.11.9.q, Crane-Supported Personnel Platforms, for crane-supported personnel platform guidance.
- **Moving Mobile Cranes.** Operators shall not move mobile cranes when employees are aloft and shall carefully observe the area when moving a crane. Operators must observe state requirements regarding special license to drive mobile cranes on roads.
- **Cranes with Capacity of 2,000 Pounds or Less.** Cranes and hoisting equipment with maximum rated lifting capacity of 2,000 pounds or less shall comply with 29 CFR 1926.1441, Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less. Inspection and use of this equipment shall comply with manufacturer instructions, recommendations, limitations, and specifications. If this documentation is not available, first-line supervisors shall consult a qualified engineer who is familiar with the type of equipment. Facility Managers are responsible for providing training to operators and signalpersons for use of mobile cranes with capacity of 2,000 pounds or less.
- **Modifications.** Any modification or repair to a mobile crane shall have a qualified engineer to oversee, inspect and approve all changes per 29 CFR 1926.1412(a), prior to initial use.

### 8. Mobile and Locomotive Cranes

In addition to the safe practices previously listed, mobile and locomotive cranes will conform to the manufacturer's instructions, 29 CFR 1910.180, Crawler locomotive and truck cranes, and the current edition of ASME B30.5, Mobile and Locomotive Cranes. Side boom wheel or crawler tractors will conform to ASME B30.14, Side Boom Tractors. Articulating boom cranes will conform to ASME B30.22, Articulating Boom Cranes.

#### a. Operating Instructions

All equipment shall have rated load capacities, recommended operating speeds, special hazard warnings, and instructions conspicuously posted. Instructions or warnings will be visible to the operator while at the control station.

#### b. Boom Angle/Radius Indicator

Manufacturers shall equip mobile cranes with a boom angle or radius indicator located within the operator's view.

#### c. Boom Stops

Work sites shall provide cranes or other hoisting devices with cable-supported booms with stops to resist the boom falling backwards. Facilities and manufacturers shall design boom stops to provide increasing resistance from the initial point of contact to a stopping point no more than 87 degrees above horizontal.

#### d. Boom Hoist Disengagement Device

Manufacturers shall provide mobile crane booms with a functional boom hoist disengagement device that will automatically stop the boom hoist mechanism when the boom reaches its highest-rated angle.

#### e. Anti-Two-Blocking Device

Manufacturers shall equip all mobile cranes with a two-block damage prevention feature or an anti-two-blocking device. Two-block damage prevention features will prevent damage to the crane or hoist line in case of a two-block condition. Anti-two blocking devices shall have automatic capabilities to disengage all crane functions in which movement can cause two-blocking. For lattice-boom cranes manufactured before 1992, two-block warning features may be used to alert the operator to an impending two-blocking condition. Reclamation prohibits cranes lacking automatic capabilities to disengage all crane functions in a two-block condition for use in critical lifts.

#### f. Level Indicator

Work sites shall provide a way for the operator to visually determine the levelness of the crane.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

Applicability: Reclamation Employees, Facilities, Operations, and Contractors

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### g. Jib Stops

In addition to boom stops, jibs shall have a positive stop to prevent overtopping.

### h. Cab Windows

Work sites shall equip crane cab windows with safety glass or equivalent. Cab windows shall not introduce any distortion that interferes with the crane's safe operation.

### i. Audible Warning Device

Mobile cranes shall have an audible warning signal device distinguishable and audible above background noise.

### j. Foot Pedal Brakes

Equipment with foot pedal brakes shall have locks, except for portal and floating cranes.

### k. Hydraulic Outrigger Jacks

Hydraulic outrigger jacks shall have an integral holding device (check valve).

### l. Load Weighing or Similar Device

Equipment manufactured after March 29, 2003, with a rated capacity over 6,000 pounds shall have a load weighing device, load moment (or rated capacity) indicator, or a load moment (or rated capacity) limiter.

### m. Outrigger/Stabilizer Position and Hoist Drum Rotation Indicators

Work sites shall equip any equipment manufactured after November 8, 2011, with an outrigger/stabilizer position sensor, or monitor if the equipment has outriggers or stabilizers and a hoist drum rotation indicator if the drum is not visible from the operator's station.

### n. Securing Booms

When they are not in use, operators shall lower crane booms to the ground or otherwise secure them to prevent displacement by wind or other outside forces.

## 9. Tower Cranes

In addition to the safe practices previously listed, tower cranes shall conform to manufacturer's instructions, 29 CFR 1926.1435, Tower Cranes, and the current edition of ASME B30.3, Tower Cranes.

### a. Design

Work sites shall construct or install all load bearing foundations, supports, and rail tracks in accordance with the crane manufacturer's instructions or a qualified engineer.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

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### **b. Crane Assembly and Disassembly**

Operators or qualified personnel shall assemble and disassemble cranes in accordance with the manufacturer's instructions and ASME B30.3. These minimum requirements shall be observed:

- supervision by a qualified person,
- provided and available manufacturers or a qualified engineer's written instructions and the weights of each component, and
- development/implementation of a JHA that includes consideration of temporary guying and bracing requirements.

### **c. Environmental Conditions**

Operators shall place the crane into its most favorable protected position to protect personnel and property when environmental conditions require lifting operations to cease.

### **d. Unattended Tower Cranes**

Operators shall place unattended tower cranes in a weathervane configuration.

### **e. Limiting Devices**

Where applicable, work sites shall install the following limiting devices:

- trolley limit switches to prevent trolley motion beyond predetermined points on tower crane booms,
- anti-two-block switches that cause the hoist drum to automatically stop, preventing contact between the load hook and the head block,
- load-limiting switches to avoid exceeding crane capacities, and
- limit switches and stops or buffers at each end of the tracks of track-mounted cranes.

### **f. Boom Angle Indicator**

Work sites shall install boom angle indicators on machines having booms capable of moving in the vertical plane.

## **10. Derricks**

In addition to the safe practices previously listed, derricks shall conform to the requirements of 29 CFR 1910.181, Derricks, 1926.1436, Derricks, and the current edition of ASME B30.6, Derricks.

### **a. Design**

Derrick installations and equipment shall be in accordance with manufacturer's instructions, or a qualified engineer.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

Applicability: Reclamation Employees, Facilities, Operations, and Contractors

---

### b. Foundation

First-line supervisors and/or operators shall ensure derricks are set on foundations designed and constructed to support the weight of the crane plus the maximum rated load.

### c. Boom Angle Aid

If the derrick is not equipped with a boom angle indicator, work sites shall use a device that automatically prevents movement past the minimum and maximum allowable boom angles or mark the boom hoist cable, within the operator's view, with caution and stop marks that correspond to the minimum and maximum allowable boom angle.

## 11. Floating Cranes and Floating Derricks

In addition to the safe practices previously listed, floating cranes and floating derricks shall conform to the manufacturer's instructions, 29 CFR 1926.1437, Floating cranes/derricks and land cranes/derricks on barges, and the current edition of ASME B30.8, Floating Cranes and Floating Derricks.

### a. Design

The manufacturer or a qualified engineer shall design and certify all floating cranes and floating derricks.

### b. Rescue

Work sites shall make a rescue skiff and personal floatation devices available meeting the requirements in RSHS Section 1.07, Personal Protective Equipment.

### c. Load Rating Chart

When reducing load ratings to compensate for "barge list," first-line supervisors shall provide a new rating chart. The manufacturer will rate barge-mounted cranes designed and constructed as a unit. All other barge-mounted cranes will be large enough to limit the "list" under maximum load to 5 degrees.

### d. Wave Action

Operators shall suspend crane operation when wave action affects the stability of the barge.

## 12. Pile Driving Equipment

Equipment used for pile driving shall be designed and manufactured for that specific purpose. In addition to the safe practices previously listed, use of pile driving equipment shall conform to the manufacturer's instructions, 29 CFR 1926.603, Pile driving equipment, and 1926.1439, Dedicated pile drivers.

# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

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### **a. Qualifications**

A qualified person shall supervise all pile driving. Only qualified persons shall operate pile drivers.

### **b. Site Conditions**

Prior to start of operations, first-line supervisors shall thoroughly inspect the site to determine conditions that require special safety measures. Qualified personnel shall locate all underground and overhead utilities. Overhead utilities shall meet safe clearance requirements, and all underground services in the area will be rendered safe.

### **c. Setup**

Work sites shall erect all pile driving equipment on a firm foundation. If necessary, qualified personnel shall use adequate guy lines, outriggers, thrust boards, counterbalances, or rail clamps to stabilize pile driving equipment during operation.

### **d. Boilers and Pressure Vessels**

Boilers and pressure vessels used in pile driving operations shall conform to standards set in RSHS Section 1.15, Hand Tools, Power Tools, Pressure Vessels, Compressors, and Welding.

### **e. Driving Leads**

Work sites shall provide pile driving equipment leads with fixed ladders and attachment points for safety harness lanyards.

### **f. Hose Connections**

Work sites shall secure high-pressure hose connections (air, steam, hydraulic) with a whip-check device that is adequate to prevent whipping in case of disconnection.

### **g. Hammer**

All personnel shall take adequate precautions to prevent the hammer from missing the pile. When employees work under the hammer, operators shall place a blocking device in the leads that can support the hammer. Work sites shall provide pile driver leads with stops to prevent the hammer from being raised into the headblocks.

### **h. Floating Pile Driving Equipment**

Hulls for floating pile driving equipment shall be at least as wide as 45 percent of the height of the lead above the water. Work sites shall protect the operating deck to prevent suspended piling from swinging or drifting over the deck. Operators and qualified personnel shall evenly distribute the weight of machinery on floating pile driving equipment so that the deck is horizontal.



# Reclamation Safety and Health Standards—2024 Edition

## Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

*Applicability: Reclamation Employees, Facilities, Operations, and Contractors*

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### **i. Overhead Protection**

Work sites shall provide overhead protection for the operator equivalent to 2-inch planking. Works sites shall position the overhead protection in a way that does not interfere with the operator's view of the pile driver.

### **j. Noise Survey**

First-line supervisors shall conduct a noise survey using a sound level meter, A-scale, fast response at the beginning of piledriving operations to determine a distance from the pile driver where noise levels do not exceed 85 decibel A-weighting. Employees working inside of the boundary shall always wear hearing protection when pile driving operations are conducted.

### **k. Preparation of Piles**

As far as practicable, piles shall be prepared at a distance at least equal to twice the length of the longest pile from the pile driving equipment.

### **l. Moving the Pile Driver**

When moving the pile driver, operators shall lower the hammer to the bottom of the leads. When not in use, operators shall block the pile driver hammer at the bottom of the leads.

### **m. Signals**

First-line supervisors, operators, and/or other qualified personnel shall develop suitable signals for the control of the pile driving operation prior to the start of the job.

### **n. Cutting Piles**

Operators shall not trim piles within a distance from the pile driver of twice the length of the longest pile.

### **o. Hoisting Piling**

Operators shall use remote release shackles when possible. If not used, provide a closed shackle or other positive means of attachment. The length of the operating rope will be less than the length of the pile, and the operators will secure the rope around the pile to prevent snagging or being blown out of reach by the wind. Employees will keep clear when hoisting piles. Operators and qualified personnel shall use tag lines to control unguided piles and flying hammers.

### **p. Pulling Piles**

Operators shall use extractors to pull piling that cannot be pulled without exceeding the safe load rating of the pulling rig. When pulling piling, the operators shall not elevate the crane boom more than 60 degrees from the horizontal.

## 13. Overhead and Gantry Cranes

29 CFR 1926.1438 (b) addresses the applicable standard for overhead and gantry cranes not permanently installed in a facility. Side boom cranes mounted on wheel or crawler tractors must meet all the requirements of ASME B30.14, Side Boom Tractors.

## 14. Helicopter Operations

Operators and aircraft will be licensed and will comply with the applicable requirements of the Federal Aviation Administration; Department of the Interior, Office of Aviation Services; ASME B30.12, Handling Loads Suspended from Rotorcraft; 29 CFR 1910.183, Helicopters; and 29 CFR 1926.551, Helicopters.

### a. Briefing

Before each day's operation, first-line supervisors shall conduct a briefing for pilots and ground personnel and discuss, in detail, the plan of operation.

### b. Loads

Operators shall secure suspended loads with pressed sleeves, swaged eyes, or equivalent means to prevent hand splices from spinning open or cable from loosening. Tag lines will be short enough to avoid drawing into the rotors.

### c. Cargo Hooks

Job sites shall use self-locking cargo hooks equipped with a quick-release device that can be activated from the pilot's location. Electrically operated cargo hooks will have the electrical activating device designed and installed to prevent accidental operation. Job sites shall also equip these hooks with an emergency control to release the load. Operators shall test the hooks before each day's operation to ensure that they function properly.

### d. Downwash

Employees shall remove or secure material and loose gear within 100 feet of the lift or delivery site.

### e. Operator Responsibility

The helicopter pilot is responsible for the size, weight, and way loads are connected to the helicopter. Job sites shall not make the lift if the pilot considers it unsafe.

### f. Hooking and Unhooking

Employees will not perform work under the hovering helicopter, except as necessary to hook and unhook loads. Job sites shall provide a safe means of access and egress for employees to approach the hook to engage or disengage cargo slings.

#### **g. Static Charge**

Unless ground personnel use a grounding device to dissipate the static charge, ground personnel will wear appropriate electrically rated rubber gloves.

#### **h. Weight Limitations**

The weight of the load and rigging shall not exceed the aircraft manufacturer's rating, considering altitude and ambient temperatures that exist at the time.

#### **i. Ground Lines**

Qualified personnel shall not attach hoist wires or other gear, except for pulling lines or conductors that "payout" from a container or roll off a reel, to any fixed ground structure or allow wires or other gear to foul on any fixed structure. Qualified personnel shall use only pulling lines or conductor stringing systems designed with stress release hardware located so that it protects the aircraft against overload and line entanglement with rotors.

#### **j. Visibility**

When dust or other conditions reduce visibility, ground personnel will exercise special caution to keep clear of the rotor blades and reduce the possibility of dust to the extent practical.

#### **k. Approaching Helicopters**

First-line supervisors shall permit only authorized personnel to approach within 50 feet of a helicopter with turning rotor blades. People approaching or leaving a helicopter with the blades turning will keep within full view of the pilot and assume a crouched position. Persons will stay out of the area from the cockpit or cabin rearward unless the pilot authorizes them to enter that area.

#### **l. Radio Communication**

Work sites shall provide reliable radio communication between the pilot and a designated member of the ground crew during all loading, unloading, and rigging operations.

#### **m. Hand Signals**

The signalperson on the ground will be distinguishable from other ground personnel. The aircrew and ground personnel shall review and agree upon the signal systems, both radio and hand signals, to be used prior to hoisting the load. Hand signals, where used, shall be standard "Helicopter Hand Signals" per 29 CFR 1910.183(n), Figure N-1.

## **15. Communication Requirements**

A signalperson shall be present when the point of operation is not in full view of the crane operator, when the view in the direction of travel is obstructed, or the operator feels a signalperson is necessary. Radio communication is required if anyone involved in the lift cannot see the signalperson/flagmen/rigger/operator. Additionally, a secondary means of communication shall be used.

# Reclamation Safety and Health Standards—2024 Edition

Chapter 3: Materials Handling | Section 3.04 Mobile Cranes

Applicability: Reclamation Employees, Facilities, Operations, and Contractors

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## a. Hand Signal Standards

The signalperson shall use Standard Method hand signals, per 29 CFR 1926 Subpart CC, App A, Standard Hand Signals, unless it is infeasible, or an operation is not covered by the standard method. The signalperson, operator and lift supervisor shall review and agree upon any non-standard hand signals.

## b. Radio Signal Standards

Operators shall test radio devices used to transmit signals to ensure transmission is reliable, clear, and effective. All staff shall use a dedicated radio channel unless the coordination or conditions of the work prohibit such use.

## ▲ RSHS Appendix A: Definitions

RSHS Appendix A ([Definitions](#)) is available to print at:

<https://www.usbr.gov/safety/rshs/index.html>.

## ▲ RSHS Appendix B: Additional References and Citations

RSHS Appendix B ([Additional References and Citations](#)) is available to print at:

<https://www.usbr.gov/safety/rshs/index.html>.