

Section 19

Hoisting and Pile Driving Equipment

Section 19 of *Reclamation Safety and Health Standards* (RSHS) covers hoisting and pile driving equipment. It specifically addresses the following:

- General requirements
- Responsibilities
- Inspections and testing
- Recordkeeping
- Qualifications of hoisting equipment operator
- Operating requirements
- Critical lifts
- Crane supported personnel platforms (manships)
- Hooks
- Wire rope
- Overhead, gantry, monorail, and underslung cranes
- Portal, tower, and pillar cranes
- Derricks
- Floating cranes and derricks
- Material hoists
- Overhead hoists
- Elevators and personnel hoists
- Cableways
- Base-mounted drum hoists
- Specialized hoisting systems
- Pile driving equipment
- Helicopter operations

19.1 General Requirements for Hoisting Equipment

Maintain and operate equipment covered by this subsection in a safe manner. Use the more stringent of the manufacturer's recommendations, Occupational Safety and Health Administration (OSHA) regulations, American Society of Mechanical Engineers/American National Standards Institute (ASME/ANSI) standards, or Bureau of Reclamation (Reclamation) standards for the installation, setup, and operation and maintenance (O&M) of all covered equipment. Reclamation's crane program is comprised of this subsection, which covers policy requirements and Facilities Instructions, Standards and Techniques (FIST) 2-11, *Crane and Rigging Manual*, which provides detailed procedures for the O&M and inspection of the hoisting equipment.

19.1.1 Equipment Design. Design and install cranes and other hoisting equipment covered by this standard in accordance with the applicable OSHA regulations, standards listed in table 19-1, the Crane Manufacturer’s Association of America standards, and the National Electrical Code (National Fire Protection Association 70).

Table 19-1.—Crane and hoisting equipment design and construction standards

Standard No.	Title
ASME/ANSI B30.2	Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
ASME/ANSI B30.3	Tower Cranes
ASME/ANSI B30.4	Portal and Pedestal Cranes
ASME/ANSI B30.5	Mobile and Locomotive Cranes
ASME/ANSI B30.6	Derricks Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME/ANSI B30.7	Winches
ASME/ANSI B30.8	Floating Cranes and Floating Derricks
ASME/ANSI B30.10	Hooks
ASME/ANSI B30.11	Monorails and Underhung Cranes - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME/ANSI B30.12	Handling Loads Suspended from Rotorcraft
ASME/ANSI B30.14	Side Boom Tractors - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME/ANSI B30.16	Overhead Hoists (Underhung)
ASME/ANSI B30.17	Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
ASME/ANSI B30.19	Safety Standard For Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, And Slings
ASME/ANSI B30.22	Articulating Boom Cranes
ASME/ANSI B30.23	Personnel Lifting Systems
ASME/ANSI HST-6M	Performance Standard for Air Wire Rope Hoists

19.1.2 Modification and Reconfiguration. Do not make modifications, additions, or repairs that affect the structural competence, capacity, or safe operation of the equipment or system without the manufacturer’s written approval or the approval of a professional engineer (P.E.) competent in the field. Any modifications will be fully documented. In no case will the original safety factor of the equipment be reduced.

19.1.3 Documentation. The following documents will be immediately available to the operator at all times:

- a. The manufacturer's operating manual, or equivalent, for the specific make and model of crane.
- b. Operating manuals for any attachments or accessories with which the crane is equipped.
- c. The load rating chart for construction cranes; portal, tower, and pillar cranes; mobile and locomotive cranes; floating cranes; floating derricks; and articulating boom cranes. This chart will be completely legible. It will also include the crane make and model and contain a complete range of the manufacturer's approved crane load ratings for all configurations for which the crane is designed.
- d. A crane logbook will be used to document inspections, unusual conditions, operations, maintenance, repairs, and testing,

19.2 Responsibilities

19.2.1 Supervisor or Manager, Hoisting and Rigging Operations.

While the operator is responsible for each lift, a supervisor or manager will be responsible for overall hoisting and rigging operation and will ensure that:

- a. Qualified personnel are assigned to operate equipment and perform hoisting and rigging tasks. Qualified personnel are current with required training and certifications.
- b. A Job Hazard Analysis (JHA) is developed and followed for all hoisting operations.
- c. Equipment is operated safely.
- d. Preplanned and approved hoisting and rigging instructions are used when necessary and always for critical lifts.
- e. Equipment found to be unsafe or requiring restrictive use is properly tagged.
- f. All equipment problems have been addressed or resolved.
- g. A designated leader (DL)/lift supervisor will be assigned to hoisting and rigging operations that require more than one person.

19.2.2 Maintenance Manager. The maintenance manager will be responsible for selecting qualified personnel for inspection, maintenance, and repair on hoisting and rigging equipment and components and will ensure the following:

- a. Equipment is properly inspected, maintained, tested, and repaired and/or replaced by qualified personnel.
- b. All hoisting and rigging equipment has preventive maintenance established, as well as detailed and accurate maintenance job plans in accordance with FIST 6-2, *Conduct of Power Maintenance*.
- c. Ensure that the maintenance, repair, inspection, and testing are documented and available for review.
- d. Hydro Asset Management Partnership equipment assessments are reported annually in accordance with FIST 6-2 as applicable.
- e. Inspection, maintenance, and repair personnel follow applicable safety procedures and have the tools to accomplish their work.
- f. Responsible inspection, maintenance, and test personnel have access to the information and documents as referenced in FIST 2-11, *Crane and Rigging Manual*.
- g. Personnel responsible for inspection or maintenance are familiar with the applicable contents of all equipment manuals.

19.2.3 Lift Supervisor for Critical Lifts. Management will assign a lift supervisor for critical lifts. The lift supervisor must be a qualified crew member or other qualified person. The lift supervisor for critical lifts will perform those activities listed in Subsection 19.7, “Requirements for Critical Lifts,” as well as ensuring that:

- a. A critical lift procedure is prepared.
- b. The critical lift procedure is properly approved before implementation.
- c. A documented prelift meeting is held, and personnel understand how the job will be done.
- d. Management provides qualified personnel (e.g., operators, riggers, flagman, and lift supervisor).
- e. Proper equipment and hardware are identified in the critical lift procedure.
- f. He or she is available to direct the lifting operation and to ensure that the job is done safely and efficiently.
- g. Involved personnel are familiar with, and follow, the critical lift procedure.

h. After the critical lift is completed, critical lift documentation is transmitted to the manager who requested the lift. Documentation will remain available for review and audit purposes for 1 year following the date of the lift.

19.2.4 Designated Leader. A DL will be appointed to hoisting and rigging activities that involve more than one person. The DL may be the operator, a competent crew member, or other competent person. The DL will:

- a. Ensure that a flagman or signaler, if required, is assigned and identified to the operator.
- b. Ensure that management provides qualified personnel and that personnel understand how the job is to be done.
- c. Ensure that the weight of the load is determined, that the proper equipment and hardware are selected and inspected, and that the capacity of the lifting device is not exceeded.
- d. Ensure that the equipment is properly set up and positioned.
- e. Examine the work area for hazardous or unsafe conditions.
- f. Direct the lifting operation to ensure that the job is done safely and efficiently.
- g. Ensure that the job is stopped when any potentially unsafe condition is recognized.
- h. Be present at the jobsite during lifting operations.
- i. Ensure that the preparation of the ground conditions needed to support crane operations has been completed before crane operations commence when mobile cranes are used. If the operator, DL/lift supervisor, or Assembly/Disassembly Director (A/D director) (defined in Paragraph 19.2.8 of the RSHS) have concerns pertaining to ground conditions, they will notify the controlling entity (e.g., property owner, prime contractor, or contracting officer).
- j. Ensure that swing radius hazards are addressed, when applicable, and that only authorized personnel are allowed in identified hazard areas.
- k. Ensure that only authorized personnel enter the fall zone to perform or conduct activity that cannot be performed except when a load is suspended or being landed.
- l. Use hoisting routes that minimize the exposure of employees to hoisted loads .

- m. Ensure that necessary traffic controls are in place to restrict unauthorized access to the crane's work area.
- n. Establish a means of communication when the spotter or signaling person is not within sight of the operator.
- o. Ensure that if an injury or accident takes place, the emergency is promptly reported. Take charge of the accident scene until emergency services personnel arrive.

19.2.5 Operator. The operator will be responsible for each hoisting and rigging operation and will perform the following activities:

- a. Safely operate equipment.
- b. Follow the equipment operating guidelines and, for mobile cranes, the load charts.
- c. Perform the preuse and shift equipment inspection.
- d. Ensure that the load will not exceed the rated capacity of the equipment.
- e. Abide by any restrictions placed on the use of the equipment.
- f. Ensure that inspections are current via inspection sticker, other documentation, or verbal confirmation from the equipment custodian.

Note: It is important that equipment users know the process for correcting problems that are discovered when operating the equipment. A method should be in place so that equipment users can easily identify and contact the equipment maintenance manager.

19.2.6 Dedicated Spotter(s) and Signal Person(s). Individuals assigned these functions will:

- a. Communicate to the crane operator precise directions to move the load.
- b. Be competent in the application of standard crane and hoist signals.
- c. Relay any communications from the rigger or DL to the operator that may affect the lift.
- d. Use hoisting routes that minimize risk to personnel, property, and the load.

- e. Ensure that the job is stopped when any potentially unsafe condition is recognized.
- f. Ensure that all signal equipment is operating properly and reliably.

19.2.7 Assembly/Disassembly Director (Mobile Cranes/Tower Cranes). The A/D director is responsible for directing both the assembly and/or disassembly of equipment (cranes) or attachments covered under 29 Code of Federal Regulations [CFR] 1926, Subpart CC, and ASME/ANSI B30 standards. With regard to tower cranes, “erecting and climbing” replaces the term “assembly,” and “dismantling” replaces the term “disassembly.” Regardless of whether the crane is initially erected to its full height or is climbed in stages, the process of increasing the height of the crane is an erection process. The A/D director must meet the criteria for both a competent person and a qualified person, or must be a competent person who is assisted by one or more qualified persons. Where the A/D is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person. The A/D director has the following responsibilities:

- a. The A/D director must understand the applicable A/D procedures.
- b. The A/D director must review the applicable A/D procedures immediately prior to the commencement of A/D unless the A/D director understands the procedures and has applied them to the same type and configuration of equipment (including accessories, if any).
- c. Before commencing A/D operations, the A/D director must ensure that the crew members are qualified and familiar with the equipment and perform a job briefing meeting.
- d. The job brief will include
 - Their tasks
 - The hazards associated with their tasks
 - The hazardous positions/locations that they need to avoid

19.3 Requirements for Cranes and Hoisting Devices, Inspections, and Testing

Cranes and hoisting devices used in Reclamation activities are subject to inspection and load-performance tests as required by this subsection, applicable ASME/ANSI standards, OSHA regulations, and the manufacturer’s recommendations.

19.3.1 Inspection Forms. Inspection forms will be developed for each crane based on the applicable ASME/ANSI standard and the manufacturer’s recommendations. Sample inspection forms are located in FIST 2-11.

19.3.2 Inspections. A designated person will conduct all inspections. For the purposes of this subsection, a designated person is a person selected or assigned by the employer as qualified to perform specific duties. For inspection of non-Reclamation owned equipment, notify a Reclamation representative at least 24 hours before the inspection to observe the inspection.

a. Frequency. Required inspections and frequency will be in accordance with table 19-2.

Table 19-2.—Crane and hoisting equipment inspection criteria

Type of inspection	When to inspect	Notes
Initial/startup inspection	Before initial use. Performed when cranes have been altered in a manner that affects safe operation or load handling equipment components.	Performed by manufacturer or qualified P.E. on all new or modified/repared cranes.
Daily/shift inspection	Performed prior to use on each shift.	Performed by a competent person.
Frequent/monthly inspection	Performed monthly or more frequently as conditions require.	Applies cranes in regular use. Standby cranes (not in use for greater than 1 month but less than 3 months) are inspected prior to use. Performed by a competent person.
Periodic/annual inspection	Performed annually or more frequently as conditions require.	Perform inspection based on time interval since last inspection. Performed by a qualified third party. Hoisting devices rated below 5 tons (nonconstruction and other hoists) will be inspected by a qualified Reclamation employee or by a qualified third party.
Frequent/monthly inspection	Contractor crane and hoisting equipment brought to a Reclamation jobsite and prior to onsite use.	Same as frequent/monthly inspection including load test.

b. Crane Inspections. Periodic/annual inspections, inspections of modified/repared cranes, or inspections of cranes not in regular use will be conducted by a third-party qualified crane inspector in accordance with the applicable OSHA regulations, ASME/ANSI standards, and manufacturer's instructions. Hoisting devices rated below 5 tons (nonconstruction and other hoists) will be inspected by a qualified Reclamation employee or by a qualified third party. Additional information pertaining to *Reclamation personnel only* is available on Reclamation's intranet site at http://intra.usbr.gov/ssle/safety/Guidance/RSHS_Sec19_guidance.pdf.

c. Inspection Records. All completed inspection reports and records will be readily available upon request.

d. Removal from Service. Whenever any crane and/or hoisting equipment is found to be unsafe, or whenever a deficiency that affects the safe operation of a crane and/or hoisting equipment is observed, the affected equipment will be immediately taken out of service, and its use will be prohibited until unsafe conditions have been corrected. If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the qualified person's manager or supervisor will ensure that the deficiency is checked in the frequent/monthly inspections.

19.3.3 Load Tests. Conduct load tests, under the direction of a competent person, as follows:

- Before initial use of cranes in which a load-bearing or load-controlling part or component, brake, travel component, or clutch has been altered, replaced, or repaired. This does not include minor brake adjustments, or when wire rope is replaced with identical new wire rope.
 - Each time the mobile crane is reconfigured or reassembled after disassembly
 - Annually for mobile cranes
 - Contractor cranes prior to first use after crane is brought to the site
 - Prior to a critical lift, and for overhead cranes if not load tested within the last 4 years
 - At the discretion of the facility manager or qualified person
 - When directed by the Contracting Officer's Representative (COR) or facility manager
- a. Load tests will be conducted in accordance with applicable ASME/ANSI standards and manufacturer's recommendations, and are not considered critical lifts as defined in Subsection 19.7.

- b. Test loads for mobile cranes will be performed at 100 percent of the load rating chart. Cranes with fixed length or extendable booms will be tested with the boom angle between 30 and 60 degrees.
- c. Overhead and gantry cranes, operating in accordance with ASME/ANSI B30.2, “Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)” and ASME/ANSI B30.17, “Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)” may exceed their rated capacities for performance load testing purposes (up to 125 percent) or for planned engineered lifts.

19.4 Availability and Retention of Records

Keep written records of inspections and performance tests, identifying the type and nature of the inspection and testing, readily accessible to operating personnel and make such records available upon request to employees or compliance officials. Records will be maintained until the next periodic/annual inspection or in accordance with Reclamation’s *Information Management Handbook*, Volume I, “Policies, Procedures, and Responsibilities,” and Volume II, “Records Retention Schedules.”

19.5 Qualifications for Operating Hoisting Equipment

19.5.1 Operators. Only operators qualified and designated to operate a particular type of crane or hoisting device will operate that equipment. The operator is qualified to operate equipment that is furnished with materials that are written in the language of the certification.

19.5.2 Proficiency

a. Crane Operator Certification - Construction Cranes and All Mobile Crane Activities. Employers will ensure that mobile crane operators, as well as crane operators involved in construction activities, meet the OSHA 29 CFR 1926.1427 standard for certification. Operators will be certified, and recertified every 5 years, by an accredited crane operator testing organization such as the National Commission for the Certification of Crane Operators.

Refer to FIST 2-11 for the types of equipment that are specifically excluded from operator certification requirements.

Operators of permanently installed overhead and gantry cranes used for construction and maintenance activities are exempt from operator

certification requirements above, but not the operator qualification requirement in subparagraph b. below

b. Crane Operator Qualifications - Nonconstruction Activities.

Operators of all other cranes and hoisting equipment will be qualified through formal training, testing, and demonstrated proficiency (initially and every 5 years) by a qualified third-party trainer. Additional information pertaining to *Reclamation personnel only* is available on Reclamation's intranet site at

http://intra.usbr.gov/ssle/safety/Guidance/RSHS_Sec19_guidance.pdf.

c. Contractor Operators of Contractor-Owned Equipment.

Contractors will provide evidence of operator qualification and certification before beginning work on Reclamation activities.

d. Maintenance Operations. Employees who operate cranes to perform crane maintenance will be trained and qualified to operate the cranes on which maintenance is being performed. Crane operation by maintenance personnel will be limited to those crane functions necessary to perform maintenance on the crane or to verify the performance of the crane after maintenance has been performed.

e. Exemption. The preceding certifications and qualifications do not apply for operators of hoisting equipment with manufacturer-rated lifting capacity of 2,000 pounds or less. However, hoisting operators for equipment less than 2,000 pounds will be qualified and designated by the immediate supervisor.

19.5.3 Physical Qualifications. Operators of cranes, derricks, and hoisting systems used to lift personnel will be physically qualified.

a. Physician's Certification. Operators will have a physician's certification that the operator meets physical qualifications to operate hoisting equipment. Operators will meet the following physical qualifications:

- Vision of at least 20/30 in one eye and 20/50 in the other eye, with or without corrective lenses
- Normal depth perception and field of vision
- Color vision sufficient to distinguish at least red, green, and amber (yellow)
- Adequate hearing, with or without hearing aid, for the specific operation
- Sufficient strength, endurance, agility, coordination, manual dexterity, and speed of reaction to meet the demands of equipment operation

- No evidence that the operator is subject to seizures or loss of physical control unless medically cleared
- No evidence by physical examination and medical history of psychiatric conditions (including alcohol or substance abuse) likely to present a safety risk or to worsen as a result of carrying out the essential functions of the job
- No tendencies toward dizziness or similar undesirable characteristics

b. Examination Validity. The certificate of qualification will be valid for the period stated by the medical provider, not to exceed 3 years.

c. Temporary Disqualification Factors. Assigned operators who report or appear to suffer from a temporary disabling condition will not be permitted or required to operate a crane.

19.6 Operating Requirements for Hoisting Equipment

19.6.1 Duty Periods. Operators will not work, or be at the jobsite, more than 12 hours in any 24-hour period.

19.6.2 Authority. Operators will be responsible for any operations under their direct control. When the operator determines that the conditions are unsafe, they will have the authority to stop or to refuse to handle loads until safety has been ensured. Other onsite personnel will alert the operator if they believe unsafe operating conditions exist.

19.6.3 Other Duties. 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.

19.6.4 Environmental Conditions

a. Excessive Winds. Outdoor crane activities will have available adequate means for monitoring local weather conditions, including a wind speed device located where it can measure maximum wind speed for the area. Cranes will not be operated when wind speeds at the site attain the maximum wind velocity based on the recommendations of the manufacturer or 25 miles per hour (mph), whichever is less.

- At wind speeds greater than 20 mph, the operator, rigger, and lift supervisor will evaluate conditions and determine if the lift will proceed. This determination will be based on wind calculations per manufacturer's recommendations.

- The determination whether or not to proceed will be documented in the crane operator’s logbook.

b. Brake Maintenance. Use storm brakes, thruster wheel chocks, and/or other similar devices, as appropriate, to secure outdoor cranes – especially during rehabilitation or other work when brakes may be inoperable. Contractors will submit their engineering or manufacturer’s designs for temporary restraints to the COR for review prior to the commencement of crane rehabilitation work

c. Impaired Visibility. If dust, darkness, fog, snow, ice, rain, or other environmental conditions impair the operator’s visibility, shut down the crane operation until steps are taken to compensate for the lack of visibility.

d. Lightning. Shut down crane and hoisting operations when lightning is present and equipment is vulnerable to lightning strikes. See Section 4, “Work Planning,” of the RSHS for specific practices.

e. Operator Responsibility. As stated in Paragraph 19.6.2 of the RSHS, it is the operator who has the authority and responsibility to only perform lifts that can be conducted safely.

19.6.5 Maximum Lifts. Do not lift loads greater than the rated capacity of the crane, except for overhead and gantry cranes, when load testing, as specified in subparagraph 19.3.3.c.

19.6.6 Hoist Drums. No less than two full wraps of rope will remain on the drum when the hook is in the extreme low position.

19.6.7 Riding Loads. 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. Where employees cannot perform work through other means, crane-supported personnel platforms (manships) may be used in accordance with Subsection 19.8, “Crane Supported Personnel Platforms (Manships).” Operations using crane-supported personnel platforms are considered critical lifts.

19.6.8 Work Area Control

a. Control. Barricade the rear-swing radius area of rotating superstructures of cranes to physically prevent people or equipment from entering the hazard area. Only operation-essential personnel will be allowed in the fall zone. Loads will not be lifted or suspended over personnel.

b. Training. Train each employee assigned to work on or near equipment to recognize struck-by, pinch/crush, and fall zone hazards in accordance with 29 CFR 1926.1424 and 1425.

19.6.9 Communications. During critical lifts, or lifts involving use of crane-supported personnel platforms, maintain and use audio communications between the operator, personnel on the work platform (when applicable), and the signal person.

19.6.10 Crane and Hoist Signals

a. Signal Systems. Use a uniform standard signal system in operating cranes, derricks, and hoists. Hand signals, as illustrated in Attachment 19-1, “Hand Signals for Cranes and Hoisting Equipment,” will be used. A signal person must be provided in each of the following situations:

- The point of operation (the load travel or the area near or at load placement) is not in full view of the operator.
- When the equipment is traveling, the view in the direction of travel is obstructed.
- Due to site-specific safety concerns, either the operator or the person handling the load determines that it is necessary.

When hand signals are insufficient, or when the distance between the operator and the signal person is over 100 feet, or they are not in the line of sight, the operator and signal person will use voice or other telecommunication means as long as it is hands-free. In the event of communication loss, operations will cease. The operator, signal person, and designated leader/lift supervisor must be able to effectively communicate in the language used.

b. Signal Person Training. The employer of the signal person will ensure that the employee is qualified and trained prior to giving any signals. Training can be delivered through a third-party evaluator or the employer’s qualified evaluator. Such training must meet the requirements of 29 CFR 1926.1428. The signal person will demonstrate competency through an oral or written test and a practical test. Documentation of the training will be available when requested.

c. Posting. Post signals at the operator’s position and, as practical, at signal control points and at other locations, as necessary, to inform persons using the signals.

d. Signal Visibility. Protect signal systems from unauthorized use, damage, or interference. Predesignate a signal person and identify that person by special color of hard hat, armband, or other distinguishing marking. The predesignated person will give crane and hoist signals.

19.6.11 Power Line Safety. Perform a hazard assessment and identify the work zone with flags or barricades when equipment operates adjacent to power lines. The owner of the power line will be contacted and informed of work near the power line.

a. Power Lines up to 350 Kilovolts. Maintain a clearance of 20 feet between the power line and the equipment's maximum operating radius. If the 20-foot distance will be entered, perform one of the following:

1. Deenergize and visibly ground the line with confirmation from the utility owner or operator.
2. Use all of the following to ensure the 20-foot clearance is maintained:
 - Develop a JHA and conduct a meeting to discuss methods to prevent encroachment or electrocution.
 - Use nonconductive tag lines.
 - Erect a high visibility elevated warning line, barricade, or line of signs that are visible to the operator.
 - Implement at least one of the following:
 - Proximity alarm
 - Dedicated spotter
 - Range control warning device
 - Range limiting device
 - Insulating link/device installed between the load and the end of the load line
3. Determine line voltage and minimum clearance distances permitted under table 19-3. Implement all of the measures listed in the bullets in subparagraph 19.6.11.a.2 above.
4. Where the employer determines that it is infeasible to do the work without breaching the minimum approach distance under table 19-3, see 29 CFR 1926.1410(c).

Table 19-3.–Minimum clearance distances

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

Note: kV = kilovolts

b. Voltage Information. The utility owner or operator will provide voltage information within two working days of the employer’s request as required by 29 CFR 1926.1407(e).

c. Power Lines Presumed Energized. The employer will assume all power lines are energized unless the utility owner or operator confirms that the line has been, and continues to be, deenergized and visibly grounded at the worksite.

d. Communications/Transmitter Tower. Deenergize the transmitter where equipment is close enough for an electrical charge to be induced.

e. Training. The employer will train each operator and crew member who works adjacent to power lines on 29 CFR 1926.1408 through 1411, as well as the following:

- Procedures to be followed in the event of electrical contact with a power line
- Electrocution hazard created if the operator simultaneously touches the equipment and the ground
- The importance of the operator staying in the cab unless there is an imminent danger of fire, explosion, or other emergency
- Safe evacuation methods for exiting the cab
- The 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
- The presumption that all power lines are energized

f. Power Lines Over 350 kV. For power lines at or below 1,000 kV, the same criteria above apply, except that the 20-foot clearance will be increased to 50 feet. For power lines over 1,000 kV, the clearance distance will be determined by the utility owner or operator.

g. Power Line Safety (All Voltages) – Equipment Operations Closer Than the Minimum Clearance Zone. Where the employer determines that it is infeasible to do the work without breaching the minimum clearance distances under table 19-3, see 29 CFR 1926.1410 (c).

h. Traveling Under or Near Power Lines With No Load. The following procedures will be followed when traveling under a power line without a load:

- Lower the boom/mast and boom/mast support system and lock it in the travel position.
- Maintain the minimum clearances distances specified in table 19-4.

Table 19-4.– Minimum clearance distances while traveling with no load

Voltage (nominal kV, alternating current)	While traveling – minimum clearance distance (feet)
Up to 0.75	4
Over 0.75 to 50	6
Over 50 to 345	10
Over 345 to 750	16
Over 750 to 1,000	20
Over 1,000	As established by the utility owner or registered P.E. who is qualified with respect to electrical power transmission and distribution

- Consider the effects of speed and terrain on equipment movement (including movement of the boom/mast) so that those effects do not cause the minimum clearance distances specified in table 19-4 to be breached.

- Use a dedicated spotter with continuous communication to the operator/driver if any part of the equipment can come within 20 feet of the power line.
- If visibility is limited, or during night operations, illuminate the power lines or otherwise clearly mark them, and identify and use a safe path of travel.

19.6.12 Tag Lines. Use nonconductive tag lines to control loads when their use is practical and will not create additional hazards to personnel, equipment, or structures. Nonconductive rope tag lines that become soiled with oil and dirt can become conductive if used inside minimum approach distance of high voltage lines, and they must be cleaned or replaced.

19.6.13 Ground Conditions. The responsible employer will ensure that ground conditions support hoisting equipment. Inform the equipment user of the locations of underground tanks, voids, and utilities that may present a hazard.

19.6.14 Assembly/Disassembly. A/D operations for lattice boom and tower cranes will be supervised by both a competent and qualified person (in some instances, they could be the same person). This individual will understand the manufacturer's procedures and ensure that the crew receives instructions that include specific hazards such as blocking parts, working under the boom, rigging, and power line safety.

19.6.15 Qualified Riggers. The employer **will** ensure that rigging work is performed by a qualified rigger. A rigger who meets the criteria for a qualified person is considered a qualified rigger. See Section 18, "Slings and Rigging Hardware," of the RSHS.

19.6.16 Construction of Electric Transmission and Distribution Lines and Equipment. The safety and health standards contained in 29 CFR 1926, Subpart V, "Power Transmission and Distribution," and 29 CFR 1910.269, "Electric Power Generation, Transmission, and Distribution," will apply to the construction of electric transmission and distribution lines and equipment.

19.7 Requirements for Critical Lifts

A critical lift is a nonroutine lift requiring detailed planning and additional or unusual safety precautions. Critical lifts include the following:

- Lifts made when the load weight is 75 percent or more of the crane's rated capacity or hoisting device, based on the operating parameters for that lift for mobile, construction, tower, or pillar cranes, or 90 percent for overhead or gantry cranes
- Lifts made with more than one crane or more than one hoist on the same crane or trolleys
- Hoisting personnel with a crane
- Lifts where the center of gravity could change
- Lifts involving nonroutine or technically difficult rigging arrangements
- Lifts when the item is unique; vital to a system, facility, or project operation; and if damage would be irreplaceable or unrepairable
- Lifts when the load, although noncritical, is to be lifted above, or in close proximity to, a critical item or component
- When the cost to replace or repair the item being lifted, or the delay in operations of having the item damaged, would have a negative impact on the facility or budget to the extent that it would affect commitments
- Any lift that the crane/hoist operator or responsible official believes is critical.

19.7.1 Critical Lift Plans. Prepare a written critical lift plan before making any critical lift. The critical lift supervisor will prepare the plan in coordination with the crane/hoisting equipment operator and rigger. The critical lift supervisor will obtain the technical approval for a qualified engineer, safety professional, or others as appropriate. All personnel involved in the lift must review and sign the critical lift plan. See FIST 2-11 for critical lift plan details, as well as the information presented below.

19.7.2 Critical Lift Plan Details. The plan must include the following information:

- Exact size and weight of the load, including all crane and rigging components that add to the weight. Include the manufacturer's maximum load limits for the complete range of the lift.
- Exact information about the sequence of events and procedures.
- Rigging plans with lift points, procedures, and hardware requirements.
- Conditions and procedures under which the lifting operation must be stopped.
- Coordination and communications procedures.

- Names of the lift supervisor, hoisting equipment operator, rigger, and other personnel who have key roles in the operation.
- For tandem lifts, general information on the hoisting equipment, including make, model, operating speeds, and other information to ensure that the equipment is compatible.
- Ground conditions and other information necessary to ensure that there is a level, stable foundation with sufficient bearing capacity for the lift supports of the hoisting equipment. This includes outrigger, crawler track, and support mat design calculations.

19.8 Crane-Supported Personnel Platforms (Manskips)

19.8.1 General Requirements. Use crane-supported personnel platforms to reach the worksite only when conventional means of erection, use, and dismantling (for example, personnel hoists, ladders, stairways, aerial lifts, elevated work platforms, or scaffolding) are impossible or hazardous. Use of crane-supported personnel platforms requires specific authorization, must comply with the requirements of this subsection, and requires supporting justification.

The written request must be specific to the operation and must: (1) describe in detail the proposed operation, with supporting data that show why employees cannot safely reach the worksite using other standard procedures; and (2) confirm, with sufficient manufacturing and design engineering data, that the proposed system and equipment fully comply with the requirements contained herein. Approvals will be for the specific operation described.

Do not use the platform system for any other operation unless an additional request has been submitted and approved. Place approved systems in operation only after a JHA has been developed. The JHA must contain provisions for initially and periodically instructing the crane operator and all affected employees.

Personnel must not work from crane-supported scaffolding, except when under constant supervision by a general foreman or superintendent, or a designated lift supervisor. In addition, the crane and operation must meet the requirements of this subsection, as well as other requirements of Section 19.

19.8.2 Specific Requirements

a. Hoist-Line Suspended Personnel Platforms

1. Suspend platform only from the main boom nose.

2. Do not hoist personnel above ground when wind velocity exceeds 10 mph, when any dangerous weather condition exists, or when other danger is impending.
3. Select sites so that, when locating cranes for platform operation, no part may come within 20 feet of an energized power line that is up to 350 kV or within 50 feet of an energized line over 350 kV. Do not use barriers, manufacturer's locks, or control level restraints to meet these requirements.
4. Do not handle material lifts when personnel are on the platform. Detach the platform before rigging the crane for material handling.
5. Do not belt off or otherwise attach a platform to an adjacent pole, structure, or equipment.
6. Lifting and lowering speeds must not exceed 100 feet per minute.
7. Engage load and boom hoist drum brakes, swing brakes, and locking devices (such as pawls or dogs) when the occupied personnel platform is in the stationary position.
8. When employees occupy platforms, they must wear body harnesses with lanyards appropriately attached to a structural member of the platform. Harnesses, lanyards, and structural support members used as anchorages must meet requirements contained in Subsection 16.1, "Fall Protection," of the RSHS that discusses personal protective equipment for fall protection. When working over water, where the danger of drowning exists, employees will be provided with U.S. Coast Guard-approved life jackets or buoyant work vests.
9. Do not move a mobile crane when employees are aloft.
10. Employees must keep all body parts inside the platform during raising, lowering, and positioning.
11. Platform occupants must not stand, sit on, or work from the top or intermediate rail or toeboard, or use any other means or device to raise their working height.

b. Cranes

1. Install and test the crane periodically using Subsection 19.3, "Requirements for Cranes and Hoisting Devices, Inspections, and Testing."
2. Use only cranes equipped with planetary or worm gears, torque converters, automatic braking systems, or other equivalent systems that prevent placing the boom hoist and load lines in a freewheeling or

neutral position controlled by manual brake and/or dogs only. Use only the main hoist for personnel handling.

3. The crane must be able to sustain a static load (as shown on the crane's capacity chart) of two times the rated platform capacity for all radii and configurations through which the platform will be hoisted.
4. The minimum load hoist line wire rope safety factor must be 7 or 10 when using rotation-resistant rope.
5. Install an anti-two-blocking device or two-block damage prevention feature and ensure that it is operating. The anti-two-blocking device must have automatic capabilities for controlling functions that may cause two-blocking conditions.
6. Mark telescoping booms or equip them with a device that clearly shows the boom's extended length to the operator at all times.
7. All critical components of hydraulic or pneumatic systems must have a minimum bursting strength of at least four times the system's designed operating pressure. (Critical components are those in which a failure could result in free rotation or lowering of the boom or platform.)
8. Equip all critical hydraulic cylinders with pilot-operated check valve, or other appropriate devices, to prevent free fall or uncontrolled movement of boom or platform in the event of a hydraulic line failure. Electrical systems used for positioning platforms must provide equal protection in the event of power failure.
9. Keep cranes within one degree of level during operation with outriggers fully extended and jack pads set on firm, level terrain or on substantial shoring as determined by a qualified person.

c. Platforms

1. The crane manufacturer or a P.E. must design the personnel platform.
2. Suspension systems must be designed to minimize tipping of the platform due to movement of employees on the platform.
3. The entire platform must be designed with a minimum safety factor of five.
4. Provide 6-foot minimum headroom for employees on the platform.
5. Provide each personnel platform with perimeter protection from the floor to 42 inches. Perimeter protection must be either solid

construction or expanded metal beginning with the toeboard and extending to at least the mid-rail with openings no greater than one-half of an inch.

6. Provide a grab rail inside the personnel platform.
7. If an access gate is provided, make sure it swings inward and equip it with a latch (restraining device) to prevent accidental opening.
8. Provide overhead protection on the personnel platform when employees are exposed to falling objects.
9. Grind smooth all exposed rough edges that employees on the platform could contact.
10. A certified welder, qualified for the weld grades, types, and material specified in the design, must perform all welding.
11. Conspicuously post a plate or other permanent marking on the personnel platform showing the weight and the rated load capacity of the personnel platform.
12. Personnel platforms must be easily identifiable by color or marking. Use personnel platforms only to hoist personnel and approved tools and equipment.
13. Use a wire rope bridle sling to connect the personnel platform to the loadline. Each bridle leg must be connected to a masterlink or be shackled in a manner that ensures that the load is evenly divided among the bridle legs.
14. Close and lock hooks, headache ball assemblies, lower load blocks, or other attachment assemblies, thus eliminating the hook throat opening. Alternatively, use a shackle with a screw pin, nut, and retaining pin.
15. Wire rope, shackles, rings, and other rigging hardware must have a minimum safety factor of five.

d. Additional Inspections and Tests

1. At the beginning of each shift, a competent person must inspect cranes that are used to hoist personnel platforms. In addition, inspect the crane again after using it for any material handling operations and before using it to hoist employees.
2. Before further use, correct any defects that were found during such inspections that may create a safety hazard.
3. Before hoisting employees for the first time at each new setup location, or after any repairs to the platform or rigging, make a

full-cycle operational test lift at 125 percent of the intended load of the personnel platform. The platform must be lowered by controlled load lowering, braked, and held in a suspended position for a minimum of 5 minutes with the test load evenly distributed on the platform.

Note: Setup location means the location where the crane or derrick is brought and set up, including assembly and leveling.

4. Immediately after lift testing, visually inspect the crane, personnel platform, and base support to determine if the testing has adversely affected any component or structure.

5. At the beginning of each shift, and after using the crane to hoist materials, make a trial lift (with the platform loaded to at least the anticipated lift weight) with the personnel platform unoccupied to make sure all systems, controls, and safety devices are functioning properly.

6. Immediately prior to each lift, the platform must be hoisted a few inches, with the personnel and materials/tools on board, and inspected by a competent person to ensure that it is secure and properly balanced.

7. Before the lifting of personnel, the following conditions must be verified each time by a competent person:

- Hoist ropes must be free of deficiencies.
- Multiple part lines must not be twisted around each other.
- The primary attachment must be centered over the platform.
- If the load rope is slack, the hoisting system must be inspected to ensure that all ropes are properly seated on drums and in sheaves.

8. Any condition found during the trial lift and subsequent inspection(s) that fails to meet this standard, or otherwise creates a safety hazard, must be corrected before hoisting personnel.

e. Work Practices

1. The crane operator must remain at the controls at all times when the personnel platform is raised.

2. Employees being hoisted must remain in direct communication with the crane operator at all times.

3. Hold a prelift meeting before each personnel hoisting operation. The crane operator, employees involved, and the responsible general foreman, superintendent, or designated lift supervisor must attend the

prelift meeting to review the applicable requirements of this subsection and the procedures that will be followed.

19.9 Hooks

19.9.1 Requirement. Manufacturing, testing, inspecting, and use of hooks must conform to the more stringent requirements contained in ANSI B30.10, “Hooks,” manufacturer’s specifications and recommendations, FIST 2-11, and this subsection.

19.9.2 Safe Working Load. Follow the manufacturer's recommendation to determine the safe working load for the specific size and type of hook used. The rated load will be in accordance with the design requirements for the equipment or system in which the hook is being used. If a manufacturer's recommendation is not available, test hooks in accordance with ANSI B30.10. Maintain a record of the dates and results of the tests.

19.9.3 Inspection. Inspect hooks frequently and remove them from service if they are missing a manufacturer’s identification and load rating; are cracked, nicked, or gouged; are severely corroded; exhibit wear exceeding 10 percent of the original section dimension of the hook or its load pin; have any visible bend or twist from the plane of the unbent hook; or have an increase in the throat opening of 5 percent, not to exceed ¼ inch.

19.9.4 Hook Latches. Hook latches (keepers) are required on lifting hooks. Latch equipped hooks will be used for all hoisting and rigging operations unless the application makes the use of the latch impractical or unsafe. Hooks without latches, or with latches that are removed or disabled, must not be used unless a qualified person has determined that it is safer to hoist and place the load without latches (or with the latches removed/tied back).

19.10 Requirements for Working with Wire Rope

19.10.1 Safe Working Load. Do not exceed the manufacturer’s rated load capacity.

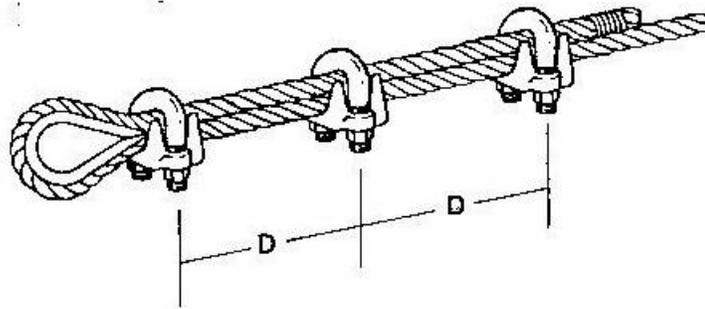
19.10.2 End Fasteners and Connectors. Use only commercial wire rope fittings.

a. Wire Rope Clips. Install wire rope clips as specified by the manufacturer and table 19-5. When U-bolt wire rope clips are used to create end terminations, the saddle will be placed on the live end of the wire rope, with the U-bolt on the dead-end side. The size, number of clips, the turnback, and tightening to the torque will be as recommended by the manufacturer. Always use new clips; reused clips will not develop

the proper efficiency. Always use a thimble installed in the eye to reduce rope wear. When twin base clips are used, they will be installed in the size, number, spacing, and torque as recommended by the manufacturer. Twin base clips are designed without a top or bottom; thus, they cannot be installed incorrectly on either the live or dead-end side of the wire rope. After assembly, the connections will be loaded to at least the expected working load, inspected, and retightened to the manufacture’s recommended torque.

Table 19-5. Size and spacing of U-bolt clips

Diameter of rope (inches)	Number of clips	Minimum spacing (inches)
1/2	3	3
5/8	3	3-3/4
3/4	4	4-1/2
7/8	4	5-1/4
1	5	6
1-1/8	6	6-3/4
1-1/4	6	7-1/2
1-3/8	7	8-1/4
1-1/2	7	9
1-5/8	7	9-3/4
1-3/4	7	10-1/2
2	8	11-1/4



**D=6 times rope diameter
Clip Spacing**

b. Wedge Sockets. Wedge sockets are extensively used in the construction industry because they attach easily to a wire rope. In applying the socket, the live rope will lead out of the socket in a straight line with the pin. The assembler will match the proper wedge with the socket for the wire rope to be installed. The dead-end tail of the wire rope will not be secured to the live end of the wire rope in a way that restricts

the movement of the live end (figure 19-1). After assembly, the connection will be loaded to fully seat the wedge before use.

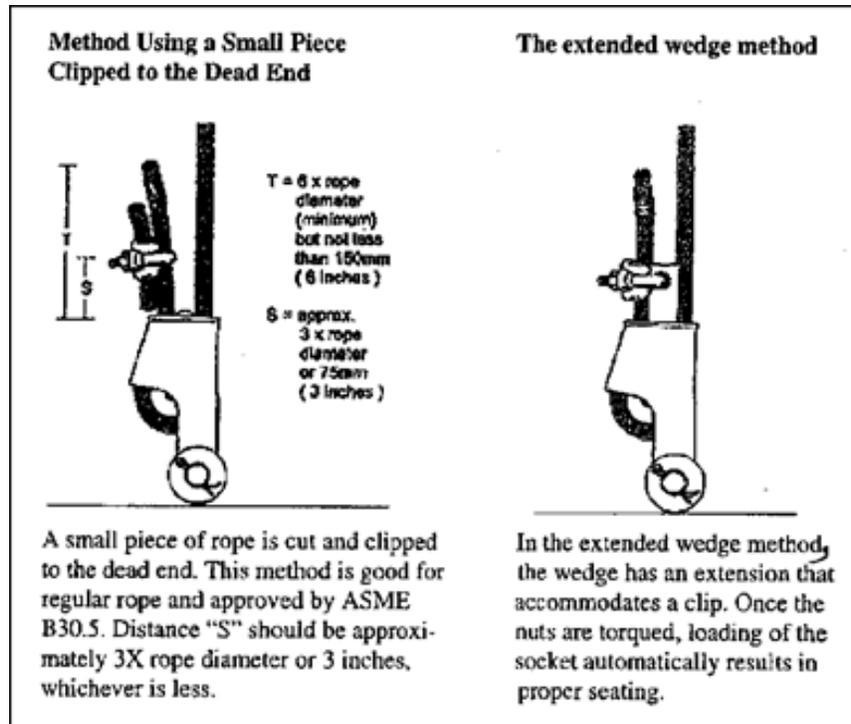


Figure 19-1.—Two recommended methods of attaching the socket to the wedge before use.

19.10.3 Hoisting Rope. Except for end fasteners, wire rope used to hoist or lower loads will be continuous, without knots or splices.

19.10.4 Spooling of Rope. Overwind or underwind wire rope correctly from right to left, or left to right, in accordance with the lay, to avoid twisting, spreading, or overlapping on winch drums in accordance with the wire rope manufacturer's instructions.

19.10.5 Sheave Diameter. The ratio between the rope diameter and the drum or sheave diameter will not be less than specified by the rope manufacturer. When not specified, the ratio will be in accordance with the appropriate ASME/ANSI standard. Drums, sheaves, and pulleys will be smooth and free of defects that could damage the rope.

19.10.6 Sheave Groove Tolerance. Use the sheave groove tolerances as recommended by the sheave manufacturer.

19.10.7 Lubrication. Lubricate wire rope with manufacturer-approved lubricants and follow the manufacturer's approved methods at the intervals required by the type of service.

19.10.8 Wire Rope Inspection. The inspection will consist of observing wire ropes (running and standing) that are likely to be used, to determine any apparent deficiencies. Opening of wire rope or booming down is not required as part of the daily/shift inspections. Refer to table 19-2 and FIST 2-11 for additional requirements.

a. Category I. Apparent deficiencies in this category include the following:

- Significant distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure, or steel core protrusion between the outer strands.
- Significant corrosion.
- Electric arc damage (from a source other than power lines) or heat damage.
- Improperly applied end connections
- Significantly corroded, cracked, bent, or worn end connections (such as from severe service)

b. Category II. Apparent deficiencies in this category are:

- Visible broken wires, as follows:
 - In running wire ropes: Six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope.
 - In rotation resistant ropes: Two randomly distributed broken wires in six rope diameters, or four randomly distributed broken wires in 30 rope diameters.
 - In pendants or standing wire ropes: More than two broken wires in one rope lay located in rope beyond end connections, and/or more than one broken wire in a rope lay located at an end connection.
 - A diameter reduction of more than 5 percent from nominal diameter.

c. Category III. Apparent deficiencies in this category include the following:

- In rotation resistant wire rope, core protrusion or other distortion indicating core failure
- Prior electrical contact with a power line
- A broken strand

d. Critical review items. The competent person will give particular attention to all of the following:

- Rotation resistant wire rope in use
- Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends
- Wire rope at flange points, crossover points, and repetitive pickup points on drums
- Wire rope at or near terminal ends
- Wire rope in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited

19.10.9 Removal from Service

a. Category I. If a deficiency in Category I is identified, an immediate determination will be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question will be prohibited until:

- The wire rope is replaced, or
- If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited.

b. Category II. If a deficiency in Category II is identified, operations involving use of the wire rope in question will be prohibited until:

- The employer complies with the wire rope manufacturer's established criterion for removal from service or a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope
- The wire rope is replaced, or

- If the deficiency is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited

c. Category III. If a deficiency in Category III is identified, operations involving use of the wire rope in question will be prohibited until:

- The wire rope is replaced, or
- If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.

19.10.10 Socket Brakes. Resocket or remove from service the wire rope when any broken or corroded wires are next to a socket or end fitting.

19.10.11 Hazardous Location. Guard running lines of stationary hoisting equipment that is located within 8 feet of the ground or working level, or enclose or barricade the hazardous area.

19.11 Requirements for Overhead and Gantry Cranes

In addition to requirements set forth in these standards, overhead and gantry cranes will conform to requirements contained in the current edition of ASME/ANSI B30.2, “Overhead and Gantry Cranes”; ASME/ANSI B30.17, “Overhung and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)”; and 29 CFR 1910.179.

19.11.1 Design. The manufacturer or a P.E. will design crane installations and equipment.

19.11.2 Performance Inspections and Tests. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3. During performance tests, the load will be transported for the full length of the supporting structure.

19.11.3 Crane Access. Provide safe access to the cab or bridge walkway with a fixed ladder, stairs, or platform, with no step or gaps exceeding 12 inches. Fixed ladders and stairways will comply with the requirements set forth in Section 13, “Walking and Working Surfaces,” of the RSHS. Provide means of egress from the cab under emergency conditions.

19.11.4 Platforms and Walkways. Install maintenance platforms and walkways, which are protected by standard guardrails and toeboards, and

provide a way to safely access the trolley and bridge. Where it is impractical to install platforms and walkways, install a fall protection system to enable safe inspection and maintenance.

19.11.5 Markings. Mark the rated load of the crane on both sides of the crane. Mark the rated load of each hoist on the crane on the hoist, trolley unit, or load block. All markings will be legible from the ground or floor.

19.11.6 Hoist Identification Markings. For cranes with multiple hoists, distinctively mark each hoist so that it is visible from the ground or floor. Clearly mark operator controls to correspond to the hoist markings to indicate which controls operate each hoist.

19.11.7 Warnings. As required by ASME/ANSI B30.2, cranes will have appropriate warning labels.

19.11.8 Fire Extinguisher. Mount a fire extinguisher of 2-A:40-B:C rating in the cab or near the operator's position.

19.11.9 Outdoor Equipment. Secure outdoor cranes from unauthorized access when not in use.

19.12 Requirements for Monorail and Underhung Cranes

In addition to requirements set forth in these standards, monorail and underhung cranes will conform to the standards in the current edition of ASME/ANSI B30.11, "Monorails and Underhung Cranes - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings."

19.12.1 Design. The manufacturer or a P.E. will design crane installations and equipment.

19.12.2 Performance Inspections and Tests. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3. During performance tests, the load will be transported for the full length of the supporting structure.

19.12.3 Crane Access. Provide safe access to the cab for cab-operated cranes with a fixed ladder, stairs, or platform, with no step or gaps exceeding 12 inches. Fixed ladders and stairways will comply with the requirements set forth in Section 13 of the RSHS. Provide a means of egress from the cab under emergency conditions.

19.12.4 Platforms and Walkways. Install maintenance platforms and walkways which are protected by standard guardrails and toeboards, and

provide a way to safely access the trolley and bridge. Where it is impractical to install platforms and walkways, install a fall protection system to enable safe inspection and maintenance.

19.12.5 Markings. Mark the rated load of each hoist on the crane on the hoist, trolley unit, or load block. All markings will be legible from the ground or floor.

19.12.6 Hoist Identification Markings. For cranes with multiple hoists, distinctively mark each hoist so that it is visible from the ground or floor. Clearly mark operator controls to correspond to the hoist markings to indicate which controls operate each hoist.

19.12.7 Warnings. As required by ASME/ANSI B30.11, cranes will have appropriate warning labels.

19.12.8 Fire Extinguisher. Mount a fire extinguisher of 2-A:40-B:C rating in the cab or near the operator's position.

19.13 Requirements for Mobile and Locomotive Cranes

In addition to the requirements set forth in these standards, mobile and locomotive cranes will conform to the standards in the current edition of ASME/ANSI B30.5, "Mobile and Locomotive Cranes"; side boom wheel or crawler tractors will conform to ASME/ANSI B30.14, "Side Boom Tractors - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings"; and articulating boom cranes will conform to ASME/ANSI B30.22, "Articulating Boom Cranes."

19.13.1 Operating Instructions. Rated load capacities and recommended operating speeds, special hazard warnings, or instruction will be conspicuously posted on all equipment. Instructions or warnings will be visible to the operator while at the control station.

19.13.2 Performance Inspection and Testing. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3 and FIST 2-11.

19.13.3 Boom Angle/Radius Indicator. Equip mobile cranes with a boom angle or radius indicator located within the operator's view.

19.13.4 Boom Stops. Provide cranes or other hoisting devices with cable-supported booms with stops to resist the boom falling over backwards. Design boom stops to provide increasing resistance from the initial point of contact to a stopping point no more than 87 degrees above horizontal.

19.13.5 Boom Hoist Disengagement Device. 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.

19.13.6 Anti-Two-Blocking Device. 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 will 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. Cranes lacking automatic capabilities to disengage all crane functions in a two-block condition are prohibited for use in critical lifts or personnel hoisting operations.

19.13.7 Level Indicator. Provide a way for the operator to visually determine the levelness of the crane.

19.13.8 Jib Stops. In addition to boom stops, jibs will have a positive stop to prevent overtopping.

19.13.9 Cab Windows. Windows in crane cabs will be safety glass or equivalent. Cab windows will not introduce any distortion that interferes with the crane's safe operation.

19.13.10 Audible Warning Device. Mobile cranes will have an audible warning signal device that is distinguishable and audible above background noise.

19.13.11 Foot Pedal Brakes. Equipment with foot pedal brakes will have locks, except for portal and floating cranes.

19.13.12 Hydraulic Outrigger Jacks. Hydraulic outrigger jacks will have an integral holding device (check valve).

19.13.13 Fire Extinguisher. Provide the cab with a 2-A:40-B:C rating fire extinguisher.

19.13.14 Load Weighing or Similar Device. Equipment manufactured after March 29, 2003, with a rated capacity over 6,000 pounds will have a load weighing device, load moment (or rated capacity) indicator, or a load moment (or rated capacity) limiter.

19.13.15 Outrigger/Stabilizer Position and Hoist Drum Rotation Indicators. Equipment manufactured after November 8, 2011, will be equipped with:

- An outrigger/stabilizer position sensor or monitor if the equipment has outriggers or stabilizers.
- A hoist drum rotation indicator if the drum is not visible from the operator's station.

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

19.14 Requirements for Floating Cranes and Floating Derricks

In addition to the requirements set forth in these standards, floating cranes and floating derricks will conform to the requirements contained in the current edition of ASME/ANSI B30.8, "Floating Cranes and Floating Derricks."

19.14.1 Design. The manufacturer or a qualified P.E. will design and certify all floating cranes and floating derricks.

19.14.2 Inspections and Performance Tests. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3.

19.14.3 Fire Extinguisher. Mount a fire extinguisher with a 2-A:40-B:C rating at the operator's station.

19.14.4 Personal Flotation Devices. All personnel will wear U.S. Coast Guard-approved personal flotation devices while onboard, except while in enclosed cabins. Additionally, provide and make readily accessible at least two U.S. Coast Guard-approved, type IV life rings (30-inch diameter) with at least 90 feet of line. For night operations, equip at least one ring with a water-activated flashing light.

19.14.5 Rescue Skiff. Make available a rescue skiff meeting the requirements in Section 8, "Personal Protective Equipment," of the RSHS.

19.14.6 Load Rating Chart. When reducing load ratings to compensate for "barge list," 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.

19.14.7 Wave Action. Suspend crane operation when significant wave action affects the stability of the barge.

19.14.8 Mobile Cranes. Block and secure mobile cranes mounted on barges or pontoons to prevent shifting.

19.15 Requirements for Tower Cranes

In addition to the requirements set forth in Section 19, tower cranes will conform to the applicable standards in the current edition of ASME/ANSI B30.3, “Construction Tower Cranes.”

19.15.1 Design. All load bearing foundations, supports, and rail tracks will be constructed or installed as determined by a registered P.E. with knowledge in this area in accordance with the crane manufacturer’s recommendations.

19.15.2 Performance Inspections and Tests. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3.

19.15.3 Fire Extinguisher. Mount a fire extinguisher of 2-A:40-B:C rating in the cab or near the operator’s position.

19.15.4 Crane Erection and Dismantling. Erect and dismantle cranes in accordance with the manufacturer’s recommendations and applicable ASME/ANSI standards. Following are the minimum requirements:

- a. Supervision by a qualified person.
- b. Provide the manufacturer’s or a qualified person’s written instructions and the weights of each component.
- c. Develop and implement a JHA during the planning, erection, and dismantling process. The JHA will include consideration of temporary guying and bracing requirements during the erection and dismantling.

19.15.5 Environmental Conditions. Place the crane into its most favorable protected position to protect personnel and property when environmental conditions require lifting operations to cease.

19.15.6 Unattended Tower Cranes. Place unattended tower cranes in a weathervane configuration.

19.15.7 Limiting Devices. Where applicable, install the following limiting devices:

- a. Trolley limit switches to prevent further trolley motion beyond predetermined points on tower crane booms.
- b. Anti-two-block switches that cause the hoist drum to automatically stop, preventing contact between the load hook and the head block.
- c. Load-limiting switches to avoid exceeding crane capacities.

- d. Limit switches and stops or buffers at each end of the tracks of track-mounted cranes

19.15.8 Boom Angle Indicator. Install boom angle indicators on machines having booms capable of moving in the vertical plane.

19.16 Requirements for Derricks

In addition to the requirements set forth in Section 19, derricks will conform to the requirements contained in the current edition of ASME/ANSI B30.6, “Derricks Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings.”

19.16.1 Design. A P.E. will design derrick installations and equipment.

19.16.2 Inspections and Performance Tests. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3.

19.16.3 Foundation. Set derricks on foundations designed and constructed to support the weight of the crane plus the maximum rated load.

19.16.4 Boom Angle Indicator. Provide a boom angle or radius indicator and place it within the operator’s view.

19.16.5 Fire Extinguisher. Mount a fire extinguisher of 2-A:40-B:C rating at the operator’s station.

19.17 Requirements for Base-Mounted Drum Hoists

Base-mounted drum hoists will conform to the requirements of ANSI B30.7, “Winches.” Air-powered hoists must conform to the requirements of ANSI/ASME HST-6M, “Performance Standard for Air Wire Rope Hoists,” or more stringent requirements of this subsection. Hoisting machines used in personnel related systems must also meet the requirements in Subsection 19.18, “Requirements for Overhead Hoists.”

19.17.1 Design. The hoist manufacturer or a P.E. must design base mounted hoisting systems.

19.17.2 Restrictions. Base-mounted drum hoist systems involving personnel use or exposure (e.g., movable work platforms, raising or lowering drilling machines, and personnel hoists) must conform to the provisions of this subsection.

19.17.3 Inspections and Performance Tests. Conduct and record inspections and performance tests using the requirements of Subsection 19.3 and FIST 2-11.

19.18 Requirements for Overhead Hoists

Install, operate, and maintain overhead hoists in compliance with the more stringent provision of this subsection and ASME/ANSI B30.16, “Overhead Hoists (Underhung).”

19.18.1 Design. The manufacturer or a P.E. will design hoists and hoist suspensions and anchorages.

19.18.2 Inspections and Performance Tests. Conduct and record inspections and performance testing in accordance with the requirements of Subsection 19.3.

19.18.3 Safe Working Load. Indicate the safe working load, as determined by the manufacturer, on the hoist. Do not exceed the safe working load.

19.18.4 Support. Design the supporting structure to withstand the loads and forces imposed by the weight of the hoist and its rated load. The support will provide unobstructed movement of the hoist and load. It will also permit the operator to stand clear of the load in all hoisting positions.

19.18.5 Limit Switch. Equip power-operated overhead hoists with a limit switch to prevent the load hook from exceeding the upper travel limit.

19.18.6 Hoist Controls. Controls on powered hoists will return to a neutral position when released, and load hook movement will stop.

19.18.7 Brakes. Except for hand-powered hoists, all overhead hoists will have brakes that apply automatically when the controls are in neutral.

19.18.8 Air-Operated Hoists. Connect air hoists to an air supply of sufficient capacity and working pressure to safely operate the hoist with maximum load.

19.18.9 Hand-Powered Hoists. Hand-powered hoists will be worm-gear driven or equipped with a pawl or ratchet system that provides continuous effective control and braking reliability.

19.19 Requirements for Material Hoists

Construct, install, test, operate, and maintain material hoists as set forth in the latest edition of ANSI A10.5, "Safety Requirements for Material Hoists," and the requirements of Subsection 19.3. The manufacturer or a P.E. will design material hoist installations.

19.19.1 Assembly. A qualified individual will directly supervise erecting and dismantling of hoist towers and material hoists.

19.19.2 Inspection. A qualified person will inspect the hoist, including all its components, after initial installation and before it is placed into service. A competent individual will inspect it monthly thereafter in accordance with ANSI A10.5.

19.19.3 Car-Arresting Devices. Test car-arresting devices before initial use and every 4 months thereafter. Conduct tests in accordance with ANSI A10.5.

19.19.4 Posting. Post operating rules, including signals, line speeds, and loading, at the operator's station and on the cage frame or crosshead. A copy of the hoist operating manual will be available at all times of operation.

19.19.5 Riding. Do not permit anyone to ride a material hoist, except for inspection and maintenance. Conspicuously post with "NO RIDERS ALLOWED."

19.19.6 Hoistway Entrances. Protect entrances to the hoistway with substantial gates or bars that are installed the full width of the landing entrance. Paint entrance bars and gates with diagonal contrasting colors, such as black and yellow stripes. Bars will not be less than 2- by 4-inch wood, or equivalent, and not less than 36 inches or more than 42 inches above the floor. Bars will be at least 2 feet from the hoist and equipped with a latching device. When gates are used, they will be at least 66 inches high, with a maximum underclearance of 2 inches, and will be no more than 4 inches from the hoist sill. Gate grilles or lattice will have openings no larger than 2 inches.

19.19.7 Overhead Protection. Protect the top of the cage or platform with 2-inch planking, 3/4-inch plywood, or material of equivalent strength.

19.19.8 Tower Enclosures. The following requirements will apply:

- a. **Enclosed.** An enclosed hoistway or tower will be enclosed on all sides for its entire height, with 1/2-inch wire mesh screen, No. 18 U.S. American Wire Gauge (AWG) or equivalent, except at access points.

b. Open Sides. For an unenclosed hoist tower, totally enclose the hoist cage or platform on all sides between the floor and the protective top with 0.5-inch wire mesh screen, No. 14 AWG, or equivalent. The hoist cage or platform enclosure will include the required gates for loading and unloading. Install an enclosure at least 6 feet high on the unused sides of the hoist tower at ground level.

19.19.9 Operator's Station. Protect the operator's station with overhead planking not less than 2 inches thick or with material of equivalent strength.

19.19.10 Towers and Shaftways. A P.E. will design towers and shaftways with a safety device capable of stopping and holding the platform with maximum load in the event of a cable failure.

19.19.11 Tower Support. Towers will rest on solid foundations. Ensure that the towers are plumb and well guyed or otherwise anchored in four directions at the top and at least every 30 feet in height.

19.19.12 Hinged Roof. The car or platform roof may be hinged to accommodate long material.

19.19.13 Electric Hoists. Electric hoists will be provided with an automatic motor brake to stop and hold the load in case of a power failure.

19.19.14 Operating Restrictions. One hoisting machine, or one operator, will operate only one cage, bucket, or hoist platform at a time.

19.19.15 Hoisting Machines. Design and install hoisting machines to raise and lower the maximum rated load, plus the weight of equipment and ropes. Hoisting machines will incorporate the following features:

a. Brakes. The brakes will be capable of stopping and holding 125 percent of the rated hoisting capacity under all operating conditions.

b. Mechanical Brakes. Install mechanical brakes to stop movement of the hoist drum, and equip the mechanical brakes with a positive acting device that will hold the brake in the engaged position.

c. Ratchet and Pawl. Equip friction-clutch-driven winding drum hoisting machines with an effective pawl and ratchet capable of holding the rated load capacity when suspended.

d. Controls. All controls will, when released, automatically return to neutral and set the brake. Plainly mark each control to indicate its function; it will be within easy reach of the operator.

19.19.16 Position Indicator. Use a positive system to indicate when the hoist car or platform has reached specific locations, including the top and bottom landings.

19.19.17 Signal System

a. Hand Signals. Hand signals may be used on a single drum hoist when the hoist tower is no more than 50 feet high and the signals are clearly visible to the operator at all times.

b. Communications. Use audio communications on all other material hoist installations. The system will be two-way, with a speaker located at the hoist operator's station and at each landing. The hoist operator will be able to communicate by voice to and from each station.

19.19.18 Fire Extinguisher. Mount a fire extinguisher of 2-A:40-B:C rating at the operator's station.

19.19.19 Inspections and Performance Testing. Performance test material hoists under the direction of the design engineer or his or her designee. Conduct the test in accordance with the requirements of ANSI A10.5, "Safety Requirements for Material Hoists," and Subsection 19.3. Include the car-arresting device in the test.

19.20 Requirements for Personnel Hoists

Construct, install, test, operate, and maintain personnel hoists as set forth in the current edition of ANSI/American Society of Safety Engineers (ASSE) A10.4, "Safety Requirements for Personnel Hoists on Construction and Demolition Sites," and the requirements of this subsection.

19.20.1 Design and Installation. Observe manufacturer's drawings, specifications, and limitations when installing and operating personnel hoists. A qualified person will design all personnel hoists, and a P.E. will certify them.

19.20.2 Inspections and Performance Tests. A qualified person will inspect and performance test personnel hoists at initial installation and inspect them annually thereafter. Conduct the tests in accordance with ANSI/ASSE A10.4. Maintain a comprehensive report detailing test and inspection procedures and results.

19.20.3 Posting. Post rated load capacities, recommended operating speeds, and special hazard warnings on cages, platforms, and at the operator's station.

19.20.4 Hoistway Enclosure. Hoist towers that are installed outside buildings or structures will be enclosed for the full height of the side, or sides, used to enter or exit the building or structure. Enclose the other sides to a height of at least 10 feet above the lowest landing. Enclose the sides of the tower adjacent to floors or scaffold platforms to a height of 10 feet above the level of such floors or scaffolds. Enclose towers inside buildings or structures on all four sides throughout the full height.

19.20.5 Tower Anchorage. Anchor towers to the structure at no less than 25-foot intervals. Where tie-ins are not practical, anchor the tower by wire rope guys that are at least 0.5 inch in diameter and securely fastened to anchorages to ensure stability.

19.20.6 Cage Enclosure. Fully enclose cages on all sides and the top, except sides used for entrance, which will have car gates or doors that completely cover the opening and are interlocked to prevent movement of the cage unless the gates are closed.

19.20.7 Overhead Protection. Overhead protection of 2-inch planking, 0.75-inch plywood, or other material of equivalent strength will cover the top of the cage.

19.20.8 Overspeed Safety Device. Equip the cage with an overspeed safety device that will stop and hold the cage, plus the maximum rated load, if the cage exceeds governor tripping speed or the hoist rope fails.

19.20.9 Brakes. Equip the hoist with two independent braking systems. One braking system will automatically operate when the controls are in neutral or when there is a power failure. The other braking system may be manually operated and attached to the hoist drum. Each braking system will be capable of stopping and holding 125 percent of the rated load in any position.

19.20.10 Power Up and Power Down. Design the hoist power unit to provide power up and power down at all times.

19.20.11 Controls. On manually controlled hoists, the controls will return to the stop position when pressure is removed from the control lever.

19.20.12 Maximum Speed. The speed of the cage will not exceed 200 feet per minute.

19.20.13 Travel Limit Stops. Equip hoists with upper and lower travel limit switches.

19.20.14 Hoist Ropes. Hoist wire ropes will meet the following minimum requirements:

- a. Minimum Number.** Drum hoists will have at least two hoisting ropes, and traction hoists will have at least three hoisting ropes.
- b. Safety Factor.** Hoisting ropes will have a minimum safety factor as identified in table 19-6, but in no event may the ropes be less than 0.5 inch in diameter.

Table 19-6.—Safety factors for hoisting ropes used in personnel hoists

Rope speed (feet per minute)	Minimum safety factor
0-100	8.00
101-125	8.10
126-150	8.25
151-175	8.40
176-200	8.60
201-225	8.75
226-250	8.90
251-300	9.20
301-350	9.50
351-400	9.75
401-500	10.25
501-600	10.70

19.20.15 Emergency Stop Switch. Install an emergency stop switch in the cage and mark it “STOP.”

19.20.16 Maintenance Access. Provide safe access for inspection and maintenance of hoist towers and equipment.

19.20.17 Bridge Tower Construction. A P.E. will design and supervise the erection of personnel hoists used in bridge tower construction. Inspect these hoists at least weekly and whenever exposed to winds exceeding 35 mph.

19.20.18 Wire Rope. Inspect hoisting rope daily and remove it from service when any of the conditions described in Subsection 19.10, “Requirements for Working with Wire Rope,” exist.

19.20.19 Signals. When a hoist operator controls personnel hoists, users will signal the operator either: (1) through direct radio communications with that operator or (2) through a visual and audible, electrically operated signal system between the operator and each cage access point.

19.21 Requirements for Elevators

Design, construct, test, inspect, and maintain permanent elevators in accordance with the current editions of ANSI/ASME A17.1, “Elevators and Escalators,” ANSI/ASME A17.2, “Inspectors’ Manual for Elevators and Escalators,” and FIST 2-10, “Maintenance, Inspection, and Testing of Electric and Hydraulic Elevators.” Design, install, and test elevators under the direction of the manufacturer or a P.E. Following installations, inspect, test, and certify elevators in accordance with referenced standards.

19.21.1 Inspection. In States with elevator codes, elevators will be inspected in accordance with State standards by an inspector acceptable to the State authorities. In States that do not have an elevator code, elevators will be inspected annually following the requirements of ANSI/ASME A17.2 and FIST 2-10.

19.22 Requirements for Cableways

In addition to the requirements of this subsection, cableways will comply with the installation, testing, operation, and maintenance requirements in Section 19 and the standards in the current edition of ASME/ANSI B30.19, “Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings.”

19.22.1 Design and Installation. A P.E. will design cableways. Install and operate cableways according to the P.E.’s design drawings, specifications, and operating, maintenance, and inspection instructions.

19.22.2 Inspection and Performance Tests. Conduct inspections and performance tests in accordance with the requirements of this subsection and ASME/ANSI B30.19.

19.22.3 Inspection and Maintenance. Inspect all cableway components daily and provide daily routine maintenance and lubrication.

19.22.4 Cableway Log. Maintain a log for each cableway to record inspections, lubrication, maintenance, and repair activities. The log will also include operating time and downtime, and the employee responsible for performing the maintenance or repair work will sign it. Make the log available for review.

19.22.5 Signal System. Continuously maintain at least two systems of communication between the operator and the signalperson. At least one of the systems will provide voice communication by telephone or radio. The second system may 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.

19.22.6 Control Consoles. During operation of the cableway, permit only the operator(s) in the control console room. The console room windows will be safety glass that introduces no distortion that would interfere with the safe operation of the cableway.

19.22.7 Operating Controls. All controls will automatically return to neutral and set the brakes when released. Plainly mark each control to indicate its function and ensure that it is within easy reach of the operator.

19.22.8 Cableway Platforms and Carriages. Provide cableway inspection platforms, moving and stationary, with standard guardrails and toeboards. Enclose open areas on carriages and moving platforms with wire mesh to reduce the hazard from falling objects.

19.22.9 Concrete Buckets. Design concrete buckets with a safety device to prevent accidental opening of the bucket while in transit to the discharge site. Construct buckets to prevent aggregate from lodging on any part of the bucket. Refer to Section 25, “Concrete, Masonry, Construction, and Formwork,” of the RSHS.

19.22.10 Riding Cableways. Prohibit riding the cableway, except for designated maintenance personnel who may ride the carriage service platform of a cableway to perform inspections or maintenance. Prepare and review a JHA before performing inspections or maintenance.

19.22.11 Track-Mounted Towers. Equip track-mounted cableway towers or structures with both limit switches and rail stops, or with buffers at each end of the tracks. 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, install an automatic control system to prevent the towers from colliding.

19.23 Requirements for Specialized Hoisting Systems

19.23.1 Draglines. Do not use draglines as hoisting devices without the manufacturer’s approval. When used for lifting, they will meet all of the requirements of Subsection 19.13, “Requirements for Mobile and Locomotive Cranes.”

19.23.2 A-Frame Trucks. The design and operation of A-frame trucks will conform to this subsection and Section 20, “Mobile and Stationary Mechanized Equipment,” of the RSHS. Do not use A-frame trucks to hoist personnel.

19.23.3 Mobile Hydraulic Excavators and Hoes, Crawlers, Wheel Loaders, and Similar Machines

- a. Requirement.** Do not use mobile hydraulic excavators and hoes, crawlers, wheel loaders, and similar machines to hoist personnel. Use them to hoist materials only when they conform to the requirements of this paragraph and appropriate Society of Automotive Engineers recommended practices. Applicable standards are identified in Appendix L, “Referenced Material,” of the RSHS.
- b. Restrictions.** Use only machines that are certified for hoisting by the manufacturer and are equipped with manufacturer-installed, closed lifting eyes or lugs for hoisting. The maximum load in any machine position will not exceed the rated capacity in the least stable position.
- c. Testing.** Load test the machine at 100 percent of the load rating chart. Hoist test loads clear of the ground at the maximum load radius and move them through the maximum angle of articulation or arc radius in both directions from the longitudinal centerline of the machine.

19.23.4 Facility Maintenance Hoisting Systems. Design, construct, install, and use hoisting systems to inspect and maintain facilities, such as penstocks, spillways, and airshafts, and for external building maintenance such as window washing, in accordance with ANSI/ASSE A10.22, “Safety Requirements for Rope-Guided and Nonguided Workers' Hoists for Construction and Demolition Operations,” or ANSI/ASME A120.1, “Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance.” The manufacturer or a P.E. will certify such hoisting systems for the intended use. Hoisting systems used on an incline or other nontraditional use will undergo a peer review by an independent P.E. The review will include the structure, controls, operating procedures, and a performance test of the completed and assembled system.

19.24 Requirements for Pile Driving Equipment

19.24.1 Qualifications. Pile driving will be carried out only under the supervision of a competent person. Only qualified persons will be permitted to operate pile drivers.

19.24.2 Preliminary Inspection. Prior to start of operations, thoroughly inspect the site to determine conditions that require special safety measures. Locate all underground and overhead utilities. Safe clearance requirements will be met for overhead utilities, and all underground services in the area will be rendered safe.

19.24.3 Setup. Pile driving equipment will be erected on a firm foundation. If necessary, use adequate guylines, outriggers, thrustboards, counterbalances, or rail clamps to stabilize pile driving equipment during operation.

19.24.4 Boilers and Pressure Vessels. Boilers and pressure vessels used in pile driving operations will conform to the requirements and standards set forth in Subsection 17.12, “General Requirements for Boilers and Unfired Pressure Vessels,” of the RSHS.

19.24.5 Hoisting Equipment. Cranes used to drive or extract piling will conform to the requirements and standards set forth in the applicable parts of Section 19 of the RSHS. Do not equip pile driving equipment hoist drums with dogs that automatically disengage by relieving the load or by rotating the drum. Install guards to prevent the hoist line from jumping out of the headblock.

19.24.6 Driving Leads. Provide pile driving equipment leads with fixed ladders and attachment points for safety harness lanyards.

19.24.7 Hose Connections. Secure high-pressure hose connections (air, steam, hydraulic) with a whip-check device that is adequate to prevent whipping if a connection breaks.

19.24.8 Hammer. Adequate precautions will be taken to prevent the hammer from missing the pile. When employees will work under the hammer, place a blocking device in the leads that can support the hammer. Provide pile driver leads with stops to prevent the hammer from being raised into the headblocks.

19.24.9 Floating Pile Driving Equipment. Hulls for floating pile driving equipment will be at least as wide as 45 percent of the height of the lead above the water. Protect the operating deck to prevent suspended piling from swinging or drifting in over the deck. The weight of machinery on floating pile driving equipment will be evenly distributed so that the deck is horizontal.

19.24.10 Overhead Protection. Provide overhead protection for the operator equivalent to 2-inch planking. Position the overhead protection in a way that does not interfere with the operator’s view of the pile driver.

19.24.11 Inspection. Pile driving equipment will be inspected prior to being used on the jobsite and daily prior to each start of each shift.

19.24.12 Operation

a. Noise Survey. A noise survey using a sound level meter, A-scale, fast response will be conducted at the beginning of piling 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 will wear hearing protection at all times when pile driving operations are conducted.

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

c. Moving the Pile Driver. When moving the pile driver, lower the hammer to the bottom of the leads. When not in use, the pile driver hammer will be blocked at the bottom of the leads.

d. Signals. Suitable signals for the control of the pile driving operation will be developed prior to the start of the job.

e. Cutting Piles. Do not trim piles within a distance from the pile driver of twice the length of the longest pile.

f. Hoisting Piling. Remote release shackles will be used 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 rope will be secured around the pile to prevent snagging or being blown out of reach by the wind. Employees will be kept in the clear when hoisting piles. Use tag lines to control unguided piles and flying hammers.

g. Pulling Piles. Use extractors to pull piling that cannot be pulled without exceeding the safe load rating of the pulling rig. When pulling piling, do not elevate the crane boom more than 60 degrees from the horizontal.

19.25 Helicopter Operations

19.25.1 Requirement. Operators and aircraft will be licensed and will comply with the applicable requirements of the Federal Aviation Administration; the U.S. Department of the Interior's Office of Aviation Services; ASME/ANSI B30.12, "Handling Loads Suspended from Rotorcraft"; and this subsection.

19.25.2 Briefing. Before each day's operation, conduct a briefing for pilots and ground personnel and discuss in detail the plan of operation.

19.25.3 Loads. 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 being drawn into the rotors.

19.25.4 Cargo Hooks. Use self-locking cargo hooks that are 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. Also, equip these hooks with an emergency control to release the load. Test the hooks before each day's operation to ensure that they function properly.

19.25.5 Personal Protective Equipment. Employees who receive the load will wear safety goggles and hard hats equipped with chinstraps. Employees will not wear loose-fitting clothing that may become snagged on the hoist line.

19.25.6 Downwash. Remove or secure material and loose gear within 100 feet of the lift or delivery site.

19.25.7 Operator Responsibility. The helicopter pilot is responsible for the size, weight, and manner in which loads are connected to the helicopter. Do not make the lift if the pilot considers it unsafe.

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

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

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

19.25.11 Ground Lines. Do 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. 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.

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

19.25.13 Approaching Helicopters. 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

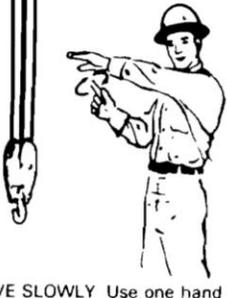
full view of the pilot and assume a crouched position. Persons will stay out of the area from the cockpit or cabin rearward unless the pilot authorizes them to enter that area.

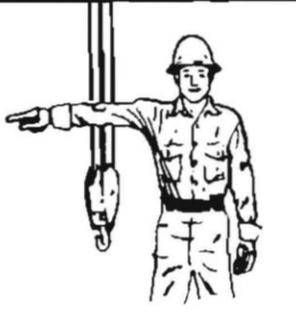
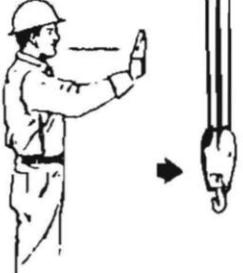
19.25.14 Radio Communication. Provide reliable radio communication between the pilot and a designated member of the ground crew during all loading, unloading, and rigging operations.

19.25.15 Hand Signals. When personnel use hand signals, they will use standard “Helicopter Hand Signals” (see figure N-1, 29 CFR 1910.183(n)]. The signal person on the ground will be distinguishable from other ground personnel.

Attachment 19-1

Hand Signals for Cranes and Hoisting Equipment

 <p>HOIST With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>	 <p>LOWER With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p>	 <p>USE MAIN HOIST. Tap fist on head; then use regular signals.</p>
 <p>USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.</p>	 <p>RAISE BOOM. Arm extended, fingers closed, thumb pointing upward</p>	 <p>LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.</p>
 <p>MOVE SLOWLY Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)</p>	 <p>RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired</p>	 <p>LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.</p>

 <p>SWING Arm extended, point with finger in direction of swing of boom</p>	 <p>STOP Arm extended, palm down, move arm back and forth horizontally</p>	 <p>EMERGENCY STOP Both arms extended, palms down, move arms back and forth horizontally</p>
 <p>TRAVEL Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel</p>	 <p>DOG EVERYTHING. Clasp hands in front of body</p>	 <p>TRAVEL (Both Tracks) Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)</p>
 <p>TRAVEL (One Track) Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body (For land cranes only)</p>	 <p>EXTEND BOOM (Telescoping Booms) Both fists in front of body with thumbs pointing outward</p>	 <p>RETRACT BOOM (Telescoping Booms) Both fists in front of body with thumbs pointing toward each other</p>

