

Section 19A

Permanently Installed (Fixed) Cranes

19A.1 Scope

This section sets forth safety requirements for permanently installed cranes, also known as fixed cranes, and 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 19B, *Mobile Cranes*, covers mobile crane safety. Appendix A, *Riggers and Signalpersons*, of this RSHS section, covers signalpersons and rigger training, which apply to both permanently installed and mobile cranes. Appendix B, *Hoists*, of this RSHS section, covers hoists and safe hoisting practices.

19A.2 General Requirements

The American Society of Mechanical Engineers (ASME) B30 standards and the Occupational Safety and Health Administration (OSHA) regulations, 1910 Subpart N for general industry use and 1926 Subpart CC for construction use govern crane safety. Within Reclamation, safety standards commonly limit permanently installed cranes to general industry 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 of permanently installed cranes.

19A.3 Responsibilities

19A.3.1 Regional Safety Managers

19A.3.1.1 Shall conduct periodic reviews of local crane safety programs as part of their normally scheduled safety and occupational health program evaluations.

19A.3.2 Area Office Managers

19A.3.2.1 Shall designate a Reclamation employee, or third-party evaluator, to assess operators, signalpersons, and riggers (see 19A.3.12).

19A.3.3 Area Office Safety Professionals

19A.3.3.1 Shall review critical lift plans.

19A.3.4 Facility Managers

- 19A.3.4.1** Shall select qualified personnel to maintain and repair permanently installed crane equipment and components.
- 19A.3.4.2** Shall ensure proper maintenance, testing, and repair/replacement of equipment by qualified personnel and will make the respective documentation available for review.
- 19A.3.4.3** Shall ensure permanently installed crane equipment have preventive maintenance schedules established, as well as detailed and accurate maintenance job plans, prepared in accordance with FIST 4-1A, *Maintenance Scheduling for Mechanical Equipment*.
- 19A.3.4.4** Shall ensure maintenance and repair personnel follow applicable safety procedures and have the tools and documentation, including equipment manuals, necessary to accomplish their work.
- 19A.3.4.5** Shall verify that a third-party evaluator or qualified person evaluates equipment operators, signalpersons, and riggers.
- 19A.3.4.6** Shall verify that a qualified inspector or third-party evaluator completes crane inspections, per 19A.7.2, *Crane Inspections*, of this section.

19A.3.5 First-Line Supervisors

- 19A.3.5.1** Shall provide or coordinate training to ensure that crane operators under their supervision meet the requirements set in 19A.4, *Training Requirements*, of this section.
- 19A.3.5.2** 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 crane used for the evaluation.
- 19A.3.5.3** Shall make the operator evaluation documentation available digitally or on the worksite for as long as the operator is employed.
- 19A.3.5.4** Shall provide or coordinate retraining and re-evaluation if an operator is not competent in a necessary aspect of safe crane operation.
- 19A.3.5.5** 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 19A.7.6) per FIST 4-1A, 6.9.3, *Designated Person*.

- 19A.3.5.6** Shall designate qualified person to 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.
- 19A.3.5.7** Shall ensure all staff operate equipment safely.
- 19A.3.5.8** Shall ensure all staff use preplanned and approved hoisting and rigging instructions when necessary, and always for critical and engineered lifts.
- 19A.3.5.9** Shall ensure operators resolve or properly tag all equipment problems if found to be unsafe or requiring restrictive use.
- 19A.3.5.10** Shall assign a qualified lift supervisor to critical lift operations.
- 19A.3.5.11** Shall ensure any signalpersons are qualified and trained for the task assigned prior to giving any signals.
- 19A.3.5.12** Shall provide crane operators the time and resources necessary to receive required medical surveillance examinations.
- 19A.3.5.13** Shall maintain an inventory of their employees who are qualified crane operators, signalpersons, and riggers. Inventory shall include dates of training and/or certification, retraining where required, and dates of medical clearance.

19A.3.6 Lift Supervisors for Critical Lifts

- 19A.3.6.1** Shall be designated by the first-line supervisor as the person to supervise the planning and execution of the critical lift.
- 19A.3.6.2** 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.
- 19A.3.6.3** Shall ensure all operators and staff perform the activities listed in FIST 4-1A, 6.9, *Critical Lifts*.

19A.3.7 Crane Operators

- 19A.3.7.1** Shall complete all required 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.
- 19A.3.7.2** Shall ensure that equipment is current on all inspections prior to lifting and that all members participating in a lift completely understand the work instruction for the lift.

19A.3.7.3 Shall not assume the role of a qualified rigger, as a qualified operator does not necessarily meet the requirements of a qualified rigger.

19A.3.7.4 Shall visually inspect equipment prior to or during each shift when the equipment is in use, per 19A.7.2 of this section.

19A.3.8 Signalpersons

19A.3.8.1 Shall be trained and qualified prior to giving any signals.

19A.3.8.2 Shall agree upon and understand communication signals and radio standards with crane operator and other personnel involved.

19A.3.9 Riggers

19A.3.9.1 Shall be trained and qualified prior to performing rigging operations or shall be a rigger in training under the direction of a qualified rigger.

19A.3.9.2 Shall participate in assembly/disassembly activities, additionally whenever workers are within a fall zone hooking/unhooking/guiding a load or initially connecting a load to a component or structure.

19A.3.9.3 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.

19A.3.9.4 Shall understand and familiarize themselves with RSHS Section 18, *Slings, Rigging Hardware, and Wire Rope*.

19A.3.10 Crane Inspectors

19A.3.10.1 Shall inspect cranes prior to initial use and any equipment that have had professional engineer approved modifications or additions which affect the safe operation of the equipment or capacity, per 19A.7.2 of this section.

19A.3.10.2 Shall inspect equipment on an annual basis per OSHA 1910.179(j).

19A.3.11 Crane Maintenance and Repair Persons (Reclamation Employee)

19A.3.11.1 Shall only operate equipment to the extent necessary to perform maintenance, inspect equipment, or verify performance.

19A.3.12 Designated Evaluators (Reclamation Employee)

19A.3.12.1 The area office manager shall designate evaluators based on qualifications of knowledge, training, and verifiable experience.

19A.3.12.2 Shall evaluate the skills, knowledge, experience, and ability of crane operators, signalpersons, and riggers to recognize and avert risk when performing their respective duties.

19A.4 Training Requirements

19A.4.1 Initial

19A.4.1.2 Crane Operators. First-line supervisors shall provide crane operator training to promote proficient performance of a crane operator. Training shall include:

- physical characteristics of the workplace,
- performance characteristics and complexity of the crane,
- type of load (multiple piece loads, raw materials, bulk materials, machine assemblies, fragile and durable materials, etc.),
- responsibilities of the crane operator and other persons involved in the movement of the load(s),
- safe operation of specific type(s) of equipment they will be operating (controls and operation, use and calculation of load/capacity information for various configurations of the equipment),
- equipment manuals,
- inspections,
- operational and maneuvering skills,
- safe shut-down procedures, and
- electrical safety.

19A.4.1.3 Crane Inspectors. An accredited organization or qualified in-house resource shall provide training and shall include information specific to the type of permanently installed/fixed crane(s) to be inspected.

19A.4.1.4 Riggers and Signalpersons. Refer to Appendix A, *Riggers and Signalpersons*, for requirements.

19A.4.2 Proficiency Qualification for Permanently Installed Crane Operators

When operating permanently installed cranes for maintenance work, crane operators shall meet the following requirements:

- trained for the specific type of crane they will be operating,
- completed formal training and testing, and
- medically cleared.

19A.4.3 Refresher Training

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.

19A.4.4 Recordkeeping

The first-line supervisor shall 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.

19A.5 Hazardous Environmental Conditions

19A.5.1 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 when monitoring has identified hazardous conditions.

19A.5.1.1 Prior To Operation. Prior to setting up a lift, a reliable weather source must confirm 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.

19A.5.1.2 During Operations. Operators will not conduct lifting 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.

19A.5.1.3 Postponing Operation. First-line supervisors must consult manufacturer recommendations for storing the crane during high-wind events. When high wind/gust conditions postpone crane operations, loads must be landed and secured. Operators shall secure all outdoor cranes capable of traveling upon rail by means of travel restraints, storm brakes, thruster wheel chocks, or similar devices when not in use.

19A.5.2 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 activities and seek shelter.

19A.6 Safety Equipment

19A.6.1 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 the crane cab/operator station. Facilities shall maintain and inspect portable fire extinguishers monthly per RSHS Section 10, *Fire Prevention and Protection*.

19A.6.2 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 the operator's line of sight.

19A.6.3 Self-Rescue Devices for Cab Operated Cranes

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

19A.7 Safe Practices

19A.7.1 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 Manual 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.

19A.7.2 Crane Inspections

Refer to OSHA 1910.179(j) 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 the requirements of this section. Previous inspection documents must be made available to crane inspectors.

- 19A.7.2.1 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.
- 19A.7.2.2 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.
- 19A.7.2.3 Periodic.** The operator or other qualified personnel shall inspect all permanently installed 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 work 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.
- 19A.7.2.4 Periodic/Annual.** Operators shall perform inspections annually or more frequently as conditions require by a qualified person or third-party evaluator.
- 19A.7.2.5 Standby Cranes.** Qualified personnel shall inspect standby cranes at least semi-annually in accordance with periodic inspection requirements. When an inspector returns standby cranes to service which have not been in use for more than 1 month, but less than 6 months, the crane 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 6 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 type of deterioration and a

certification for continued use (including date, signature of inspector, and identifier of the specific rope).

19A.7.2.6 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.

19A.7.2.7 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 13, *Walking and Working Surfaces*, paragraph 13.9.7.4, *Additional Inspections and Tests*, facilities 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.

19A.7.3 Medical Surveillance

Qualified medical personnel shall conduct medical surveillance of crane operators per the Interior Office of Occupational Safety and Health, 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 manages all medical clearances.

19A.7.4 Electrical Safety

For Reclamation's electrical safety standards refer to RSHS Section 12, *Electrical Safety Requirements*. Crane wiring and equipment shall comply with OSHA 1910, Subpart S, *Electrical*. 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 crane uses multiple conductor cable 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.

19A.7.5 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.

19A.7.6 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 should review critical lift plans. The first-line supervisor to supervise the planning and execution of the critical lift shall designate the critical lift 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.

19A.7.7 Engineered Lifts

Operators shall plan engineered lifts that exceed the crane's rated capacity in accordance with ASME B30.2-3.4, ASME B30.16-3.5, and ASME B30.17-3.4. Engineered lifts shall not exceed 110 percent of the rated capacity.

19A.7.8 Powerline Safety

Prior to operating permanently installed/fixed cranes, first-line supervisors shall assess the area for any potential powerline hazards and document the assessment in the JHA.

19A.7.9 Restriction of Lifting Personnel

Unless there is a specific variance issued in accordance with the RSHS and meeting the intent of an OSHA standard, 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 Section 13, *Walking and Working Surfaces*, paragraph 13.9.7, *Crane-Supported Personnel Platforms*, for crane-supported personnel platform guidance.

19A.7.10 Modifications

Any modification or repair to a permanently installed/fixed crane shall have a qualified engineer to oversee, inspect, and approve all changes per OSHA 1910.179(b)(3), prior to initial use.

19A.8 Cableways

In addition to the requirements previously listed, cableways shall comply with the installation, testing, operation, and maintenance requirements in the current edition of ASME B30.19, *Cableways*.

19A.8.1 Design and Installation

A qualified engineer will design cableways. Qualified personnel shall install and operate cableways according to the engineer's design drawings, specifications, and operating, maintenance, and inspection instructions.

19A.8.2 Cableway Log

First-line supervisors shall maintain a log for each cableway to record inspections, lubrication, maintenance, and repair activities. The log must include operating time and downtime, and the employee responsible for performing the maintenance or repair work must sign it. The log must be made available for review.

19A.8.3 Signal System

The operator and the signalperson must continuously maintain at least two systems of communication between them. At least one of the systems shall provide voice communication by telephone or radio. The second system shall use lights or bells as the signaling means. When the dual system is not functioning properly, the operator may deliver the load suspended from the cableway, but the operator will rig no further load until both communication systems are functioning.

19A.8.4 Control Consoles

During operation of the cableway, only the operator(s) are permitted in the control console room. The console room windows shall be safety glass that introduces no distortion that would interfere with the safe operation of the cableway.

19A.8.5 Operating Controls

All controls shall automatically return to neutral and set the brakes when released. The manufacturer must plainly mark each control to indicate its function and ensure that it is within easy reach of the operator.

19A.8.6 Cableway Platforms and Carriages

Facilities shall provide cableway inspection platforms, moving and stationary, with standard guardrails and toeboards. Facilities shall enclose open areas on carriages and moving platforms with wire mesh to reduce the hazard from falling objects.

19A.8.7 Concrete Buckets

Manufacturers shall design concrete buckets with a safety device to prevent accidental opening of the bucket while in transit to the discharge site. These buckets must be constructed to prevent aggregate from lodging in any part of the bucket. Refer to RSHS Section 25, *Concrete, Masonry, Construction, and Formwork*.

19A.8.8 Riding Cableways

First-line supervisors shall prohibit riding the cableway, except for designated maintenance personnel who may ride the carriage service platform of a cableway to perform inspections or maintenance. First-line supervisors shall then prepare and review a JHA before performing inspections or maintenance.

19A.8.9 Track-Mounted Towers

Facilities shall equip track-mounted cableway towers or structures with both limit switches and rail stops, or with buffers at each end of the tracks. The facility shall also equip the wheel with track or rail sweeps that extend below the top of the rail and are effective in all directions of travel. When two or more towers operate on the same track, the facility shall install an automatic control system to prevent the towers from colliding.

19A.9 Communication Requirements

A signalperson shall be present when the point of operation is not in full view of the operator, when the view in the direction of travel is obstructed, or the operator feels a signalperson is necessary.

19A.9.1 Hand Signal Standards

The signalperson shall use Standard Method hand signals, per OSHA 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.

19A.9.2 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 shall unless the coordination or conditions of the work prohibit such use.

19A.10 Definitions

Accredited organization	An officially recognized group being qualified to perform a particular activity. In the context of this document accredited organizations shall be formally recognized by OSHA, for example the National Center for Construction Education and Research and the National Commission for the Certification of Crane Operators.
Competent person	A person who, by training and/or experience, can perform specifically assigned duties and responsibilities. Further, the person can recognize existing and predictable hazards or conditions which are unsanitary, hazardous, or dangerous and is authorized to initiate prompt corrective action.
Construction work	Federal OSHA has defined “construction work” to mean work that involves “construction, alteration, and/or repair, including painting and decorating.” (See OSHA 1910.12(b) and OSHA 1926.10(a)).
Critical lift	Hoisting or lifting operations that are known to have increased risks to personnel or property.
Engineered lift	A noncritical lift that management has designated as requiring additional controls by having a qualified individual or engineer independently pre-identify load weight, load center of gravity, lift attachment points, and minimum lifting hardware (slings, below-the-hook lifting devices, shackles, etc.) capacities that will be used for the lift or series of lifts. Pre-identified information shall be provided to the personnel involved in the lift.
Qualified person	A person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated ability to solve or resolve problems relating to the subject matter, the work, or the project.
Maintenance work (General Industry)	Making or keeping a structure, fixture, or foundation (substrates) in proper condition in a routine, scheduled, or anticipated fashion. This work only goes so far as to keep equipment in its existing state, to prevent failure and decline. Maintenance work is small scale and simple, routine, and done on a regularly scheduled/periodic basis to help maintain the original condition of the component. If the extent of these work activities is larger or more complex, it is no longer maintenance work.

Standby crane	A crane which is not in regular service, but which is used occasionally or intermittently as required. OSHA 1910.179(a)(56)
Differentiating between General Industry and Construction	Determining whether a task or operation falls under the Federal OSHA General Industry Standard, 1910, versus the Federal OSHA Construction Standard, 1926 is relatively subjective. In general, maintenance or replacement-in-kind activities are not considered construction and would therefore fall under the Federal OSHA General Industry standard. For example, keeping a structure, fixture, or foundation in a routine, scheduled, or anticipated condition would be considered general maintenance.

19A.11 References

- American Society of Mechanical Engineers. ASME B30.16 *Overhead Underhung and Stationary Hoist*
- American Society of Mechanical Engineers. ASME B30.17 *Cranes and Monorails (With Underhung Trolley or Bridge)*
- American Society of Mechanical Engineers. ASME B30.19 *Cableways*
- American Society of Mechanical Engineers. ASME B30.2 *Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)*
- American Society of Mechanical Engineers. ASME B30.3 *Tower Cranes.*
- American Society of Mechanical Engineers. ASME B30.6 *Derricks*
- American Society of Mechanical Engineers. ASME B30.7 *Winches*
- American Society of Mechanical Engineers. ASME HST-6M, *Performance Standard for Air Wire Rope Hoists.*
- Bureau of Reclamation. Facilities Instructions, Standards, and Techniques Volume 4-1A, *Maintenance Scheduling for Mechanical Equipment, Revised January 2009.*
https://www.usbr.gov/power/data/fist_pub.html
- Bureau of Reclamation. Facilities Instructions, Standards, and Techniques Volume 6-2, *Conduct of Power Maintenance, March 2006.* https://www.usbr.gov/power/data/fist_pub.html
- Bureau of Reclamation. Reclamation Manual Policy SAF P01, *Safety and Occupational Health Program.* <https://www.usbr.gov/recman/policies.html>
- Bureau of Reclamation. O&M Guidance & Training Resources. *Review of Operation and Maintenance Program Field Examination Guidelines.*
<https://intra.usbr.gov/amd/oss/docs/1991%20RO&M%20Guidelines%20PDF.pdf>
- Bureau of Reclamation. O&M Guidance & Training Resources. *Guidelines for The Process of Evaluating the Reliability of Mechanical Equipment During Dam Safety Comprehensive Facility Review Examinations.*
[https://intra.usbr.gov/amd/oss/docs/Guidelines%20on%20CFR%20Mechanical%20Inspections%20\(2001%20version\).pdf](https://intra.usbr.gov/amd/oss/docs/Guidelines%20on%20CFR%20Mechanical%20Inspections%20(2001%20version).pdf)
- Infrastructure Health & Safety Association (IHSA). Hoisting and Rigging Safety Manual.
<https://www.ihsa.ca/PDFs/Products/Id/M035.pdf>
- Occupational Safety and Health Administration. 29 CFR 1910 Subpart N – *Materials Handling and Storage.* <https://www.osha.gov/laws-regs/regulations/standardnumber/1910>

- Occupational Safety and Health Administration. 29 CFR 1926 Subpart CC – *Cranes and Derricks in Construction*. <https://www.osha.gov/laws-regs/regulations/standardnumber/1926>
- Occupational Safety and Health Administration. 29 CFR 1926 Subpart R - Steel Erection 1926.753, *Hoisting and Rigging*. <https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.753>
- US Department of Energy - Hanford Site. Hanford Hoisting and Rigging Manual. <https://www.hanford.gov/page.cfm/HoistingRiggingManual>
- US Department of the Interior Office of Occupational Safety and Health. Medical Program Handbook (Fifth Edition). https://www.doi.gov/sites/doi.gov/files/migrated/bureaus/doi_medical_handbook_2018_-_draft.pdf

Appendix A

Riggers and Signalpersons Requirements

A.1 Scope

Riggers and signalpersons that participate in any lifts or hoisting activities shall only perform duties commensurate with their level of certification or qualification. The requirements applicable to performing these roles are addressed in OSHA 1926 Subpart CC, *Cranes and Derricks in Construction*:

- OSHA 1926.1428, *Signal person qualifications*
- OSHA 1926.1431, *Hoisting personnel*

A.2 Training Requirements

A.2.1 Initial

A.2.1.1 Signalpersons. Signalpersons shall be trained and qualified prior to giving any signals. Training shall meet the requirements of OSHA 1926.1428, to know and understand:

- types of signals used,
- application of signals used,
- basic equipment operation and limitations including crane dynamics when hoisting loads,
- general signal requirements,
- standard voice and hand signals, and
- radio, telephone, and other electronic signals.

A.2.1.2 Riggers. Persons performing rigging work shall be trained and qualified prior to performing any rigging duties. Training shall meet the proficiency requirements in A.2.2.2 and include:

- hoisting and rigging hazards,
- factors that reduce capacity,
- calculating load weights, load angle factors, and center of gravity,
- lift point identification,
- OSHA 1910.184, *Slings*,
- OSHA 1926.251, *Rigging equipment for material handling*,
- ASME B30, as it pertains to lifting and material handling related to lifting equipment,
- sling use and inspection,
- basic hitch connections, their advantages, and disadvantages,
- calculating sling loading based on rigging configuration,
- basics of crane operation and what to be aware of during a lift,
- signal operations, and

- rigging hardware use and inspection criteria.

A.2.2 Proficiency Qualification.

A.2.2.1 Signalpersons. The signalperson is qualified if they:

- meet the requirements of a qualified person, and
- know and understand the type of signals used at the worksite, and
- are competent in using signals.

A.2.2.2 Riggers. At a minimum, a qualified rigger:

- possesses a recognized degree, certificate, or professional standing, or
- has extensive knowledge, training, and experience, and
- can successfully demonstrate the ability to solve problems related to rigging loads.