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Part II

Department of Labor

Occupational Safety and Health Administration

29 CFR Part 1926
Cranes and Derricks in Construction; Final Rule

Subpart S—Underground Construction, Caissons, Cofferdams, and Compressed Air

■ 19. The authority citation for subpart S of 29 CFR part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), 1–90 (55 FR 9033), 6–96 (62 FR 111), or 5–2007 (72 FR 31159) as applicable.

■ 20. Section 1926.800 is amended by revising paragraph (t) to read as follows:

§ 1926.800 Underground construction.

* * * * *

(t) *Hoisting unique to underground construction.* Employers must comply with § 1926.1501(g) of § 1926 subpart DD. Except as modified by this paragraph (t), the following provisions of subpart N of this part apply: Requirements for material hoists are found in §§ 1926.552(a) and (b) of this part. Requirements for personnel hoists are found in the personnel hoists requirements of §§ 1926.552(a) and (c) of this part and in the elevator requirement of §§ 1926.552(a) and (d) of this part.

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Subpart T—Demolition

■ 21. The authority citation for subpart S of 29 CFR part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), 1–90 (55 FR 9033), 6–96 (62 FR 111), or 5–2007 (72 FR 31159) as applicable.

■ 22. Section 1926.856 is amended by revising paragraph (c) to read as follows:

§ 1926.856 Removal of walls, floors, and material with equipment.

* * * * *

(c) Mechanical equipment used shall meet the requirements specified in subparts N and O and § 1926.1501 of § 1926 subpart DD.

■ 23. Section 1926.858 is amended by revising paragraph (b) to read as follows:

§ 1926.858 Removal of walls, floors, and material with equipment.

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(b) Cranes, derricks, and other hoisting equipment used shall meet the requirements specified in § 1926.1501 of § 1926 subpart DD.

Subpart V—Power Transmission and Distribution

■ 24. The authority citation for subpart V of part 1926 is revised to read as follows:

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 12–71 (36 FR 8754); 8–76 (41 FR 25059); 9–83 (48 FR 35736, 1–90 (55 FR 9033), and 5–2007 (72 FR 31159). Section 1926.951 also issued under 29 CFR part 1911.

■ 25. Section 1926.952 is amended by revising paragraph (c) to read as follows:

§ 1926.952 Mechanical equipment.

* * * * *

(c) *Cranes and other lifting equipment.*

(1) All equipment shall comply with subparts CC and O of this part, as applicable.

(2) Digger derricks used for augering holes for poles carrying electric lines, placing and removing poles, or for handling associated materials to be installed or removed from the poles must comply with 29 CFR 1910.269.

(3) With the exception of equipment certified for work on the proper voltage, mechanical equipment shall not be operated closer to any energized line or equipment than the clearances set forth in § 1926.950(c) unless, in addition to the requirements in § 1926.1410:

(i) The mechanical equipment is insulated, or

(ii) The mechanical equipment is considered as energized.

Note to paragraph (c)(3): In accordance with 29 CFR 1926.1400(g), compliance with 29 CFR 1910.269(p) will be deemed compliance with §§ 1926.1407 through 1926.1411, including § 1926.1410.

Subpart X—Stairways and Ladders

■ 26. The authority citation for subpart X of 29 CFR part 1926 is amended by revising paragraph (a) to read as follows:

Authority: Section 107, Contract Work Hours and Safety Standards Act (Construction Safety Act](40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Nos. 1–90 (55 FR 9033), 5–2007 (72 FR 31159); and 29 CFR part 1911.

■ 27. Section 1926.1050 is amended by revising paragraph (a) to read as follows:

§ 1926.1050 Scope, application, and definitions applicable to this subpart.

(a) *Scope and application.* This subpart applies to all stairways and ladders used in construction, alteration, repair (including painting and decorating), and demolition workplaces covered under 29 CFR part 1926, and also sets forth, in specified circumstances, when ladders and stairways are required to be provided. Additional requirements for ladders used on or with scaffolds are contained in subpart L—Scaffolds. This subpart does not apply to integral components of equipment covered by subpart CC. Subpart CC exclusively sets forth the circumstances when ladders and stairways must be provided on equipment covered by subpart CC.

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Appendix A to Part 1926—Designations for General Industry Standards Incorporated into Body of Construction Standards

■ 28. Appendix A to part 1926 is amended by removing the row containing "1926.550(a)(19)" and "1910.184(c)(9)" from the table "1926 DESIGNATIONS FOR APPLICABLE 1910 STANDARDS."

Subparts AA and BB—[Reserved]

■ 29. Subparts AA and BB are reserved and subpart CC is added to read as follows:

Subpart CC—Cranes and Derricks in Construction

Sec.

1926.1400 Scope.
1926.1401 Definitions.
1926.1402 Ground conditions.
1926.1403 Assembly/Disassembly—selection of manufacturer or employer procedures.
1926.1404 Assembly/Disassembly—general requirements (applies to all assembly and disassembly operations).
1926.1405 Disassembly—additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).
1926.1406 Assembly/Disassembly—employer procedures—general requirements.
1926.1407 Power line safety (up to 350 kV)—assembly and disassembly.
1926.1408 Power line safety (up to 350 kV)—equipment operations.
1926.1409 Power line safety (over 350 kV).
1926.1410 Power line safety (all voltages)—equipment operations closer than the Table A zone.
1926.1411 Power line safety—while traveling.
1926.1412 Inspections.
1926.1413 Wire rope—inspection.
1926.1414 Wire rope—selection and installation criteria.
1926.1415 Safety devices.
1926.1416 Operational aids.
1926.1417 Operation.
1926.1418 Authority to stop operation.
1926.1419 Signals—general requirements.

1926.1420 Signals—radio, telephone or other electronic transmission of signals.
1926.1421 Signals—voice signals—additional requirements.
1926.1422 Signals—hand signal chart.
1926.1423 Fall protection.
1926.1424 Work area control.
1926.1425 Keeping clear of the load.
1926.1426 Free fall and controlled load lowering.
1926.1427 Operator qualification and certification.
1926.1428 Signal person qualifications.
1926.1429 Qualifications of maintenance & repair employees.
1926.1430 Training.
1926.1431 Hoisting personnel.
1926.1432 Multiple-crane/derrick lifts—supplemental requirements.
1926.1433 Design, construction and testing.
1926.1434 Equipment modifications.
1926.1435 Tower cranes.
1926.1436 Derricks.
1926.1437 Floating cranes/derricks and land cranes/derricks on barges.
1926.1438 Overhead & gantry cranes.
1926.1439 Dedicated pile drivers.
1926.1440 Sideboom cranes.
1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.
1926.1442 Severability.
Appendix A to Subpart CC of part 1926—Standard Hand Signals
Appendix B to Subpart CC of part 1926—Assembly/Disassembly—Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement
Appendix C to Subpart CC of part 1926—Operator Certification—Written Examination—Technical Knowledge Criteria

Subpart CC—Cranes and Derricks in Construction

Authority: Section 3704 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701); sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 5–2007 (72 FR 31159); and 29 CFR part 1911.

§ 1926.1400 Scope.

(a) This standard applies to power-operated equipment, when used in construction, that can hoist, lower and horizontally move a suspended load. Such equipment includes, but is not limited to: Articulating cranes (such as knuckle-boom cranes); crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial cranes (such as carry-deck cranes); dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as a fixed jib, *i.e.,* "hammerhead boom"), luffing boom and self-erecting); pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; sideboom cranes; derricks; and variations of such equipment. However, items listed in paragraph (c) of this section are excluded from the scope of this standard.

(b) *Attachments.* This standard applies to equipment included in paragraph (a) of this section when used with attachments. Such attachments, whether crane-attached or suspended include, but are not limited to: Hooks, magnets, grapples, clamshell buckets, orange peel buckets, concrete buckets, drag lines, personnel platforms, augers or drills and pile driving equipment.

(c) *Exclusions.* This subpart does not cover:

(1) Machinery included in paragraph (a) of this section while it has been converted or adapted for a non-hoisting/lifting use. Such conversions/adaptations include, but are not limited to, power shovels, excavators and concrete pumps.

(2) Power shovels, excavators, wheel loaders, backhoes, loader backhoes, track loaders. This machinery is also excluded when used with chains, slings or other rigging to lift suspended loads.

(3) Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles.

(4) Digger derricks when used for augering holes for poles carrying electric and telecommunication lines, placing and removing the poles, and for handling associated materials to be installed on or removed from the poles. Digger derricks used in work subject to 29 CFR part 1926, subpart V, must comply with 29 CFR 1910.269. Digger derricks used in construction work for telecommunication service (as defined at 29 CFR 1910.268(s)(40)) must comply with 29 CFR 1910.268.

(5) Machinery originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms.

(6) Telescopic/hydraulic gantry systems.

(7) Stacker cranes.

(8) Powered industrial trucks (forklifts), except when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load.

(9) Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair.

(10) Machinery that hoists by using a come-a-long or chainfall.

(11) Dedicated drilling rigs.

(12) Gin poles when used for the erection of communication towers.

(13) Tree trimming and tree removal work.

(14) Anchor handling or dredge-related operations with a vessel or barge using an affixed A-frame.

(15) Roustabouts.

(16) Helicopter cranes.

(17) *Material Delivery*

(i) Articulating/knuckle-boom truck cranes that deliver material to a construction site when used to transfer materials from the truck crane to the ground, without arranging the materials in a particular sequence for hoisting.

(ii) Articulating/knuckle-boom truck cranes that deliver material to a construction site when the crane is used to transfer building supply sheet goods or building supply packaged materials from the truck crane onto a structure, using a fork/cradle at the end of the boom, but only when the truck crane is equipped with a properly functioning automatic overload prevention device. Such sheet goods or packaged materials include, but are not limited to: Sheets of sheet rock, sheets of plywood, bags of cement, sheets or packages of roofing shingles, and rolls of roofing felt.

(iii) This exclusion does not apply when:

(A) The articulating/knuckle-boom crane is used to hold, support or stabilize the material to facilitate a construction activity, such as holding material in place while it is attached to the structure;

(B) The material being handled by the articulating/knuckle-boom crane is a prefabricated component. Such prefabricated components include, but are not limited to: Precast concrete members or panels, roof trusses (wooden, cold-formed metal, steel, or other material), prefabricated building sections such as, but not limited to: Floor panels, wall panels, roof panels, roof structures, or similar items;

(C) The material being handled by the crane is a structural steel member (for example, steel joists, beams, columns, steel decking (bundled or unbundled) or a component of a systems-engineered metal building (as defined in 29 CFR 1926 subpart R).

(D) The activity is not specifically excluded under § 1400(c)(17)(i) and (ii).

(d) All sections of this subpart CC apply to the equipment covered by this standard unless specified otherwise.

(e) The duties of controlling entities under this subpart include, but are not limited to, the duties specified in § 1926.1402(c), § 1926.1402(e) and § 1926.1424(b).

(f) Where provisions of this standard direct an operator, crewmember, or other employee to take certain actions, the employer must establish, effectively

communicate to the relevant persons, and enforce, work rules to ensure compliance with such provisions.

(g) For work covered by subpart V of this part, compliance with 29 CFR § 1910.269(p) is deemed compliance with §§ 1926.1407 through 1926.1411.

(h) Section 1926.1402 does not apply to cranes designed for use on railroad tracks, when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213, and that comply with applicable Federal Railroad Administration requirements. *See* § 1926.1402(f).

§ 1926.1401 Definitions.

A/D director (Assembly/Disassembly director) means an individual who meets this subpart's requirements for an A/D director, irrespective of the person's formal job title or whether the person is non-management or management personnel.

Articulating crane means a crane whose boom consists of a series of folding, pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders.

Assembly/Disassembly means the assembly and/or disassembly of equipment covered under this standard. 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.

Assist crane means a crane used to assist in assembling or disassembling a crane.

Attachments means any device that expands the range of tasks that can be done by the equipment. Examples include, but are not limited to: An auger, drill, magnet, pile-driver, and boom-attached personnel platform.

Audible signal means a signal made by a distinct sound or series of sounds. Examples include, but are not limited to, sounds made by a bell, horn, or whistle.

Blocking (also referred to as "cribbing") is wood or other material used to support equipment or a component and distribute loads to the ground. It is typically used to support lattice boom sections during assembly/disassembly and under outrigger and stabilizer floats.

Boatswain's chair means a single-point adjustable suspension scaffold consisting of a seat or sling (which may be incorporated into a full body harness) designed to support one employee in a sitting position.

Bogie means "travel bogie," which is defined below.

Boom (equipment other than tower crane) means an inclined spar, strut, or other long structural member which supports the upper hoisting tackle on a crane or derrick. Typically, the length and vertical angle of the boom can be varied to achieve increased height or height and reach when lifting loads. Booms can usually be grouped into general categories of hydraulically extendible, cantilevered type, latticed section, cable supported type or articulating type.

Boom (tower cranes): On tower cranes, if the "boom" (*i.e.,* principal horizontal structure) is fixed, it is referred to as a jib; if it is moveable up and down, it is referred to as a boom.

Boom angle indicator means a device which measures the angle of the boom relative to horizontal.

Boom hoist limiting device includes boom hoist disengaging device, boom hoist shut-off, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, or derricking limiter. This type of device disengages boom hoist power when the boom reaches a predetermined operating angle. It also sets brakes or closes valves to prevent the boom from lowering after power is disengaged.

Boom length indicator indicates the length of the permanent part of the boom (such as ruled markings on the boom) or, as in some computerized systems, the length of the boom with extensions/attachments.

Boom stop includes boom stops, (belly straps with struts/standoff), telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward.

Boom suspension system means a system of pendants, running ropes, sheaves, and other hardware which supports the boom tip and controls the boom angle.

Builder means the builder/constructor of equipment.

Center of gravity: The center of gravity of any object is the point in the object around which its weight is evenly distributed. If you could put a support under that point, you could balance the object on the support.

Certified welder means a welder who meets nationally recognized certification requirements applicable to the task being performed.

Climbing means the process in which a tower crane is raised to a new working height, either by adding additional tower sections to the top of the crane (top climbing), or by a system in which the entire crane is raised inside the structure (inside climbing).

Come-a-long means a mechanical device typically consisting of a chain or cable attached at each end that is used to facilitate movement of materials through leverage.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Controlled load lowering means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

Controlling entity means an employer that is a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project—its planning, quality and completion.

Counterweight means a weight used to supplement the weight of equipment in providing stability for lifting loads by counterbalancing those loads.

Crane/derrick includes all equipment covered by this subpart.

Crawler crane means equipment that has a type of base mounting which incorporates a continuous belt of sprocket driven track.

Crossover points means locations on a wire rope which is spooled on a drum where one layer of rope climbs up on and crosses over the previous layer. This takes place at each flange of the drum as the rope is spooled onto the drum, reaches the flange, and begins to wrap back in the opposite direction.

Dedicated channel means a line of communication assigned by the employer who controls the communication system to only one signal person and crane/derrick or to a coordinated group of cranes/derricks/signal person(s).

Dedicated pile-driver is a machine that is designed to function exclusively as a pile-driver. These machines typically have the ability to both hoist the material that will be pile-driven and to pile-drive that material.

Dedicated spotter (power lines): To be considered a dedicated spotter, the requirements of § 1926.1428 (Signal person qualifications) must be met and

his/her sole responsibility is to watch the separation between the power line and the equipment, load line and load (including rigging and lifting accessories), and ensure through communication with the operator that the applicable minimum approach distance is not breached.

Directly under the load means a part or all of an employee is directly beneath the load.

Dismantling includes partial dismantling (such as dismantling to shorten a boom or substitute a different component).

Drum rotation indicator means a device on a crane or hoist which indicates in which direction and at what relative speed a particular hoist drum is turning.

Electrical contact occurs when a person, object, or equipment makes contact or comes in close proximity with an energized conductor or equipment that allows the passage of current.

Employer-made equipment means floating cranes/derricks designed and built by an employer for the employer's own use.

Encroachment is where any part of the crane, load line or load (including rigging and lifting accessories) breaches a minimum clearance distance that this subpart requires to be maintained from a power line.

Equipment means equipment covered by this subpart.

Equipment criteria means instructions, recommendations, limitations and specifications.

Fall protection equipment means guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.

Fall restraint system means a fall protection system that prevents the user from falling any distance. The system is comprised of either a body belt or body harness, along with an anchorage, connectors and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devices.

Fall zone means the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall in the event of an accident.

Flange points are points of contact between rope and drum flange where the rope changes layers.

Floating cranes/derricks means equipment designed by the manufacturer (or employer) for marine use by permanent attachment to a barge, pontoons, vessel or other means of flotation.

For example means "one example, although there are others."

Free fall (of the load line) means that only the brake is used to regulate the descent of the load line (the drive mechanism is not used to drive the load down faster or retard its lowering).

Free surface effect is the uncontrolled transverse movement of liquids in compartments which reduce a vessel's transverse stability.

Hoist means a mechanical device for lifting and lowering loads by winding a line onto or off a drum.

Hoisting is the act of raising, lowering or otherwise moving a load in the air with equipment covered by this standard. As used in this standard, "hoisting" can be done by means other than wire rope/hoist drum equipment.

Include/including means "including, but not limited to."

Insulating link/device means an insulating device listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7.

Jib stop (also referred to as a jib backstop), is the same type of device as a boom stop but is for a fixed or luffing jib.

Land crane/derrick is equipment not originally designed by the manufacturer for marine use by permanent attachment to barges, pontoons, vessels, or other means of floatation.

List means the angle of inclination about the longitudinal axis of a barge, pontoons, vessel or other means of floatation.

Load refers to the object(s) being hoisted and/or the weight of the object(s); both uses refer to the object(s) and the load-attaching equipment, such as, the load block, ropes, slings, shackles, and any other ancillary attachment.

Load moment (or rated capacity) indicator means a system which aids the equipment operator by sensing (directly or indirectly) the overturning moment on the equipment, *i.e.,* load multiplied by radius. It compares this lifting condition to the equipment's rated capacity, and indicates to the operator the percentage of capacity at which the equipment is working. Lights, bells, or buzzers may be incorporated as a warning of an approaching overload condition.

Load moment (or rated capacity) limiter means a system which aids the equipment operator by sensing (directly or indirectly) the overturning moment on the equipment, *i.e.,* load multiplied by radius. It compares this lifting condition to the equipment's rated capacity, and when the rated capacity is reached, it shuts off power to those equipment functions which can increase the severity of loading on the equipment, *e.g.,* hoisting, telescoping out, or luffing out. Typically, those functions which decrease the severity of loading on the equipment remain operational, *e.g.,* lowering, telescoping in, or luffing in.

Locomotive crane means a crane mounted on a base or car equipped for travel on a railroad track.

Luffing jib limiting device is similar to a boom hoist limiting device, except that it limits the movement of the luffing jib.

Marine hoisted personnel transfer device means a device, such as a "transfer net," that is designed to protect the employees being hoisted during a marine transfer and to facilitate rapid entry into and exit from the device. Such devices do not include boatswain's chairs when hoisted by equipment covered by this standard.

Marine worksite means a construction worksite located in, on or above the water.

Mobile crane means a lifting device incorporating a cable suspended latticed boom or hydraulic telescopic boom designed to be moved between operating locations by transport over the road.

Moving point-to-point means the times during which an employee is in the process of going to or from a work station.

Multi-purpose machine means a machine that is designed to be configured in various ways, at least one of which allows it to hoist (by means of a winch or hook) and horizontally move a suspended load. For example, a machine that can rotate and can be configured with removable forks/tongs (for use as a forklift) or with a winch pack, jib (with a hook at the end) or jib used in conjunction with a winch. When configured with the forks/tongs, it is not covered by this subpart. When configured with a winch pack, jib (with a hook at the end) or jib used in conjunction with a winch, it is covered by this subpart.

Nationally recognized accrediting agency is an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations. Examples of such accrediting agencies include, but are not limited to, the National Commission for Certifying Agencies and the American National Standards Institute.

Nonconductive means that, because of the nature and condition of the materials used, and the conditions of use (including environmental conditions and condition of the material), the object in question has the

property of not becoming energized (that is, it has high dielectric properties offering a high resistance to the passage of current under the conditions of use).

Operational aids are devices that assist the operator in the safe operation of the crane by providing information or automatically taking control of a crane function. These include, but are not limited to, the devices listed in § 1926.1416 ("listed operational aids").

Operational controls means levers, switches, pedals and other devices for controlling equipment operation.

Operator means a person who is operating the equipment.

Overhead and gantry cranes includes overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.

Paragraph refers to a paragraph in the same section of this subpart that the word "paragraph" is used, unless otherwise specified.

Pendants includes both wire and bar types. Wire type: A fixed length of wire rope with mechanical fittings at both ends for pinning segments of wire rope together. Bar type: Instead of wire rope, a bar is used. Pendants are typically used in a latticed boom crane system to easily change the length of the boom suspension system without completely changing the rope on the drum when the boom length is increased or decreased.

Personal fall arrest system means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these.

Portal crane is a type of crane consisting of a rotating upperstructure, hoist machinery, and boom mounted on top of a structural gantry which may be fixed in one location or have travel capability. The gantry legs or columns usually have portal openings in between to allow passage of traffic beneath the gantry.

Power lines means electric transmission and distribution lines.

Procedures include, but are not limited to: Instructions, diagrams, recommendations, warnings, specifications, protocols and limitations.

Proximity alarm is a device that provides a warning of proximity to a power line and that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7.

Qualified evaluator (not a third party) means a person employed by the signal person's employer who has demonstrated that he/she is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person.

Qualified evaluator (third party) means an entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person.

Qualified person means a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.

Qualified rigger is a rigger who meets the criteria for a qualified person.

Range control limit device is a device that can be set by an equipment operator to limit movement of the boom or jib tip to a plane or multiple planes.

Range control warning device is a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes.

Rated capacity means the maximum working load permitted by the manufacturer under specified working conditions. Such working conditions typically include a specific combination of factors such as equipment configuration, radii, boom length, and other parameters of use.

Rated capacity indicator: See load moment indicator.

Rated capacity limiter: See load moment limiter.

Repetitive pickup points refer to, when operating on a short cycle operation, the rope being used on a single layer and being spooled repetitively over a short portion of the drum.

Running wire rope means a wire rope that moves over sheaves or drums.

Runway means a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane suspended platform. An existing surface may be used as long as it meets these criteria.

Section means a section of this subpart, unless otherwise specified.

Sideboom crane means a track-type or wheel-type tractor having a boom mounted on the side of the tractor, used for lifting, lowering or transporting a load suspended on the load hook. The boom or hook can be lifted or lowered in a vertical direction only.

Special hazard warnings means warnings of site-specific hazards (for example, proximity of power lines).

Stability (flotation device) means the tendency of a barge, pontoons, vessel or other means of flotation to return to an upright position after having been inclined by an external force.

Standard Method means the protocol in Appendix A of this subpart for hand signals.

Such as means "such as, but not limited to."

Superstructure: See Upperworks.

Tagline means a rope (usually fiber) attached to a lifted load for purposes of controlling load spinning and pendular motions or used to stabilize a bucket or magnet during material handling operations.

Tender means an individual responsible for monitoring and communicating with a diver.

Tilt up or tilt down operation means raising/lowering a load from the horizontal to vertical or vertical to horizontal.

Tower crane is a type of lifting structure which utilizes a vertical mast or tower to support a working boom (jib) in an elevated position. Loads are suspended from the working boom. While the working boom may be of the fixed type (horizontal or angled) or have luffing capability, it can always rotate to swing loads, either by rotating on the top of the tower (top slewing) or by the rotation of the tower (bottom slewing). The tower base may be fixed in one location or ballasted and moveable between locations. Mobile cranes that are configured with luffing jib and/or tower attachments are not considered tower cranes under this section.

Travel bogie (tower cranes) is an assembly of two or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels.

Trim means angle of inclination about the transverse axis of a barge, pontoons, vessel or other means of floatation.

Two blocking means a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component.

Unavailable procedures means procedures that are no longer available from the manufacturer, or have never been available, from the manufacturer.

Upperstructure: See Upperworks.

Upperworks means the revolving frame of equipment on which the operating machinery (and many cases the engine) are mounted along with the operator's cab. The counterweight is typically supported on the rear of the upperstructure and the boom or other front end attachment is mounted on the front.

Up to means "up to and including."

Wire rope means a flexible rope constructed by laying steel wires into various patterns of multi-wired strands around a core system to produce a helically wound rope.

§ 1926.1402 Ground conditions.

(a) *Definitions.*

(1) "Ground conditions" means the ability of the ground to support the equipment (including slope, compaction, and firmness).

(2) "Supporting materials" means blocking, mats, cribbing, marsh buggies (in marshes/wetlands), or similar supporting materials or devices.

(b) The equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes/wetlands.

(c) The controlling entity must:

(1) Ensure that ground preparations necessary to meet the requirements in paragraph (b) of this section are provided.

(2) Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.

(d) If there is no controlling entity for the project, the requirement in paragraph (c)(1) of this section must be met by the employer that has authority at the site to make or arrange for ground preparations needed to meet paragraph (b) of this section.

(e) If the A/D director or the operator determines that ground conditions do not meet the requirements in paragraph (b) of this section, that person's employer must have a discussion with the controlling entity regarding the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary), the requirements in paragraph (b) of this section can be met.

(f) This section does not apply to cranes designed for use on railroad tracks when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213 and that comply with applicable Federal Railroad Administration requirements.

§ 1926.1403 Assembly/Disassembly—selection of manufacturer or employer procedures.

When assembling or disassembling equipment (or attachments), the employer must comply with all applicable manufacturer prohibitions and must comply with either:

(a) Manufacturer procedures applicable to assembly and disassembly, or

(b) Employer procedures for assembly and disassembly. Employer procedures may be used only where the employer can demonstrate that the procedures used meet the requirements in § 1926.1406. **Note:** The employer must follow manufacturer procedures when an employer uses synthetic slings during assembly or disassembly rigging. (*See* § 1926.1404(r).)

§ 1926.1404 Assembly/Disassembly—general requirements (applies to all assembly and disassembly operations).

(a) *Supervision—competent-qualified person.*

(1) Assembly/disassembly must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons ("A/D director").

(2) Where the assembly/disassembly is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D director.

(b) *Knowledge of procedures.* The A/D director must understand the applicable assembly/disassembly procedures.

(c) *Review of procedures.* The A/D director must review the applicable assembly/disassembly procedures immediately prior to the commencement of assembly/disassembly unless the A/D director understands the procedures and has applied them to the same type and configuration of equipment (including accessories, if any).

(d) *Crew instructions.*

(1) Before commencing assembly/disassembly operations, the A/D director must ensure that the crew members understand all of the following:

(i) Their tasks.

(ii) The hazards associated with their tasks.

(iii) The hazardous positions/locations that they need to avoid.

(2) During assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations, the requirements in paragraphs (d)(1)(i) through (d)(1)(iii) of this section must be met.

(e) *Protecting assembly/disassembly crew members out of operator view.*

(1) Before a crew member goes to a location that is out of view of the operator and is either in, on, or under the equipment, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member must inform the operator that he/she is going to that location.

(2) Where the operator knows that a crew member went to a location covered by paragraph (e)(1) of this section, the operator must not move any part of the equipment (or load) until the operator is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position.

(f) *Working under the boom, jib or other components.*

(1) When pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where the requirements of paragraph (f)(2) of this section are met.

(2) *Exception.* Where the employer demonstrates that site constraints require one or more employees to be under the boom, jib, or other components when pins (or similar devices) are being removed, the A/D director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom. (*See* Non-mandatory Appendix B of this subpart for an example.)

(g) *Capacity limits.* During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, equipment components (including rigging), lifting lugs and equipment accessories, must not be exceeded for the equipment being assembled/disassembled.

(h) *Addressing specific hazards.* The A/D director supervising the assembly/disassembly operation must address the hazards associated with the operation, which include:

(1) *Site and ground bearing conditions.* Site and ground conditions must be adequate for safe assembly/disassembly operations and to support the equipment during assembly/disassembly (*see* § 1926.1402 for ground condition requirements).

(2) *Blocking material.* The size, amount, condition and method of stacking the blocking must be sufficient to sustain the loads and maintain stability.

(3) *Proper location of blocking.* When used to support lattice booms or components, blocking must be appropriately placed to:

(i) Protect the structural integrity of the equipment, and

(ii) Prevent dangerous movement and collapse.

(4) *Verifying assist crane loads.* When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly must be verified in accordance with § 1926.1417(o)(3) before assembly/disassembly begins.

(5) *Boom and jib pick points.* The point(s) of attachment of rigging to a boom (or boom sections or jib or jib sections) must be suitable for preventing structural damage and facilitating safe handling of these components.

(6) *Center of gravity.*

(i) The center of gravity of the load must be identified if that is necessary for the method used for maintaining stability.

(ii) Where there is insufficient information to accurately identify the center of gravity, measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity must be used. (*See* Non-mandatory Appendix B of this subpart for an example.)

(7) *Stability upon pin removal.* The boom sections, boom suspension systems (such as gantry A-frames and jib struts), and components must be rigged or supported to maintain stability upon the removal of the pins.

(8) *Snagging.* Suspension ropes and pendants must not be allowed to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).

(9) *Struck by counterweights.* The potential for unintended movement from inadequately supported counterweights and from hoisting counterweights.

(10) *Boom hoist brake failure.* Each time reliance is to be placed on the boom hoist brake to prevent boom movement during assembly/disassembly, the brake must be tested prior to such reliance to determine if it is sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or using an assist crane) from a boom hoist brake failure must be used.

(11) *Loss of backward stability.* Backward stability before swinging the upperworks, travel, and when attaching or removing equipment components.

(12) *Wind speed and weather.* The effect of wind speed and weather on the equipment.

(i) [*Reserved.*]

(j) *Cantilevered boom sections.* Manufacturer limitations on the maximum amount of boom supported only by cantilevering must not be exceeded. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must determine in writing this limitation, which must not be exceeded.

(k) *Weight of components.* The weight of each of the components must be readily available.

(l) [*Reserved.*]

(m) *Components and configuration.*

(1) The selection of components, and configuration of the equipment, that affect the capacity or safe operation of the equipment must be in accordance with:

(i) Manufacturer instructions, prohibitions, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or

(ii) Approved modifications that meet the requirements of § 1926.1434 (Equipment modifications).

(2) *Post-assembly inspection.* Upon completion of assembly, the equipment must be inspected to ensure compliance with paragraph (m)(1) of this section (*see* § 1926.1412(c) for post-assembly inspection requirements).

(n) [*Reserved.*]

(o) *Shipping pins.* Reusable shipping pins, straps, links, and similar equipment must be removed. Once they are removed they must either be stowed or otherwise stored so that they do not present a falling object hazard.

(p) *Pile driving.* Equipment used for pile driving must not have a jib attached during pile driving operations.

(q) *Outriggers and Stabilizers.* When the load to be handled and the operating radius require the use of outriggers or stabilizers, or at any time when outriggers or stabilizers are used, all of the following requirements must be met (except as otherwise indicated):

(1) The outriggers or stabilizers must be either fully extended or, if manufacturer procedures permit, deployed as specified in the load chart.

(2) The outriggers must be set to remove the equipment weight from the wheels, except for locomotive cranes (*see* paragraph (q)(6) of this section for use of outriggers on locomotive cranes). This provision does not apply to stabilizers.

(3) When outrigger floats are used, they must be attached to the outriggers. When stabilizer floats are used, they must be attached to the stabilizers.

(4) Each outrigger or stabilizer must be visible to the operator or to a signal person during extension and setting.

(5) Outrigger and stabilizer blocking must:

(i) Meet the requirements in paragraphs (h)(2) and (h)(3) of this section.

(ii) Be placed only under the outrigger or stabilizer float/pad of the jack or, where the outrigger or stabilizer is designed without a jack, under the outer bearing surface of the extended outrigger or stabilizer beam.

(6) For locomotive cranes, when using outriggers or stabilizers to handle loads, the manufacturer's procedures must be followed. When lifting loads without using outriggers or stabilizers, the manufacturer's procedures must be met regarding truck wedges or screws.

(r) *Rigging.* In addition to following the requirements in 29 CFR 1926.251 and other requirements in this and other standards applicable to rigging, when rigging is used for assembly/disassembly, the employer must ensure that:

(1) The rigging work is done by a qualified rigger.

(2) Synthetic slings are protected from: Abrasive, sharp or acute edges, and configurations that could cause a reduction of the sling's rated capacity, such as distortion or localized compression. **Note:** Requirements for the protection of wire rope slings are contained in 29 CFR 1926.251(c)(9).

(3) When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications and recommendations must be followed.

§ 1926.1405 Disassembly—additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).

Dismantling (including dismantling for changing the length of) booms and jibs.

(a) None of the pins in the pendants are to be removed (partly or completely) when the pendants are in tension.

(b) None of the pins (top or bottom) on boom sections located between the pendant attachment points and the crane/derrick body are to be removed (partly or completely) when the pendants are in tension.

(c) None of the pins (top or bottom) on boom sections located between the uppermost boom section and the crane/derrick body are to be removed (partly or completely) when the boom is being supported by the uppermost boom section resting on the ground (or other support).

(d) None of the top pins on boom sections located on the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) are to be removed (partly or completely) until the cantilevered section to be removed is fully supported.

§ 1926.1406 Assembly/Disassembly—employer procedures—general requirements.

(a) When using employer procedures instead of manufacturer procedures for assembly/disassembly, the employer must ensure that the procedures:

(1) Prevent unintended dangerous movement, and prevent collapse, of any part of the equipment.

(2) Provide adequate support and stability of all parts of the equipment.

(3) Position employees involved in the assembly/disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.

(b) *Qualified person.* Employer procedures must be developed by a qualified person.

§ 1926.1407 Power line safety (up to 350 kV)—assembly and disassembly.

(a) Before assembling or disassembling equipment, the employer must determine if any part of the equipment, load line, or load (including rigging and lifting accessories) could get, in the direction or area of assembly/disassembly, closer than 20 feet to a power line during the assembly/disassembly process. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) of this section, as follows:

(1) *Option (1)—Deenergize and ground.* Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

(2) *Option (2)—20 foot clearance.* Ensure that no part of the equipment, load line or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.

(3) *Option (3)—Table A clearance.*

(i) Determine the line's voltage and the minimum clearance distance permitted under Table A (*see* § 1926.1408).

(ii) Determine if any part of the equipment, load line, or load (including rigging and lifting accessories), could get closer than the minimum clearance distance to the power line permitted under Table A (*see* § 1926.1408). If so, then the employer must follow the requirements in paragraph (b) of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum clearance distance.

(b) *Preventing encroachment/electrocution.* Where encroachment precautions are required under Option (2), or Option (3) of this section, all of the following requirements must be met:

(1) Conduct a planning meeting with the Assembly/Disassembly director (A/D director), operator, assembly/disassembly crew and the other workers who will be in the assembly/disassembly area to review the location of the power line(s) and the steps that will be implemented to prevent encroachment/electrocution.

(2) If tag lines are used, they must be nonconductive.

(3) At least one of the following additional measures must be in place. The measure selected from this list must be effective in preventing encroachment.

The additional measures are:

(i) Use a dedicated spotter who is in continuous contact with the equipment operator. The dedicated spotter must:

(A) Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

(B) Be positioned to effectively gauge the clearance distance.

(C) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(D) Give timely information to the operator so that the required clearance distance can be maintained.

(ii) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

(iii) A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.

(iv) A device that automatically limits range of movement, set to prevent encroachment.

(v) An elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings.

(c) *Assembly/disassembly below power lines prohibited.* No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line.

(d) *Assembly/disassembly inside Table A clearance prohibited.* No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed closer than the minimum approach distance under Table A (*see* § 1926.1408) to a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line.

(e) *Voltage information.* Where Option (3) of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of the employer's request.

(f) *Power lines presumed energized.* The employer must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(g) *Posting of electrocution warnings.* There must be at least one electrocution hazard warning conspicuously posted in the cab so that it is in view of the operator and (except for overhead gantry and tower cranes) at least two on the outside of the equipment.

§ 1926.1408 Power line safety (up to 350 kV)—equipment operations.

(a) *Hazard assessments and precautions inside the work zone.* Before beginning equipment operations, the employer must:

(1) *Identify the work zone by either:*

(i) Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibiting the operator from operating the equipment past those boundaries, or

(ii) Defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius.

(2) Determine if any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get closer than 20 feet to a power line. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) of this section, as follows:

(i) *Option (1)—Deenergize and ground.* Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

(ii) *Option (2)—20 foot clearance.* Ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.

(iii) *Option (3)—Table A clearance.*

(A) Determine the line's voltage and the minimum approach distance permitted under Table A (*see* § 1926.1408).

(B) Determine if any part of the equipment, load line or load (including rigging and lifting accessories), while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Table A (*see* § 1926.1408). If so, then the employer must follow the requirements in paragraph (b) of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum approach distance.

(b) *Preventing encroachment/electrocution.* Where encroachment precautions are required under Option (2) or Option (3) of this section, all of the following requirements must be met:

(1) Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.

(2) If tag lines are used, they must be non-conductive.

(3) Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line (if using Option (2) of this section) or at the minimum approach distance under Table A (*see* § 1926.1408) (if using Option (3) of this section). If the operator is unable to see the elevated warning line, a dedicated spotter must be used as described in § 1926.1408(b)(4)(ii) in addition to implementing one of the measures described in §§ 1926.1408(b)(4)(i), (iii), (iv) and (v).

(4) Implement at least one of the following measures:

(i) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

(ii) A dedicated spotter who is in continuous contact with the operator. Where this measure is selected, the dedicated spotter must:

(A) Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

(B) Be positioned to effectively gauge the clearance distance.

(C) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(D) Give timely information to the operator so that the required clearance distance can be maintained.

(iii) A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.

(iv) A device that automatically limits range of movement, set to prevent encroachment.

(v) An insulating link/device, as defined in § 1926.1401, installed at a point between the end of the load line (or below) and the load.

(5) The requirements of paragraph (b)(4) of this section do not apply to work covered by subpart V of this part.

(c) *Voltage information.* Where Option (3) of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of the employer's request.

(d) *Operations below power lines.*

(1) No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line, except where one of the exceptions in paragraph (d)(2) of this section applies.

(2) *Exceptions.* Paragraph (d)(1) of this section is inapplicable where the employer demonstrates that one of the following applies:

(i) The work is covered by subpart V of this part.

(ii) For equipment with non-extensible booms: The uppermost part of the equipment, with the boom at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

(iii) For equipment with articulating or extensible booms: The uppermost part of the equipment, with the boom in the fully extended position, at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

(iv) The employer demonstrates that compliance with paragraph (d)(1) of this section is infeasible and meets the requirements of § 1926.1410.

(e) *Power lines presumed energized.* The employer must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(f) When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter must be deenergized or the following precautions must be taken:

(1) The equipment must be provided with an electrical ground.

(2) If tag lines are used, they must be non-conductive.

(g) *Training.*

(1) The employer must train each operator and crew member assigned to work with the equipment on all of the following:

(i) The procedures to be followed in the event of electrical contact with a power line. Such training must include:

(A) Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.

(B) The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.

(C) The safest means of evacuating from equipment that may be energized.

(D) The danger of the potentially energized zone around the equipment (step potential).

(E) The need for crew in the area to avoid approaching or touching the equipment and the load.

(F) Safe clearance distance from power lines.

(ii) Power lines are presumed to be energized unless the utility owner/

operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(iii) Power lines are presumed to be uninsulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.

(iv) The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

(v) The procedures to be followed to properly ground equipment and the limitations of grounding.

(2) Employees working as dedicated spotters must be trained to enable them to effectively perform their task, including training on the applicable requirements of this section.

(3) Training under this section must be administered in accordance with § 1926.1430(g).

(h) Devices originally designed by the manufacturer for use as: A safety device (*see* § 1926.1415), operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must meet the manufacturer's procedures for use and conditions of use.

TABLE A—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/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

§ 1926.1409 Power line safety (over 350 kV).

The requirements of § 1926.1407 and § 1926.1408 apply to power lines over 350 kV except:

(a) For power lines at or below 1000 kV, wherever the distance "20 feet" is specified, the distance "50 feet" must be substituted; and

(b) For power lines over 1000 kV, the minimum clearance distance must be established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

§ 1926.1410 Power line safety (all voltages)—equipment operations closer than the Table A zone.

Equipment operations in which any part of the equipment, load line, or load (including rigging and lifting accessories) is closer than the minimum approach distance under Table A of § 1926.1408 to an energized power line is prohibited, except where the employer demonstrates that all of the following requirements are met:

(a) The employer determines that it is infeasible to do the work without breaching the minimum approach distance under Table A of § 1926.1408.

(b) The employer determines that, after consultation with the utility owner/operator, it is infeasible to deenergize and ground the power line or relocate the power line.

(c) *Minimum clearance distance.*

(1) The power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution determines the minimum clearance distance that must be maintained to prevent electrical contact in light of the on-site conditions. The factors that must be considered in making this determination include, but are not limited to: Conditions affecting atmospheric conductivity; time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions, and other conditions affecting the ability to prevent electrical contact.

(2) Paragraph (c)(1) of this section does not apply to work covered by subpart V of this part; instead, for such work, the minimum clearance distances specified in § 1926.950 Table V–1 apply. Employers engaged in subpart V work are permitted to work closer than the distances in § 1926.950 Table V–1 where both the requirements of this section and § 1926.952(c)(3)(i) or (ii) are met.

(d) A planning meeting with the employer and utility owner/operator (or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution) is held to determine the procedures that will be followed to prevent electrical contact and electrocution. At a minimum these procedures must include:

(1) If the power line is equipped with a device that automatically reenergizes the circuit in the event of a power line contact, before the work begins, the automatic reclosing feature of the circuit interrupting device must be made inoperative if the design of the device permits.

(2) A dedicated spotter who is in continuous contact with the operator. The dedicated spotter must:

(i) Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

(ii) Be positioned to effectively gauge the clearance distance.

(iii) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(iv) Give timely information to the operator so that the required clearance distance can be maintained.

(3) An elevated warning line, or barricade (not attached to the crane), in view of the operator (either directly or through video equipment), equipped with flags or similar high-visibility markings, to prevent electrical contact. However, this provision does not apply to work covered by subpart V of this part.

(4) *Insulating link/device.*

(i) An insulating link/device installed at a point between the end of the load line (or below) and the load.

(ii) For work covered by subpart V of this part, the requirement in paragraph

(d)(4)(i) of this section applies only when working inside the § 1926.950 Table V–1 clearance distances.

(iii) For work covered by subpart V of this part involving operations where use of an insulating link/device is infeasible, the requirements of § 1910.269(p)(4)(iii)(B) or (C) may be substituted for the requirement in (d)(4)(i) of this section.

(iv) Until November 8, 2011, the following procedure may be substituted for the requirement in paragraph (d)(4)(i) of this section: All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load. Insulating gloves rated for the voltage involved are adequate insulation for the purposes of this paragraph.

(v) Until November 8, 2013, the following procedure may be substituted for the requirement in (d)(4)(i) of this section:

(A) The employer must use a link/device manufactured on or before November 8, 2011, that meets the definition of an insulating link/device, except that it has not been approved by a Nationally Recognized Testing Laboratory, and that is maintained and used in accordance with manufacturer requirements and recommendations, and is installed at a point between the end of the load line (or below) and the load; and

(B) All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load through an additional means other than the device described in paragraph (d)(4)(v)(A) of this section. Insulating gloves rated for the voltage involved are adequate additional means of protection for the purposes of this paragraph.

(5) Nonconductive rigging if the rigging may be within the Table A of § 1926.1408 distance during the operation.

(6) If the equipment is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the equipment, load line, or load (including rigging and lifting accessories) from breaching the minimum approach distance established under paragraph (c) of this section.

(7) If a tag line is used, it must be of the nonconductive type.

(8) Barricades forming a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade must be as far from the equipment as feasible.

(9) Workers other than the operator must be prohibited from touching the load line above the insulating link/device and crane. Operators remotely operating the equipment from the ground must use either wireless controls that isolate the operator from the equipment or insulating mats that insulate the operator from the ground.

(10) Only personnel essential to the operation are permitted to be in the area of the crane and load.

(11) The equipment must be properly grounded.

(12) Insulating line hose or cover-up must be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved.

(e) The procedures developed to comply with paragraph (d) of this section are documented and immediately available on-site.

(f) The equipment user and utility owner/operator (or registered professional engineer) meet with the equipment operator and the other workers who will be in the area of the equipment or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in paragraph (c) of this section and prevent electrocution.

(g) The procedures developed to comply with paragraph (d) of this section are implemented.

(h) The utility owner/operator (or registered professional engineer) and all employers of employees involved in the work must identify one person who will direct the implementation of the procedures. The person identified in accordance with this paragraph must direct the implementation of the procedures and must have the authority to stop work at any time to ensure safety.

(i) [*Reserved.*]

(j) If a problem occurs implementing the procedures being used to comply with paragraph (d) of this section, or indicating that those procedures are inadequate to prevent electrocution, the employer must safely stop operations and either develop new procedures to comply with paragraph (d) of this section or have the utility owner/operator deenergize and visibly ground or relocate the power line before resuming work.

(k) Devices originally designed by the manufacturer for use as a safety device (*see* § 1926.1415), operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must comply with the manufacturer's procedures for use and conditions of use.

(l) [*Reserved.*]

(m) The employer must train each operator and crew member assigned to work with the equipment in accordance with § 1926.1408(g).

§ 1926.1411 Power line safety—while traveling under or near power lines with no load.

(a) This section establishes procedures and criteria that must be met for equipment traveling under or near a power line on a construction site with no load. Equipment traveling on a construction site with a load is governed by §§ 1926.1408, 1926.1409 or 1926.1410, whichever is appropriate, and § 1926.1417(u).

(b) The employer must ensure that:

(1) The boom/mast and boom/mast support system are lowered sufficiently to meet the requirements of this paragraph.

(2) The clearances specified in Table T of this section are maintained.

(3) The effects of speed and terrain on equipment movement (including movement of the boom/mast) are considered so that those effects do not cause the minimum clearance distances specified in Table T of this section to be breached.

(4) *Dedicated spotter.* If any part of the equipment while traveling will get closer than 20 feet to the power line, the employer must ensure that a dedicated spotter who is in continuous contact with the driver/operator is used. The dedicated spotter must:

(i) Be positioned to effectively gauge the clearance distance.

(ii) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

(iii) Give timely information to the operator so that the required clearance distance can be maintained.

(5) *Additional precautions for traveling in poor visibility.* When traveling at night, or in conditions of poor visibility, in addition to the measures specified in paragraphs (b)(1) through (4) of this section, the employer must ensure that:

(i) The power lines are illuminated or another means of identifying the location of the lines is used.

(ii) A safe path of travel is identified and used.

TABLE T—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 .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/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

§ 1926.1412 Inspections.

(a) *Modified equipment.*

(1) Equipment that has had modifications or additions which affect the safe operation of the equipment (such as modifications or additions involving a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity must be inspected by a qualified person after such modifications/additions have been completed, prior to initial use. The inspection must meet all of the following requirements:

(i) The inspection must assure that the modifications or additions have been done in accordance with the approval obtained pursuant to § 1926.1434 (Equipment modifications).

(ii) The inspection must include functional testing of the equipment.

(2) Equipment must not be used until an inspection under this paragraph demonstrates that the requirements of paragraph (a)(1)(i) of this section have been met.

(b) *Repaired/adjusted equipment.*

(1) Equipment that has had a repair or adjustment that relates to safe operation (such as: A repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism), must be inspected by a qualified person after such a repair or adjustment has been completed, prior to initial use. The inspection must meet all of the following requirements:

(i) The qualified person must determine if the repair/adjustment meets manufacturer equipment criteria (where applicable and available).

(ii) Where manufacturer equipment criteria are unavailable or inapplicable, the qualified person must:

(A) Determine if a registered professional engineer (RPE) is needed to develop criteria for the repair/adjustment. If an RPE is not needed, the employer must ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer must ensure that they are developed by an RPE.

(B) Determine if the repair/adjustment meets the criteria developed in accordance with paragraph (b)(1)(ii)(A) of this section.

(iii) The inspection must include functional testing of the repaired/adjusted parts and other components that may be affected by the repair/adjustment.

(4) Equipment must not be used until an inspection under this paragraph demonstrates that the repair/adjustment meets the requirements of paragraph (b)(1)(i) of this section (or, where applicable, paragraph (b)(1)(ii) of this section).

(c) *Post-assembly.*

(1) Upon completion of assembly, the equipment must be inspected by a qualified person to assure that it is configured in accordance with manufacturer equipment criteria.

(2) Where manufacturer equipment criteria are unavailable, a qualified person must:

(i) Determine if a registered professional engineer (RPE) familiar with the type of equipment involved is needed to develop criteria for the equipment configuration. If an RPE is not needed, the employer must ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer must ensure that they are developed by an RPE.

(ii) Determine if the equipment meets the criteria developed in accordance with paragraph (c)(2)(i) of this section.

(3) Equipment must not be used until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria.

(d) *Each shift.*

(1) A competent person must begin a visual inspection prior to each shift the equipment will be used, which must be completed before or during that shift. The inspection must consist of observation for apparent deficiencies. Taking apart equipment components and booming down is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating taking apart equipment components or booming down is needed. Determinations made in conducting the inspection must be reassessed in light of observations made during operation. At a minimum the inspection must include all of the following:

(i) Control mechanisms for maladjustments interfering with proper operation.

(ii) Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.

(iii) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.

(iv) Hydraulic system for proper fluid level.

(v) Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.

(vi) Wire rope reeving for compliance with the manufacturer's specifications.

(vii) Wire rope, in accordance with § 1926.1413(a).

(viii) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.

(ix) Tires (when in use) for proper inflation and condition.

(x) Ground conditions around the equipment for proper support, including ground settling under and around outriggers/stabilizers and supporting foundations, ground water accumulation, or similar conditions. This paragraph does not apply to the inspection of ground conditions for railroad tracks and their underlying support when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

(xi) The equipment for level position within the tolerances specified by the

equipment manufacturer's recommendations, both before each shift and after each move and setup.

(xii) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.

(xiii) Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling. This paragraph does not apply to the inspection of rails, rail stops, rail clamps and supporting surfaces when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

(xiv) Safety devices and operational aids for proper operation.

(2) If any deficiency in paragraphs (d)(1)(i) through (xiii) of this section (or in additional inspection items required to be checked for specific types of equipment in accordance with other sections of this standard) is identified, an immediate determination must 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, the equipment must be taken out of service until it has been corrected. *See* § 1926.1417.

(3) If any deficiency in paragraph (d)(1)(xiv) of this section (safety devices/operational aids) is identified, the action specified in § 1926.1415 and § 1926.1416 must be taken prior to using the equipment.

(e) *Monthly.*

(1) Each month the equipment is in service it must be inspected in accordance with paragraph (d) of this section (each shift).

(2) Equipment must not be used until an inspection under this paragraph demonstrates that no corrective action under paragraphs (d)(2) and (3) of this section is required.

(3) *Documentation.*

(i) The following information must be documented and maintained by the employer that conducts the inspection:

(A) The items checked and the results of the inspection.

(B) The name and signature of the person who conducted the inspection and the date.

(ii) This document must be retained for a minimum of three months.

(f) *Annual/comprehensive.*

(1) At least every 12 months the equipment must be inspected by a qualified person in accordance with paragraph (d) of this section (each shift) except that the corrective action set forth in paragraphs (f)(4), (f)(5), and (f)(6) of this section must apply in place of the corrective action required by paragraphs (d)(2) and (d)(3) of this section.

(2) In addition, at least every 12 months, the equipment must be inspected by a qualified person. Disassembly is required, as necessary, to complete the inspection. The equipment must be inspected for all of the following:

(i) Equipment structure (including the boom and, if equipped, the jib):

(A) Structural members: Deformed, cracked, or significantly corroded.

(B) Bolts, rivets and other fasteners: loose, failed or significantly corroded.

(C) Welds for cracks.

(ii) Sheaves and drums for cracks or significant wear.

(iii) Parts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear.

(iv) Brake and clutch system parts, linings, pawls and ratchets for excessive wear.

(v) Safety devices and operational aids for proper operation (including significant inaccuracies).

(vi) Gasoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature) and conditions, and proper operation.

(vii) Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch.

(viii) Travel steering, brakes, and locking devices, for proper operation.

(ix) Tires for damage or excessive wear.

(x) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:

(A) Flexible hose or its junction with the fittings for indications of leaks.

(B) Threaded or clamped joints for leaks.

(C) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.

(D) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing.

(xi) Hydraulic and pneumatic pumps and motors, as follows:

(A) Performance indicators: Unusual noises or vibration, low operating speed, excessive heating of the fluid, low pressure.

(B) Loose bolts or fasteners.

(C) Shaft seals and joints between pump sections for leaks.

(xii) Hydraulic and pneumatic valves, as follows:

(A) Spools: Sticking, improper return to neutral, and leaks.

(B) Leaks.

(C) Valve housing cracks.

(D) Relief valves: Failure to reach correct pressure (if there is a manufacturer procedure for checking pressure, it must be followed).

(xiii) Hydraulic and pneumatic cylinders, as follows:

(A) Drifting caused by fluid leaking across the piston.

(B) Rod seals and welded joints for leaks.

(C) Cylinder rods for scores, nicks, or dents.

(D) Case (barrel) for significant dents.

(E) Rod eyes and connecting joints: Loose or deformed.

(xiv) Outrigger or stabilizer pads/floats for excessive wear or cracks.

(xv) Slider pads for excessive wear or cracks.

(xvi) Electrical components and wiring for cracked or split insulation and loose or corroded terminations.

(xvii) Warning labels and decals originally supplied with the equipment by the manufacturer or otherwise required under this standard: Missing or unreadable.

(xviii) Originally equipped operator seat (or equivalent): Missing.

(xix) Operator seat: Unserviceable.

(xx) Originally equipped steps, ladders, handrails, guards: Missing.

(xxi) Steps, ladders, handrails, guards: In unusable/unsafe condition.

(3) This inspection must include functional testing to determine that the equipment as configured in the inspection is functioning properly.

(4) If any deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard or, though not yet a safety hazard, needs to be monitored in the monthly inspections.

(5) If the qualified person determines that a deficiency is a safety hazard, the equipment must be taken out of service until it has been corrected, except when temporary alternative measures are implemented as specified in § 1926.1416(d) or § 1926.1435(e). *See* § 1926.1417.

(6) If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer must ensure that the deficiency is checked in the monthly inspections.

(7) *Documentation of annual/comprehensive inspection.* The following information must be documented, maintained, and retained for a minimum of 12 months, by the employer that conducts the inspection:

(i) The items checked and the results of the inspection.

(ii) The name and signature of the person who conducted the inspection and the date.

(g) *Severe service.* Where the severity of use/conditions is such that there is a

reasonable probability of damage or excessive wear (such as loading that may have exceeded rated capacity, shock loading that may have exceeded rated capacity, prolonged exposure to a corrosive atmosphere), the employer must stop using the equipment and a qualified person must:

(1) Inspect the equipment for structural damage to determine if the equipment can continue to be used safely.

(2) In light of the use/conditions determine whether any items/conditions listed in paragraph (f) of this section need to be inspected; if so, the qualified person must inspect those items/conditions.

(3) If a deficiency is found, the employer must follow the requirements in paragraphs (f)(4) through (6) of this section.

(h) *Equipment not in regular use.* Equipment that has been idle for 3 months or more must be inspected by a qualified person in accordance with the requirements of paragraph (e) (Monthly) of this section before initial use.

(i) [*Reserved.*]

(j) Any part of a manufacturer's procedures regarding inspections that relate to safe operation (such as to a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule of inspection than the requirements of this section must be followed.

(k) All documents produced under this section must be available, during the applicable document retention period, to all persons who conduct inspections under this section.

§ 1926.1413 Wire rope—inspection.

(a) *Shift inspection.*

(1) A competent person must begin a visual inspection prior to each shift the equipment is used, which must be completed before or during that shift. The inspection must consist of observation of wire ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies, including those listed in paragraph (a)(2) of this section. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.

(2) *Apparent deficiencies.*

(i) *Category I.* Apparent deficiencies in this category include the following:

(A) 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.

(B) Significant corrosion.

(C) Electric arc damage (from a source other than power lines) or heat damage.

(D) Improperly applied end connections.

(E) Significantly corroded, cracked, bent, or worn end connections (such as from severe service).

(ii) *Category II.* Apparent deficiencies in this category are:

(A) Visible broken wires, as follows:

(1) 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.

(2) In rotation resistant ropes: Two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters.

(3) 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.

(B) A diameter reduction of more than 5% from nominal diameter.

(iii) *Category III.* Apparent deficiencies in this category include the following:

(A) In rotation resistant wire rope, core protrusion or other distortion indicating core failure.

(B) Prior electrical contact with a power line.

(C) A broken strand.

(3) *Critical review items.* The competent person must give particular attention to all of the following:

(i) Rotation resistant wire rope in use.

(ii) Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.

(iii) Wire rope at flange points, crossover points and repetitive pickup points on drums.

(iv) Wire rope at or near terminal ends.

(v) Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.

(4) *Removal from service.*

(i) If a deficiency in Category I (*see* paragraph (a)(2)(i) of this section) is identified, an immediate determination must 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 must be prohibited until:

(A) The wire rope is replaced (*see* § 1926.1417), or

(B) 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. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(ii) If a deficiency in Category II (*see* paragraph (a)(2)(ii) of this section) is identified, operations involving use of the wire rope in question must be prohibited until:

(A) 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 (*see* § 1926.1417),

(B) The wire rope is replaced (*see* § 1926.1417), or

(C) 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. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(iii) If a deficiency in Category III is identified, operations involving use of the wire rope in question must be prohibited until:

(A) The wire rope is replaced (*see* § 1926.1417), or

(B) 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. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(iv) Where a wire rope is required to be removed from service under this section, either the equipment (as a whole) or the hoist with that wire rope must be tagged-out, in accordance with § 1926.1417(f)(1), until the wire rope is repaired or replaced.

(b) *Monthly inspection.*

(1) Each month an inspection must be conducted in accordance with paragraph (a) (shift inspection) of this section.

(2) The inspection must include any deficiencies that the qualified person who conducts the annual inspection

determines under paragraph (c)(3)(ii) of this section must be monitored.

(3) Wire ropes on equipment must not be used until an inspection under this paragraph demonstrates that no corrective action under paragraph (a)(4) of this section is required.

(4) The inspection must be documented according to § 1926.1412(e)(3) (monthly inspection documentation).

(c) *Annual/comprehensive.*

(1) At least every 12 months, wire ropes in use on equipment must be inspected by a qualified person in accordance with paragraph (a) of this section (shift inspection).

(2) In addition, at least every 12 months, the wire ropes in use on equipment must be inspected by a qualified person, as follows:

(i) The inspection must be for deficiencies of the types listed in paragraph (a)(2) of this section.

(ii) The inspection must be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to all of the following:

(A) Critical review items listed in paragraph (a)(3) of this section.

(B) Those sections that are normally hidden during shift and monthly inspections.

(C) Wire rope subject to reverse bends.

(D) Wire rope passing over sheaves.

(iii) *Exception:* In the event an inspection under paragraph (c)(2) of this section is not feasible due to existing set-up and configuration of the equipment (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting), such inspections must be conducted as soon as it becomes feasible, but no longer than an additional 6 months for running ropes and, for standing ropes, at the time of disassembly.

(3) If a deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard.

(i) If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question must be prohibited until:

(A) The wire rope is replaced (*see* § 1926.1417), or

(B) 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. If a rope is shortened under this paragraph, the employer must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

(ii) If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer must ensure that the deficiency is checked in the monthly inspections.

(4) The inspection must be documented according to § 1926.1412(f)(7) (annual/comprehensive inspection documentation).

(d) Rope lubricants that are of the type that hinder inspection must not be used.

(e) All documents produced under this section must be available, during the applicable document retention period, to all persons who conduct inspections under this section.

§ 1926.1414 Wire rope—selection and installation criteria.

(a) Original equipment wire rope and replacement wire rope must be selected and installed in accordance with the requirements of this section. Selection of replacement wire rope must be in accordance with the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.

(b) *Wire rope design criteria:* Wire rope (other than rotation resistant rope) must comply with either Option (1) or Option (2) of this section, as follows:

(1) *Option (1).* Wire rope must comply with section 5–1.7.1 of ASME B30.5–2004 (incorporated by reference, *see* § 1926.6) except that section's paragraph (c) must not apply.

(2) *Option (2).* Wire rope must be designed to have, in relation to the equipment's rated capacity, a sufficient minimum breaking force and design factor so that compliance with the applicable inspection provisions in § 1926.1413 will be an effective means of preventing sudden rope failure.

(c) Wire rope must be compatible with the safe functioning of the equipment.

(d) *Boom hoist reeving.*

(1) Fiber core ropes must not be used for boom hoist reeving, except for derricks.

(2) Rotation resistant ropes must be used for boom hoist reeving only where the requirements of paragraph (e)(4)(ii) of this section are met.

(e) *Rotation resistant ropes.*

(1) *Definitions.*

(i) *Type I rotation resistant wire rope ("Type I").* Type I rotation resistant rope is stranded rope constructed to have little or no tendency to rotate or, if guided, transmits little or no torque. It has at least 15 outer strands and comprises an assembly of at least three layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(ii) *Type II rotation resistant wire rope ("Type II").* Type II rotation resistant rope is stranded rope constructed to have significant resistance to rotation. It has at least 10 outer strands and comprises an assembly of two or more layers of strands laid helically over a center in two or three operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(iii) *Type III rotation resistant wire rope ("Type III").* Type III rotation resistant rope is stranded rope constructed to have limited resistance to rotation. It has no more than nine outer strands, and comprises an assembly of two layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(2) *Requirements.*

(i) Types II and III with an operating design factor of less than 5 must not be used for duty cycle or repetitive lifts.

(ii) Rotation resistant ropes (including Types I, II and III) must have an operating design factor of no less than 3.5.

(iii) Type I must have an operating design factor of no less than 5, except where the wire rope manufacturer and the equipment manufacturer approves the design factor, in writing.

(iv) Types II and III must have an operating design factor of no less than 5, except where the requirements of paragraph (e)(3) of this section are met.

(3) When Types II and III with an operating design factor of less than 5 are used (for non-duty cycle, non-repetitive lifts), the following requirements must be met for each lifting operation:

(i) A qualified person must inspect the rope in accordance with § 1926.1413(a). The rope must be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any one rope lay must be considered a hazard.

(ii) Operations must be conducted in such a manner and at such speeds as to minimize dynamic effects.

(iii) Each lift made under § 1926.1414(e)(3) must be recorded in the monthly and annual inspection documents. Such prior uses must be considered by the qualified person in determining whether to use the rope again.

(4) *Additional requirements for rotation resistant ropes for boom hoist reeving.*

(i) Rotation resistant ropes must not be used for boom hoist reeving, except where the requirements of paragraph (e)(4)(ii) of this section are met.

(ii) Rotation resistant ropes may be used as boom hoist reeving when load hoists are used as boom hoists for attachments such as luffing attachments or boom and mast attachment systems. Under these conditions, all of the following requirements must be met:

(A) The drum must provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(B) The requirements in § 1926.1426(a) (irrespective of the date of manufacture of the equipment), and § 1926.1426(b).

(C) The requirements in ASME B30.5–2004 sections 5–1.3.2(a), (a)(2) through (a)(4), (b) and (d) (incorporated by reference, *see* § 1926.6) except that the minimum pitch diameter for sheaves used in multiple rope reeving is 18 times the nominal diameter of the rope used (instead of the value of 16 specified in section 5–1.3.2(d)).

(D) All sheaves used in the boom hoist reeving system must have a rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(E) The operating design factor for the boom hoist reeving system must be not less than five.

(F) The operating design factor for these ropes must be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure and the load within the equipment's rated capacity.

(G) When provided, a power-controlled lowering system must be capable of handling rated capacities and speeds as specified by the manufacturer.

(f) Wire rope clips used in conjunction with wedge sockets must be attached to the unloaded dead end of the rope only, except that the use of devices specifically designed for dead-ending rope in a wedge socket is permitted.

(g) Socketing must be done in the manner specified by the manufacturer of the wire rope or fitting.

(h) Prior to cutting a wire rope, seizings must be placed on each side of the point to be cut. The length and number of seizings must be in accordance with the wire rope manufacturer's instructions.

§ 1926.1415 Safety devices.

(a) *Safety devices.* The following safety devices are required on all equipment covered by this subpart, unless otherwise specified:

(1) *Crane level indicator.*

(i) The equipment must have a crane level indicator that is either built into the equipment or is available on the equipment.

(ii) If a built-in crane level indicator is not working properly, it must be tagged-out or removed. If a removable crane level indicator is not working properly, it must be removed.

(iii) This requirement does not apply to portal cranes, derricks, floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.

(2) Boom stops, except for derricks and hydraulic booms.

(3) Jib stops (if a jib is attached), except for derricks.

(4) Equipment with foot pedal brakes must have locks.

(5) Hydraulic outrigger jacks and hydraulic stabilizer jacks must have an integral holding device/check valve.

(6) Equipment on rails must have rail clamps and rail stops, except for portal cranes.

(7) *Horn*

(i) The equipment must have a horn that is either built into the equipment or is on the equipment and immediately available to the operator.

(ii) If a built-in horn is not working properly, it must be tagged-out or removed. If a removable horn is not working properly, it must be removed.

(b) *Proper operation required.* Operations must not begin unless all of the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. If any of the devices listed in this section are not in proper working order, the equipment must be taken out of service and operations must not resume until the device is again working properly. *See* § 1926.1417 (Operation). Alternative measures are not permitted to be used.

§ 1926.1416 Operational aids.

(a) The devices listed in this section ("listed operational aids") are required on all equipment covered by this subpart, unless otherwise specified.

(1) The requirements in paragraphs (e)(1), (e)(2), and (e)(3) of this section do not apply to articulating cranes.

(2) The requirements in paragraphs (d)(3), (e)(1), and (e)(4) of this section apply only to those digger derricks manufactured after November 8, 2011.

(b) Operations must not begin unless the listed operational aids are in proper working order, except where an operational aid is being repaired the employer uses the specified temporary alternative measures. The time periods permitted for repairing defective operational aids are specified in paragraphs (d) and (e) of this section. More protective alternative measures specified by the crane/derrick manufacturer, if any, must be followed.

(c) If a listed operational aid stops working properly during operations, the operator must safely stop operations until the temporary alternative measures are implemented or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted and is not considered a modification under § 1926.1434.

(d) *Category I operational aids and alternative measures.* Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 calendar days after the deficiency occurs. *Exception:* If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receipt of the parts. *See* § 1926.1417(j) for additional requirements.

(1) *Boom hoist limiting device.*

(i) For equipment manufactured after December 16, 1969, a boom hoist limiting device is required. *Temporary alternative measures (use at least one).* One or more of the following methods must be used:

(A) Use a boom angle indicator.

(B) Clearly mark the boom hoist cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

(C) Clearly mark the boom hoist cable (so that it can easily be seen by a spotter) at a point that will give the spotter sufficient time to signal the operator and have the operator stop the hoist to keep the boom within the minimum allowable radius.

(ii) If the equipment was manufactured on or before December 16, 1969, and is not equipped with a boom hoist limiting device, at least one of the measures in paragraphs (d)(1)(i)(A) through (C) of this section must be used.

(2) *Luffing jib limiting device.* Equipment with a luffing jib must have a luffing jib limiting device. Temporary alternative measures are the same as in paragraph (d)(1)(i) of this section, except to limit the movement of the luffing jib rather than the boom hoist.

(3) *Anti two-blocking device.*

(i) Telescopic boom cranes manufactured after February 28, 1992, must be equipped with a device which automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block

or similar component). The device(s) must prevent such damage at all points where two-blocking could occur.

Temporary alternative measures: Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

(ii) *Lattice boom cranes.*

(A) Lattice boom cranes manufactured after Feb 28, 1992, must be equipped with a device that either automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component), or warns the operator in time for the operator to prevent two-blocking. The device must prevent such damage/failure or provide adequate warning for all points where two-blocking could occur.

(B) Lattice boom cranes and derricks manufactured after November 8, 2011 must be equipped with a device which automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage/failure at all points where two-blocking could occur.

(C) *Exception.* The requirements in paragraphs (d)(3)(ii)(A) and (B) of this section do not apply to such lattice boom equipment when used for dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, marine operations that do not involve hoisting personnel, and pile driving work.

(D) *Temporary alternative measures.* Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter.

(iii) Articulating cranes manufactured after December 31, 1999, that are equipped with a load hoist must be equipped with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device must prevent such damage at all points where two-blocking could occur. *Temporary alternative measures:* When two-blocking could only occur with movement of the load hoist, clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter. When two-blocking could occur without movement of the load hoist, clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

(e) *Category II operational aids and alternative measures.* Operational aids listed in this paragraph that are not working properly must be repaired no later than 30 calendar days after the deficiency occurs. *Exception:* If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the parts. *See* § 1926.1417(j) for additional requirements.

(1) *Boom angle or radius indicator.* The equipment must have a boom angle or radius indicator readable from the operator's station. *Temporary alternative measures:* Radii or boom angle must be determined by measuring the radii or boom angle with a measuring device.

(2) Jib angle indicator if the equipment has a luffing jib. *Temporary alternative measures:* Radii or jib angle must be determined by ascertaining the main boom angle and then measuring the radii or jib angle with a measuring device.

(3) Boom length indicator if the equipment has a telescopic boom, except where the rated capacity is independent of the boom length. *Temporary alternative measures.* One or more of the following methods must be used:

(i) Mark the boom with measured marks to calculate boom length,

(ii) Calculate boom length from boom angle and radius measurements,

(iii) Measure the boom with a measuring device.

(4) *Load weighing and similar devices.*

(i) Equipment (other than derricks and articulating cranes) manufactured after March 29, 2003 with a rated capacity over 6,000 pounds must have at least one of the following: load weighing device, load moment (or rated capacity) indicator, or load moment (or rated capacity) limiter. *Temporary alternative measures:* The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer) or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator prior to the lift.

(ii) Articulating cranes manufactured after November 8, 2011 must have at least one of the following: automatic overload prevention device, load weighing device, load moment (or rated capacity) indicator, or load moment (rated capacity) limiter. *Temporary alternative measures:* The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer) or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator prior to the lift.

(5) The following devices are required on equipment manufactured after November 8, 2011:

(i) Outrigger/stabilizer position (horizontal beam extension) sensor/monitor if the equipment has outriggers or stabilizers. *Temporary alternative measures:* The operator must verify that the position of the outriggers or stabilizers is correct (in accordance with manufacturer procedures) before beginning operations requiring outrigger or stabilizer deployment.

(ii) Hoist drum rotation indicator if the equipment has a hoist drum not visible from the operator's station. *Temporary alternative measures:* Mark the drum to indicate the rotation of the drum. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

§ 1926.1417 Operation.

(a) The employer must comply with all manufacturer procedures applicable to the operational functions of equipment, including its use with attachments.

(b) *Unavailable operation procedures.*

(1) Where the manufacturer procedures are unavailable, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(2) Procedures for the operational controls must be developed by a qualified person.

(3) Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

(c) *Accessibility of procedures.*

(1) The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, must be readily available in the cab at all times for use by the operator.

(2) Where rated capacities are available in the cab only in electronic form: In the event of a failure which makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities (in electronic or other form) are available.

(d) The operator must not engage in any practice or activity that diverts his/her attention while actually engaged in operating the equipment, such as the use of cellular phones (other than when used for signal communications).

(e) *Leaving the equipment unattended.*

(1) The operator must not leave the controls while the load is suspended, except where all of the following are met:

(i) The operator remains adjacent to the equipment and is not engaged in any other duties.

(ii) The load is to be held suspended for a period of time exceeding normal lifting operations.

(iii) The competent person determines that it is safe to do so and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.

(iv) Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees, including those listed in §§ 1926.1425(b)(1) through (3), § 1926.1425(d) or § 1926.1425(e), are permitted in the fall zone.

(2) The provisions in § 1926.1417(e)(1) do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the weight of the working gear is negligible relative to the lifting capacity of the equipment as positioned, and the working gear is suspended over an area other than an entrance or exit.

(f) *Tag-out.*

(1) *Tagging out of service equipment/functions.* Where the employer has taken the equipment out of service, a tag must be placed in the cab stating that the equipment is out of service and is not to be used. Where the employer has taken a function(s) out of service, a tag must be placed in a conspicuous position stating that the function is out of service and is not to be used.

(2) *Response to "do not operate"/tag-out signs.*

(i) If there is a warning (tag-out or maintenance/do not operate) sign on the equipment or starting control, the operator must not activate the switch or start the equipment until the sign has been removed by a person authorized to remove it, or until the operator has verified that:

(A) No one is servicing, working on, or otherwise in a dangerous position on the machine.

(B) The equipment has been repaired and is working properly.

(ii) If there is a warning (tag-out or maintenance/do not operate) sign on any other switch or control, the operator must not activate that switch or control until the sign has been removed by a person authorized to remove it, or until the operator has verified that the requirements in paragraphs (f)(2)(i)(A) and (B) of this section have been met.

(g) Before starting the engine, the operator must verify that all controls are in the proper starting position and that all personnel are in the clear.

(h) *Storm warning.* When a local storm warning has been issued, the competent person must determine whether it is necessary to implement manufacturer recommendations for securing the equipment.

(i) [*Reserved.*]

(j) If equipment adjustments or repairs are necessary:

(1) The operator must, in writing, promptly inform the person designated by the employer to receive such information and, where there are successive shifts, to the next operator; and

(2) The employer must notify all affected employees, at the beginning of each shift, of the necessary adjustments or repairs and all alternative measures.

(k) Safety devices and operational aids must not be used as a substitute for the exercise of professional judgment by the operator.

(l) [*Reserved.*]

(m) If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it must be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.

(n) The competent person must adjust the equipment and/or operations to address the effect of wind, ice, and snow on equipment stability and rated capacity.

(o) *Compliance with rated capacity.*

(1) The equipment must not be operated in excess of its rated capacity.

(2) The operator must not be required to operate the equipment in a manner that would violate paragraph (o)(1) of this section.

(3) *Load weight.* The operator must verify that the load is within the rated capacity of the equipment by at least one of the following methods:

(i) The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. In addition, when requested by the operator, this information must be provided to the operator prior to the lift; or

(ii) The operator must begin hoisting the load to determine, using a load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter, if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation. If it does, the operator must not proceed with the lift until he/she verifies the weight of the load in accordance with paragraph (o)(3)(i) of this section.

(p) The boom or other parts of the equipment must not contact any obstruction.

(q) The equipment must not be used to drag or pull loads sideways.

(r) On wheel-mounted equipment, no loads must be lifted over the front area, except as permitted by the manufacturer.

(s) The operator must test the brakes each time a load that is 90% or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90% or more of the maximum line pull, this requirement applies to the first lift but not to successive lifts.

(t) Neither the load nor the boom must be lowered below the point where less than two full wraps of rope remain on their respective drums.

(u) *Traveling with a load.*

(1) Traveling with a load is prohibited if the practice is prohibited by the manufacturer.

(2) Where traveling with a load, the employer must ensure that:

(i) A competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.

(ii) The determinations of the competent person required in paragraph (u)(2)(i) of this section are implemented.

(iii) For equipment with tires, tire pressure specified by the manufacturer is maintained.

(v) Rotational speed of the equipment must be such that the load does not swing out beyond the radius at which it can be controlled.

(w) A tag or restraint line must be used if necessary to prevent rotation of the load that would be hazardous.

(x) The brakes must be adjusted in accordance with manufacturer procedures to prevent unintended movement.

(y) The operator must obey a stop (or emergency stop) signal, irrespective of who gives it.

(z) *Swinging locomotive cranes.* A locomotive crane must not be swung into a position where railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track and that proper flag protection has been established.

(aa) *Counterweight/ballast.*

(1) The following applies to equipment other than tower cranes:

(i) Equipment must not be operated without the counterweight or ballast in place as specified by the manufacturer.

(ii) The maximum counterweight or ballast specified by the manufacturer for the equipment must not be exceeded.

(2) Counterweight/ballast requirements for tower cranes are specified in § 1926.1435(b)(8).

§ 1926.1418 Authority to stop operation.

Whenever there is a concern as to safety, the operator must have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.

§ 1926.1419 Signals—general requirements.

(a) A signal person must be provided in each of the following situations:

(1) The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.

(2) When the equipment is traveling, the view in the direction of travel is obstructed.

(3) Due to site specific safety concerns, either the operator or the person handling the load determines that it is necessary.

(b) *Types of signals.* Signals to operators must be by hand, voice, audible, or new signals.

(c) *Hand signals.*

(1) When using hand signals, the Standard Method must be used (*see* Appendix A of this subpart). *Exception:* Where use of the Standard Method for hand signals is infeasible, or where an operation or use of an attachment is not covered in the Standard Method, non-standard hand signals may be used in accordance with paragraph (c)(2) of this section.

(2) *Non-standard hand signals.* When using non-standard hand signals, the signal person, operator, and lift director (where there is one) must contact each other prior to the operation and agree on the non-standard hand signals that will be used.

(d) *New signals.* Signals other than hand, voice, or audible signals may be used where the employer demonstrates that:

(1) The new signals provide at least equally effective communication as voice, audible, or Standard Method hand signals, or

(2) The new signals comply with a national consensus standard that provides at least equally effective communication as voice, audible, or Standard Method hand signals.

(e) *Suitability.* The signals used (hand, voice, audible, or new), and means of transmitting the signals to the operator (such as direct line of sight, video, radio, *etc.*), must be appropriate for the site conditions.

(f) During operations requiring signals, the ability to transmit signals between the operator and signal person must be maintained. If that ability is interrupted at any time, the operator must safely stop operations requiring signals until it is reestablished and a proper signal is given and understood.

(g) If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator must safely stop operations. Operations must not resume until the operator and signal person agree that the problem has been resolved.

(h) Only one person may give signals to a crane/derrick at a time, except in circumstances covered by paragraph (j) of this section.

(i) [*Reserved.*]

(j) Anyone who becomes aware of a safety problem must alert the operator or signal person by giving the stop or emergency stop signal. (**Note:** § 1926.1417(y) requires the operator to obey a stop or emergency stop signal).

(k) All directions given to the operator by the signal person must be given from the operator's direction perspective.

(l) [*Reserved.*]

(m) *Communication with multiple cranes/derricks.* Where a signal person(s) is in communication with more than one crane/derrick, a system must be used for identifying the crane/derrick each signal is for, as follows:

(1) for each signal, prior to giving the function/direction, the signal person must identify the crane/derrick the signal is for, or

(2) must use an equally effective method of identifying which crane/derrick the signal is for.

§ 1926.1420 Signals—radio, telephone or other electronic transmission of signals.

(a) The device(s) used to transmit signals must be tested on site before beginning operations to ensure that the signal transmission is effective, clear, and reliable.

(b) Signal transmission must be through a dedicated channel, except:

(1) Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.

(2) Where a crane is being operated on or adjacent to railroad tracks, and the actions of the crane operator need to be coordinated with the movement of other equipment or trains on the same or adjacent tracks.

(c) The operator's reception of signals must be by a hands-free system.

§ 1926.1421 Signals—voice signals—additional requirements.

(a) Prior to beginning operations, the operator, signal person and lift director (if there is one), must contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is added or substituted, there is confusion about the voice signals, or a voice signal is to be changed.

(b) Each voice signal must contain the following three elements, given in the following order: function (such as hoist, boom, *etc.*), direction; distance and/or speed; function, stop command.

(c) The operator, signal person and lift director (if there is one), must be able to effectively communicate in the language used.

§ 1926.1422 Signals—hand signal chart.

Hand signal charts must be either posted on the equipment or conspicuously posted in the vicinity of the hoisting operations.

§ 1926.1423 Fall protection.

(a) *Application.*

(1) Paragraphs (b), (c)(3), (e) and (f) of this section apply to all equipment covered by this subpart except tower cranes.

(2) Paragraphs (c)(1), (c)(2), (d), (g), (j) and (k) of this section apply to all equipment covered by this subpart.

(3) Paragraphs (c)(4) and (h) of this section apply only to tower cranes.

(b) *Boom walkways.*

(1) Equipment manufactured after November 8, 2011 with lattice booms must be equipped with walkways on the boom(s) if the vertical profile of the boom (from cord centerline to cord centerline) is 6 or more feet.

(2) *Boom walkway criteria.*

(i) The walkways must be at least 12 inches wide.

(ii) Guardrails, railings and other permanent fall protection attachments along walkways are:

(A) Not required.

(B) Prohibited on booms supported by pendant ropes or bars if the guardrails/railings/attachments could be snagged by the ropes or bars.

(C) Prohibited if of the removable type (designed to be installed and removed each time the boom is assembled/disassembled).

(D) Where not prohibited, guardrails or railings may be of any height up to, but not more than, 45 inches.

(c) *Steps, handholds, ladders, grabrails, guardrails and railings.*

(1) Section 1926.502(b) does not apply to equipment covered by this subpart.

(2) The employer must maintain in good condition originally-equipped steps, handholds, ladders and guardrails/railings/grabrails.

(3) Equipment manufactured after November 8, 2011 must be equipped so as to provide safe access and egress between the ground and the operator work station(s), including the forward and rear positions, by the provision of devices such as steps, handholds, ladders, and guardrails/railings/grabrails. These devices must meet the following criteria:

(i) Steps, handholds, ladders and guardrails/railings/grabrails must meet the criteria of SAE J185 (May 2003) (incorporated by reference, *see* § 1926.6) or ISO 11660–2:1994(E) (incorporated by reference, *see* § 1926.6) except where infeasible.

(ii) Walking/stepping surfaces, except for crawler treads, must have slip-resistant features/properties (such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint).

(4) Tower cranes manufactured after November 8, 2011 must be equipped so as to provide safe access and egress between the ground and the cab, machinery platforms, and tower (mast), by the provision of devices such as steps, handholds, ladders, and guardrails/railings/grabrails. These devices must meet the following criteria:

(i) Steps, handholds, ladders, and guardrails/railings/grabrails must meet the criteria of ISO 11660–1:2008(E) (incorporated by reference, *see* § 1926.6) and ISO 11660–3:2008(E) (incorporated by reference, *see* § 1926.6) or SAE J185 (May 2003) (incorporated by reference, *see* § 1926.6) except where infeasible.

(ii) Walking/stepping surfaces must have slip-resistant features/properties (such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint).

(d) *Personal fall arrest and fall restraint systems.* Personal fall arrest system components must be used in personal fall arrest and fall restraint systems and must conform to the criteria in § 1926.502(d) except that § 1926.502(d)(15) does not apply to components used in personal fall arrest and fall restraint systems. Either body belts or body harnesses must be used in personal fall arrest and fall restraint systems.

(e) For non-assembly/disassembly work, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level as follows:

(1) When moving point-to-point:

(i) On non-lattice booms (whether horizontal or not horizontal).

(ii) On lattice booms that are not horizontal.

(iii) On horizontal lattice booms where the fall distance is 15 feet or more.

(2) While at a work station on any part of the equipment (including the boom, of any type), except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck.

(f) For assembly/disassembly work, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level, except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck.

(g) *Anchorage criteria.*

(1) Sections 1926.502(d)(15) and 1926.502(e)(2) apply to equipment covered by this subpart only to the extent delineated in paragraph (g)(2) of this section.

(2) *Anchorages for personal fall arrest and positioning device systems.*

(i) Personal fall arrest systems must be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in § 1926.502(d)(15) would not be met.

(ii) Positioning device systems must be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in § 1926.502(e)(2) would not be met.

(iii) Attachable anchor devices (portable anchor devices that are attached to the equipment) must meet the anchorage criteria in § 1926.502(d)(15) for personal fall arrest systems and § 1926.502(e)(2) for positioning device systems.

(3) *Anchorages for fall restraint systems.* Fall restraint systems must be anchored to any part of the equipment that is capable of withstanding twice the maximum load that an employee may impose on it during reasonably anticipated conditions of use.

(h) *Tower cranes.*

(1) For work other than erecting, climbing, and dismantling, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level, except when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck.

(2) For erecting, climbing, and dismantling work, the employer must provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 15 feet above a lower level.

(i) [*Reserved.*]

(j) *Anchoring to the load line.* A personal fall arrest system is permitted to be anchored to the crane/derrick's hook (or other part of the load line) where all of the following requirements are met:

(1) A qualified person has determined that the set-up and rated capacity of the crane/derrick (including the hook, load line and rigging) meets or exceeds the requirements in § 1926.502(d)(15).

(2) The equipment operator must be at the work site and informed that the equipment is being used for this purpose.

(3) No load is suspended from the load line when the personal fall arrest system is anchored to the crane/derrick's hook (or other part of the load line).

(k) *Training.* The employer must train each employee who may be exposed to fall hazards while on, or hoisted by, equipment covered by this subpart on all of the following:

(1) the requirements in this subpart that address fall protection.

(2) the applicable requirements in §§ 1926.500 and 1926.502.

§ 1926.1424 Work area control.

(a) *Swing radius hazards.*

(1) The requirements in paragraph (a)(2) of this section apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily

mounted) poses a reasonably foreseeable risk of:

(i) Striking and injuring an employee; or

(ii) Pinching/crushing an employee against another part of the equipment or another object.

(2) To prevent employees from entering these hazard areas, the employer must:

(i) Train each employee assigned to work on or near the equipment ("authorized personnel") in how to recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure.

(ii) Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas. *Exception:* When the employer can demonstrate that it is neither feasible to erect such barriers on the ground nor on the equipment, the hazard areas must be clearly marked by a combination of warning signs (such as "Danger—Swing/Crush Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the employer must train each employee to understand what these markings signify.

(3) *Protecting employees in the hazard area.*

(i) Before an employee goes to a location in the hazard area that is out of view of the operator, the employee (or someone instructed by the employee) must ensure that the operator is informed that he/she is going to that location.

(ii) Where the operator knows that an employee went to a location covered by paragraph (a)(1) of this section, the operator must not rotate the superstructure until the operator is informed in accordance with a pre-arranged system of communication that the employee is in a safe position.

(b) Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity must institute a system to coordinate operations. If there is no controlling entity, the employer (if there is only one employer operating the multiple pieces of equipment), or employers, must institute such a system.

§ 1926.1425 Keeping clear of the load.

(a) Where available, hoisting routes that minimize the exposure of employees to hoisted loads must be used, to the extent consistent with public safety.

(b) While the operator is not moving a suspended load, no employee must be within the fall zone, except for employees:

(1) Engaged in hooking, unhooking or guiding a load;

(2) Engaged in the initial attachment of the load to a component or structure; or

(3) Operating a concrete hopper or concrete bucket.

(c) When employees are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, all of the following criteria must be met:

(1) The materials being hoisted must be rigged to prevent unintentional displacement.

(2) Hooks with self-closing latches or their equivalent must be used. *Exception:* "J" hooks are permitted to be used for setting wooden trusses.

(3) The materials must be rigged by a qualified rigger.

(d) *Receiving a load.* Only employees needed to receive a load are permitted to be within the fall zone when a load is being landed.

(e) During a tilt-up or tilt-down operation:

(1) No employee must be directly under the load.

(2) Only employees essential to the operation are permitted in the fall zone (but not directly under the load). An employee is essential to the operation if the employee is conducting one of the following operations and the employer can demonstrate it is infeasible for the employee to perform that operation from outside the fall zone: (1) Physically guide the load; (2) closely monitor and give instructions regarding the load's movement; or (3) either detach it from or initially attach it to another component or structure (such as, but not limited to, making an initial connection or installing bracing).

Note: Boom free fall is prohibited when an employee is in the fall zone of the boom or load, and load line free fall is prohibited when an employee is directly under the load; *see* § 1926.1426.

§ 1926.1426 Free fall and controlled load lowering.

(a) *Boom free fall prohibitions.*

(1) The use of equipment in which the boom is designed to free fall (live boom) is prohibited in each of the following circumstances:

(i) An employee is in the fall zone of the boom or load.

(ii) An employee is being hoisted.

(iii) The load or boom is directly over a power line, or over any part of the area extending the Table A of § 1926.1408 clearance distance to each side of the power line; or any part of the area extending the Table A clearance distance to each side of the power line is within the radius of vertical travel of the boom or the load.

(iv) The load is over a shaft, except where there are no employees in the shaft.

(v) The load is over a cofferdam, except where there are no employees in the fall zone of the boom or the load.

(vi) Lifting operations are taking place in a refinery or tank farm.

(2) The use of equipment in which the boom is designed to free fall (live boom) is permitted only where none of the circumstances listed in paragraph (a)(1) of this section are present and:

(i) The equipment was manufactured prior to October 31, 1984; or

(ii) The equipment is a floating crane/derrick or a land crane/derrick on a vessel/flotation device.

(b) *Preventing boom free fall.* Where the use of equipment with a boom that is designed to free fall (live boom) is prohibited, the boom hoist must have a secondary mechanism or device designed to prevent the boom from falling in the event the primary system used to hold or regulate the boom hoist fails, as follows:

(1) Friction drums must have:

(i) A friction clutch and, in addition, a braking device, to allow for controlled boom lowering.

(ii) A secondary braking or locking device, which is manually or automatically engaged, to back-up the primary brake while the boom is held (such as a secondary friction brake or a ratchet and pawl device).

(2) Hydraulic drums must have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.

(3) Neither clutches nor hydraulic motors must be considered brake or locking devices for purposes of this subpart.

(4) Hydraulic boom cylinders must have an integrally mounted holding device.

(c) *Preventing uncontrolled retraction.* Hydraulic telescoping booms must have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure.

(d) *Load line free fall.* In each of the following circumstances, controlled load lowering is required and free fall of the load line hoist is prohibited:

(1) An employee is directly under the load.

(2) An employee is being hoisted.

(3) The load is directly over a power line, or over any part of the area extending the Table A of § 1926.1408 clearance distance to each side of the power line; or any part of the area extending the Table A of § 1926.1408

clearance distance to each side of the power line is within the radius of vertical travel of the load.

(4) The load is over a shaft.

(5) The load is over a cofferdam, except where there are no employees in the fall zone of the load.

§ 1926.1427 Operator qualification and certification.

(a) The employer must ensure that, prior to operating any equipment covered under subpart CC, the person is operating the equipment during a training period in accordance with paragraph (f) of this section, or the operator is qualified or certified to operate the equipment in accordance with the following:

(1) When a non-military government entity issues operator licenses for equipment covered under subpart CC, and that government licensing program meets the requirements of paragraphs (e)(2) and (j) of this section, the equipment operator must either be:

(i) Licensed by that government entity for operation of equipment within that entity's jurisdiction; or

(ii) qualified in compliance with paragraph (d) of this section.

(2) Where paragraph (a)(1) of this section is not applicable, the certification or qualification must comply with one of the options in paragraphs (b) through (d) of this section.

(3) *Exceptions:* Operator qualification or certification under this section is not required for operators of derricks (*see* § 1926.1436), sideboom cranes (*see* § 1926.1440), or equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less (*see* § 1926.1441).

(4) Whenever operator qualification or certification is required under § 1926.1427, the employer must provide the qualification or certification at no cost to operators who are employed by the employer on November 8, 2010.

(b) *Option (1): Certification by an accredited crane operator testing organization.*

(1) For a testing organization to be considered accredited to certify operators under this subpart, it must:

(i) Be accredited by a nationally recognized accrediting agency based on that agency's determination that industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel have been met.

(ii) Administer written and practical tests that:

(A) Assess the operator applicant regarding, at a minimum, the knowledge and skills listed in paragraphs (j)(1) and (2) of this section.

(B) Provide different levels of certification based on equipment capacity and type.

(iii) Have procedures for operators to re-apply and be re-tested in the event an operator applicant fails a test or is decertified.

(iv) Have testing procedures for re-certification designed to ensure that the operator continues to meet the technical knowledge and skills requirements in paragraphs (j)(1) and (2) of this section.

(v) Have its accreditation reviewed by the nationally recognized accrediting agency at least every three years.

(2) An operator will be deemed qualified to operate a particular piece of equipment if the operator is certified under paragraph (b) of this section for that type and capacity of equipment or for higher-capacity equipment of that type. If no accredited testing agency offers certification examinations for a particular type and/or capacity of equipment, an operator will be deemed qualified to operate that equipment if the operator has been certified for the type/capacity that is most similar to that equipment and for which a certification examination is available. The operator's certificate must state the type/capacity of equipment for which the operator is certified.

(3) A certification issued under this option is portable and meets the requirements of paragraph (a)(2) of this section.

(4) A certification issued under this paragraph is valid for 5 years.

(c) *Option (2): Qualification by an audited employer program.* The employer's qualification of its employee must meet the following requirements:

(1) The written and practical tests must be either:

(i) Developed by an accredited crane operator testing organization (*see* paragraph (b) of this section); or

(ii) Approved by an auditor in accordance with the following requirements:

(A) The auditor is certified to evaluate such tests by an accredited crane operator testing organization (*see* paragraph (b) of this section).

(B) The auditor is not an employee of the employer.

(C) The approval must be based on the auditor's determination that the written and practical tests meet nationally recognized test development criteria and are valid and reliable in assessing the operator applicants regarding, at a minimum, the knowledge and skills listed in paragraphs (j)(1) and (2) of this section.

(D) The audit must be conducted in accordance with nationally recognized auditing standards.

(2) *Administration of tests.*

(i) The written and practical tests must be administered under circumstances approved by the auditor as meeting nationally recognized test administration standards.

(ii) The auditor must be certified to evaluate the administration of the written and practical tests by an accredited crane operator testing organization (*see* paragraph (b) of this section).

(iii) The auditor must not be an employee of the employer.

(iv) The audit must be conducted in accordance with nationally recognized auditing standards.

(3) The employer program must be audited within 3 months of the beginning of the program and at least every 3 years thereafter.

(4) The employer program must have testing procedures for re-qualification designed to ensure that the operator continues to meet the technical knowledge and skills requirements in paragraphs (j)(1) and (2) of this section. The re-qualification procedures must be audited in accordance with paragraphs (c)(1) and (2) of this section.

(5) *Deficiencies.* If the auditor determines that there is a significant deficiency ("deficiency") in the program, the employer must ensure that:

(i) No operator is qualified until the auditor confirms that the deficiency has been corrected.

(ii) The program is audited again within 180 days of the confirmation that the deficiency was corrected.

(iii) The auditor files a documented report of the deficiency to the appropriate Regional Office of the Occupational Safety and Health Administration within 15 days of the auditor's determination that there is a deficiency.

(iv) Records of the audits of the employer's program are maintained by the auditor for three years and are made available by the auditor to the Secretary of Labor or the Secretary's designated representative upon request.

(6) A qualification under this paragraph is:

(i) Not portable. Such a qualification meets the requirements of paragraph (a) of this section only where the operator is employed by (and operating the equipment for) the employer that issued the qualification.

(ii) Valid for 5 years.

(d) *Option (3): Qualification by the U.S. military.*

(1) For purposes of this section, an operator who is an employee of the U.S.

military is considered qualified if he/she has a current operator qualification issued by the U.S. military for operation of the equipment. An employee of the U.S. military is a Federal employee of the Department of Defense or Armed Forces and does not include employees of private contractors.

(2) A qualification under this paragraph is:

(i) Not portable. Such a qualification meets the requirements of paragraph (a) of this section only where the operator is employed by (and operating the equipment for) the employer that issued the qualification.

(ii) Valid for the period of time stipulated by the issuing entity.

(e) *Option (4): Licensing by a government entity.*

(1) For purposes of this section, a government licensing department/office that issues operator licenses for operating equipment covered by this standard is considered a government accredited crane operator testing organization if the criteria in paragraph (e)(2) of this section are met.

(2) *Licensing criteria.*

(i) The requirements for obtaining the license include an assessment, by written and practical tests, of the operator applicant regarding, at a minimum, the knowledge and skills listed in paragraphs (j)(1) and (2) of this section.

(ii) The testing meets industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel.

(iii) The government authority that oversees the licensing department/office, has determined that the requirements in paragraphs (e)(2)(i) and (ii) of this section have been met.

(iv) The licensing department/office has testing procedures for re-licensing designed to ensure that the operator continues to meet the technical knowledge and skills requirements in paragraphs (j)(1) and (2) of this section.

(3) A license issued by a government accredited crane operator testing organization that meets the requirements of this option:

(i) Meets the operator qualification requirements of this section for operation of equipment only within the jurisdiction of the government entity.

(ii) Is valid for the period of time stipulated by the licensing department/office, but no longer than 5 years.

(f) *Pre-qualification/certification training period.* An employee who is not qualified or certified under this section is permitted to operate equipment only as an operator-in-training and only where the requirements of this paragraph are met.

(1) The employer must provide each operator-in-training with sufficient training prior to operating the equipment to enable the operator-in-training to operate the equipment safely under limitations established by this section (including continuous monitoring) and any additional limitations established by the employer.

(2) The tasks performed by the operator-in-training while operating the equipment must be within the operator-in-training's ability.

(3) *Trainer.* While operating the equipment, the operator-in-training must be continuously monitored by an individual ("operator's trainer") who meets all of the following requirements:

(i) The operator's trainer is an employee or agent of the operator-in-training's employer.

(ii) The operator's trainer is either a certified operator under this section, or has passed the written portion of a certification test under one of the options in paragraphs (b) through (e) of this section, and is familiar with the proper use of the equipment's controls.

(iii) While monitoring the operator-in-training, the operator's trainer performs no tasks that detract from the trainer's ability to monitor the operator-in-training.

(iv) For equipment other than tower cranes: The operator's trainer and the operator-in-training must be in direct line of sight of each other. In addition, they must communicate verbally or by hand signals. For tower cranes: The operator's trainer and the operator-in-training must be in direct communication with each other.

(4) *Continuous monitoring.* The operator-in-training must be monitored by the operator's trainer at all times, except for short breaks where all of the following are met:

(i) The break lasts no longer than 15 minutes and there is no more than one break per hour.

(ii) Immediately prior to the break the operator's trainer informs the operator-in-training of the specific tasks that the operator-in-training is to perform and limitations to which he/she must adhere during the operator trainer's break.

(iii) The specific tasks that the operator-in-training will perform during the operator trainer's break are within the operator-in-training's abilities.

(5) The operator-in-training must not operate the equipment in any of the following circumstances unless the exception stated in paragraph (f)(5)(v) of this section is applicable:

(i) If any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone (*see* § 1926.1408(a)(1)), could get within 20 feet of a power line that is up to 350 kV, or within 50 feet of a power line that is over 350 kV.

(ii) If the equipment is used to hoist personnel.

(iii) In multiple-equipment lifts.

(iv) If the equipment is used over a shaft, cofferdam, or in a tank farm.

(v) In multiple-lift rigging operations, except where the operator's trainer determines that the operator-in-training skills are sufficient for this high-skill work.

(g) Under this section, a testing entity is permitted to provide training as well as testing services as long as the criteria of the applicable accrediting agency (in the option selected) for an organization providing both services are met.

(h) *Language and Literacy Requirements.*

(1) Tests under this section may be administered verbally, with answers given verbally, where the operator candidate:

(i) Passes a written demonstration of literacy relevant to the work.

(ii) Demonstrates the ability to use the type of written manufacturer procedures applicable to the class/type of equipment for which the candidate is seeking certification.

(2) Tests under this section may be administered in any language the operator candidate understands, and the operator's certificate must note the language in which the test was given. The operator is qualified under paragraph (b)(2) of this section to operate equipment that is furnished with materials required by this subpart that are written in the language of the certification. The operator may only operate equipment furnished with such materials.

(i) [*Reserved.*]

(j) *Certification criteria.* Qualifications and certifications must be based, at a minimum, on the following:

(1) A determination through a written test that:

(i) The individual knows the information necessary for safe operation of the specific type of equipment the individual will operate, including all of the following:

(A) The controls and operational/performance characteristics.

(B) Use of, and the ability to calculate (manually or with a calculator), load/capacity information on a variety of configurations of the equipment.

(C) Procedures for preventing and responding to power line contact.

(D) Technical knowledge similar to the subject matter criteria listed in

Appendix C of this subpart applicable to the specific type of equipment the individual will operate. Use of the Appendix C criteria meets the requirements of this provision.

(E) Technical knowledge applicable to:

(1) The suitability of the supporting ground and surface to handle expected loads.

(2) Site hazards.

(3) Site access.

(F) This subpart, including applicable incorporated materials.

(ii) The individual is able to read and locate relevant information in the equipment manual and other materials containing information referred to in paragraph (j)(1)(i) of this section.

(2) A determination through a practical test that the individual has the skills necessary for safe operation of the equipment, including the following:

(i) Ability to recognize, from visual and auditory observation, the items listed in § 1926.1412(d) (shift inspection).

(ii) Operational and maneuvering skills.

(iii) Application of load chart information.

(iv) Application of safe shut-down and securing procedures.

(k) *Phase-in.*

(1) The provisions of this section are applicable November 8, 2010, except for paragraphs (a)(2) and (f) which are applicable November 10, 2014.

(2) When § 1926.1427(a)(1) is not applicable, all of the requirements in paragraphs (k)(2)(i) and (ii) of this section apply until November 10, 2014:

(i) The employer must ensure that operators of equipment covered by this standard are competent to operate the equipment safely.

(ii) Where an employee assigned to operate machinery does not have the required knowledge or ability to operate the equipment safely, the employer must train that employee prior to operating the equipment. The employer must ensure that each operator is evaluated to confirm that he/she understands the information provided in the training.

§ 1926.1428 Signal person qualifications.

(a) The employer of the signal person must ensure that each signal person meets the Qualification Requirements (paragraph (c) of this section) prior to giving any signals. This requirement must be met by using either Option (1) or Option (2) of this section.

(1) *Option (1)—Third party qualified evaluator.* The signal person has documentation from a third party qualified evaluator (*see* Qualified Evaluator (third party), § 1926.1401 for definition) showing that the signal person meets the Qualification Requirements (*see* paragraph (c) of this section).

(2) *Option (2)—Employer's qualified evaluator.* The employer's qualified (*see* Qualified Evaluator (not a third party), § 1926.1401 for definition) evaluator assesses the individual and determines that the individual meets the Qualification Requirements (*see* paragraph (c) of this section) and provides documentation of that determination. An assessment by an employer's qualified evaluator under this option is not portable—other employers are not permitted to use it to meet the requirements of this section.

(3) The employer must make the documentation for whichever option is used available at the site while the signal person is employed by the employer. The documentation must specify each type of signaling (*e.g.* hand signals, radio signals, *etc.*) for which the signal person meets the requirements of paragraph (c) of this section.

(b) If subsequent actions by the signal person indicate that the individual does not meet the Qualification Requirements (*see* paragraph (c) of this section), the employer must not allow the individual to continue working as a signal person until re-training is provided and a re-assessment is made in accordance with paragraph (a) of this section that confirms that the individual meets the Qualification Requirements.

(c) *Qualification Requirements.* Each signal person must:

(1) Know and understand the type of signals used. If hand signals are used, the signal person must know and understand the Standard Method for hand signals.

(2) Be competent in the application of the type of signals used.

(3) Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.

(4) Know and understand the relevant requirements of § 1926.1419 through § 1926.1422 and § 1926.1428.

(5) Demonstrate that he/she meets the requirements in paragraphs (c)(1) through (4) of this section through an oral or written test, and through a practical test.

§ 1926.1429 Qualifications of maintenance & repair employees.

(a) Maintenance, inspection and repair personnel are permitted to operate the equipment only where all of the following requirements are met:

(1) The operation is limited to those functions necessary to perform maintenance, inspect the equipment, or verify its performance.

(2) The personnel either:

(i) Operate the equipment under the direct supervision of an operator who meets the requirements of § 1926.1427 (Operator qualification and certification); or

(ii) Are familiar with the operation, limitations, characteristics and hazards associated with the type of equipment.

(b) Maintenance and repair personnel must meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.

§ 1926.1430 Training.

The employer must provide training as follows:

(a) *Overhead powerlines.* The employer must train each employee specified in § 1926.1408(g) and § 1926.1410(m) in the topics listed in § 1926.1408(g).

(b) *Signal persons.* The employer must train each employee who will be assigned to work as a signal persons who does not meet the requirements of § 1926.1428(c) in the areas addressed in that paragraph.

(c) *Operators.*

(1) *Operators-in-Training for equipment where certification or qualification is required by this subpart.* The employer must train each operator-in-training in the areas addressed in § 1926.1427(j). The employer must provide re-training if the operator-in-training does not pass a qualification or certification test.

(2) *Transitional Period.* During the four-year phase-in period for operator certification or qualification, as provided in § 1926.1427(k), employers must train each operator who has not yet been certified or qualified in the areas addressed in § 1926.1427(j).

(3) *Operators excepted from the requirements of § 1926.1427.* The employer must train each operator excepted under § 1926.1427(a) from the requirements of § 1926.1427 on the safe operation of the equipment the operator will be using.

(4) The employer must train each operator of the equipment covered by this subpart in the following practices:

(i) On friction equipment, whenever moving a boom off a support, first raise the boom a short distance (sufficient to take the load of the boom) to determine if the boom hoist brake needs to be adjusted. On other types of equipment with a boom, the same practice is applicable, except that typically there is no means of adjusting the brake; if the

brake does not hold, a repair is necessary. *See* § 1926.1417(f) and (j) for additional requirements.

(ii) Where available, the manufacturer's emergency procedures for halting unintended equipment movement.

(d) *Competent persons and qualified persons.* The employer must train each competent person and each qualified person regarding the requirements of this subpart applicable to their respective roles.

(e) *Crush/pinch points.* The employer must train each employee who works with the equipment to keep clear of holes, and crush/pinch points and the hazards addressed in § 1926.1424 (Work area control).

(f) *Tag-out.* The employer must train each operator and each additional employee authorized to start/energize equipment or operate equipment controls (such as maintenance and repair employees), in the tag-out and start-up procedures in §§ 1926.1417(f) and (g).

(g) *Training administration.*

(1) The employer must evaluate each employee required to be trained under this subpart to confirm that the employee understands the information provided in the training.

(2) The employer must provide refresher training in relevant topics for each employee when, based on the conduct of the employee or an evaluation of the employee's knowledge, there is an indication that retraining is necessary.

(3) Whenever training is required under subpart CC, the employer must provide the training at no cost to the employee.

§ 1926.1431 Hoisting personnel.

The requirements of this section are supplemental to the other requirements in this subpart and apply when one or more employees are hoisted.

(a) The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions. This paragraph does not apply to work covered by subpart R (Steel Erection) of this part.

(b) *Use of personnel platform.*

(1) When using equipment to hoist employees, the employees must be in a personnel platform that meets the requirements of paragraph (e) of this section.

(2) *Exceptions:* A personnel platform is not required for hoisting employees:

(i) Into and out of drill shafts that are up to and including 8 feet in diameter (*see* paragraph (o) of this section for requirements for hoisting these employees).

(ii) In pile driving operations (*see* paragraph (p) of this section for requirements for hoisting these employees).

(iii) Solely for transfer to or from a marine worksite in a marine-hoisted personnel transfer device (*see* paragraph (r) of this section for requirements for hoisting these employees).

(iv) In storage-tank (steel or concrete), shaft and chimney operations (*see* paragraph (s) of this section for requirements for hoisting these employees).

(c) *Equipment set-up.*

(1) The equipment must be uniformly level, within one percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.

(2) Equipment with outriggers or stabilizers must have them all extended and locked. The amount of extension must be the same for all outriggers and stabilizers and in accordance with manufacturer procedures and load charts.

(d) *Equipment criteria.*

(1) *Capacity: Use of suspended personnel platforms.* The total load (with the platform loaded, including the hook, load line and rigging) must not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.

(2) *Capacity: Use of boom-attached personnel platforms.* The total weight of the loaded personnel platform must not exceed 50 percent of the rated capacity for the radius and configuration of the equipment (except during proof testing).

(3) *Capacity: Hoisting personnel without a personnel platform.* When hoisting personnel without a personnel platform pursuant to paragraph (b)(2) of this section, the total load (including the hook, load line, rigging and any other equipment that imposes a load) must not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.

(4) When the occupied personnel platform is in a stationary working position, the load and boom hoist brakes, swing brakes, and operator actuated secondary braking and locking features (such as pawls or dogs) or automatic secondary brakes must be engaged.

(5) *Devices.*

(i) Equipment (except for derricks and articulating cranes) with a variable angle boom must be equipped with all of the following:

(A) A boom angle indicator, readily visible to the operator, and

(B) A boom hoist limiting device.

(ii) Articulating cranes must be equipped with a properly functioning automatic overload protection device.

(iii) Equipment with a luffing jib must be equipped with:

(A) A jib angle indicator, readily visible to the operator, and.

(B) A jib hoist limiting device.

(iv) Equipment with telescoping booms must be equipped with a device to indicate the boom's extended length clearly to the operator, or must have measuring marks on the boom.

(v) *Anti two-block.* A device which automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component) must be used. The device(s) must prevent such damage/failure at all points where two-blocking could occur. *Exception:* This device is not required when hoisting personnel in pile driving operations. Instead, paragraph (p)(2) of this section specifies how to prevent two-blocking during such operations.

(vi) *Controlled load lowering.* The load line hoist drum must have a system, other than the load line hoist brake, which regulates the lowering rate of speed of the hoist mechanism. This system or device must be used when hoisting personnel.

Note: Free fall of the load line hoist is prohibited (*see* § 1926.1426(d); the use of equipment in which the boom hoist mechanism can free fall is also prohibited (*see* § 1926.1426(a)(1).

(vii) *Proper operation required.* Personnel hoisting operations must not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator must safely stop operations. Personnel hoisting operations must not resume until the device is again working properly. Alternative measures are not permitted. (*See* § 1926.1417 for tag-out and related requirements.)

(6) Direct attachment of a personnel platform to a luffing jib is prohibited.

(e) *Personnel platform criteria.*

(1) A qualified person familiar with structural design must design the personnel platform and attachment/suspension system used for hoisting personnel.

(2) The system used to connect the personnel platform to the equipment

must allow the platform to remain within 10 degrees of level, regardless of boom angle.

(3) The suspension system must be designed to minimize tipping of the platform due to movement of employees occupying the platform.

(4) The personnel platform itself (excluding the guardrail system and personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(5) All welding of the personnel platform and its components must be performed by a certified welder familiar with the weld grades, types and material specified in the platform design.

(6) The personnel platform must be equipped with a guardrail system which meets the requirements of subpart M of this part, and must be enclosed at least from the toeboard to mid-rail with either solid construction material or expanded metal having openings no greater than ½ inch (1.27 cm). Points to which personal fall arrest systems are attached must meet the anchorage requirements in subpart M of this part.

(7) A grab rail must be installed inside the entire perimeter of the personnel platform except for access gates/doors.

(8) *Access gates/doors.* If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) must:

(i) Not swing outward. If due to the size of the personnel platform, such as a 1-person platform, it is infeasible for the door to swing inward and allow safe entry for the platform occupant, then the access gate/door may swing outward.

(ii) Be equipped with a device that prevents accidental opening.

(9) Headroom must be sufficient to allow employees to stand upright in the platform.

(10) In addition to the use of hard hats, employees must be protected by overhead protection on the personnel platform when employees are exposed to falling objects. The platform overhead protection must not obscure the view of the operator or platform occupants (such as wire mesh that has up to ½ inch openings), unless full protection is necessary.

(11) All edges exposed to employee contact must be smooth enough to prevent injury.

(12) The weight of the platform and its rated capacity must be conspicuously posted on the platform with a plate or other permanent marking.

(f) *Personnel platform loading.*

(1) The personnel platform must not be loaded in excess of its rated capacity.

(2) *Use.*

(i) Personnel platforms must be used only for employees, their tools, and the materials necessary to do their work. Platforms must not be used to hoist materials or tools when not hoisting personnel.

(ii) *Exception:* Materials and tools to be used during the lift, if secured and distributed in accordance with paragraph (f)(3) of this section may be in the platform for trial lifts.

(3) Materials and tools must be:

(i) Secured to prevent displacement.

(ii) Evenly distributed within the confines of the platform while it is suspended.

(4) The number of employees occupying the personnel platform must not exceed the maximum number the platform was designed to hold or the number required to perform the work, whichever is less.

(g) *Attachment and rigging.*

(1) *Hooks and other detachable devices.*

(i) Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul ball assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) must be:

(A) Of a type that can be closed and locked, eliminating the throat opening.

(B) Closed and locked when attached.

(ii) Shackles used in place of hooks must be of the alloy anchor type, with either:

(A) A bolt, nut and retaining pin, in place; or

(B) Of the screw type, with the screw pin secured from accidental removal.

(iii) Where other detachable devices are used, they must be of the type that can be closed and locked to the same extent as the devices addressed in paragraphs (g)(1)(i) and (ii) of this section. Such devices must be closed and locked when attached.

(2) *Rope bridle.* When a rope bridle is used to suspend the personnel platform, each bridle leg must be connected to a master link or shackle (*see* paragraph (g)(1) of this section) in a manner that ensures that the load is evenly divided among the bridle legs.

(3) Rigging hardware (including wire rope, shackles, rings, master links, and other rigging hardware) and hooks must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component. Where rotation resistant rope is used, the slings must be capable of supporting without failure at least ten times the maximum intended load.

(4) Eyes in wire rope slings must be fabricated with thimbles.

(5) Bridles and associated rigging for suspending the personnel platform must be used only for the platform and the necessary employees, their tools and materials necessary to do their work. The bridles and associated rigging must not have been used for any purpose other than hoisting personnel.

(h) *Trial lift and inspection.*

(1) A trial lift with the unoccupied personnel platform loaded at least to the anticipated liftweight must be made from ground level, or any other location where employees will enter the platform, to each location at which the platform is to be hoisted and positioned. Where there is more than one location to be reached from a single set-up position, either individual trial lifts for each location, or a single trial lift, in which the platform is moved sequentially to each location, must be performed; the method selected must be the same as the method that will be used to hoist the personnel.

(2) The trial lift must be performed immediately prior to each shift in which personnel will be hoisted. In addition, the trial lift must be repeated prior to hoisting employees in each of the following circumstances:

(i) The equipment is moved and set up in a new location or returned to a previously used location.

(ii) The lift route is changed, unless the competent person determines that the new route presents no new factors affecting safety.

(3) The competent person must determine that:

(i) Safety devices and operational aids required by this section are activated and functioning properly. Other safety devices and operational aids must meet the requirements of § 1926.1415 and § 1926.1416.

(ii) Nothing interferes with the equipment or the personnel platform in the course of the trial lift.

(iii) The lift will not exceed 50 percent of the equipment's rated capacity at any time during the lift.

(iv) The load radius to be used during the lift has been accurately determined.

(4) Immediately after the trial lift, the competent person must:

(i) Conduct a visual inspection of the equipment, base support or ground, and personnel platform, to determine whether the trial lift has exposed any defect or problem or produced any adverse effect.

(ii) Confirm that, upon the completion of the trial lift process, the test weight has been removed.

(5) Immediately prior to each lift:

(i) 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.

(ii) The following conditions must be determined by a competent person to exist before the lift of personnel proceeds:

(A) Hoist ropes must be free of deficiencies in accordance with § 1926.1413(a).

(B) Multiple part lines must not be twisted around each other.

(C) The primary attachment must be centered over the platform.

(D) 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.

(6) Any condition found during the trial lift and subsequent inspection(s) that fails to meet a requirement of this standard or otherwise creates a safety hazard must be corrected before hoisting personnel. (*See* § 1926.1417 for tag-out and related requirements.)

(i) [*Reserved.*]

(j) *Proof testing.*

(1) At each jobsite, prior to hoisting employees on the personnel platform, and after any repair or modification, the platform and rigging must be proof tested to 125 percent of the platform's rated capacity. The proof test may be done concurrently with the trial lift.

(2) The platform must be lowered by controlled load lowering, braked, and held in a suspended position for a minimum of five minutes with the test load evenly distributed on the platform.

(3) After proof testing, a competent person must inspect the platform and rigging to determine if the test has been passed. If any deficiencies are found that pose a safety hazard, the platform and rigging must not be used to hoist personnel unless the deficiencies are corrected, the test is repeated, and a competent person determines that the test has been passed. (*See* § 1926.1417 for tag-out and related requirements.)

(4) Personnel hoisting must not be conducted until the competent person determines that the platform and rigging have successfully passed the proof test.

(k) *Work practices.*

(1) Hoisting of the personnel platform must be performed in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.

(2) Platform occupants must:

(i) Keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.

(ii) Not stand, sit on, or work from the top or intermediate rail or toeboard, or use any other means/device to raise their working height.

(iii) Not pull the platform out of plumb in relation to the hoisting equipment.

(3) Before employees exit or enter a hoisted personnel platform that is not landed, the platform must be secured to the structure where the work is to be performed, unless the employer can demonstrate that securing to the structure would create a greater hazard.

(4) If the platform is tied to the structure, the operator must not move the platform until the operator receives confirmation that it is freely suspended.

(5) Tag lines must be used when necessary to control the platform.

(6) *Platforms without controls.* Where the platform is not equipped with controls, the equipment operator must remain at the equipment controls, on site, and in view of the equipment, at all times while the platform is occupied.

(7) *Platforms with controls.* Where the platform is equipped with controls, all of the following must be met at all times while the platform is occupied:

(i) The occupant using the controls in the platform must be a qualified person with respect to their use, including the safe limitations of the equipment and hazards associated with its operation.

(ii) The equipment operator must be at a set of equipment controls that include boom and swing functions of the equipment, and must be on site and in view of the equipment.

(iii) The platform operating manual must be in the platform or on the equipment.

(8) *Environmental conditions.*

(i) *Wind.* When wind speed (sustained or gusts) exceeds 20 mph at the personnel platform, a qualified person must determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation must not begin (or, if already in progress, must be terminated).

(ii) *Other weather and environmental conditions.* A qualified person must determine if, in light of indications of dangerous weather conditions, or other impending or existing danger, it is not safe to lift personnel. If it is not, the lifting operation must not begin (or, if already in progress, must be terminated).

(9) Employees being hoisted must remain in direct communication with the signal person (where used), or the operator.

(10) *Fall protection.*

(i) Except over water, employees occupying the personnel platform must be provided and use a personal fall arrest system. The system must be attached to a structural member within the personnel platform. When working over or near water, the requirements of § 1926.106 apply.

(ii) The fall arrest system, including the attachment point (anchorage) used to comply with paragraph (i) of this section, must meet the requirements in § 1926.502.

(11) *Other load lines.*

(i) No lifts must be made on any other of the equipment's load lines while personnel are being hoisted, except in pile driving operations.

(ii) *Factory-produced boom-mounted personnel platforms that incorporate a winch as original equipment.* Loads are permitted to be hoisted by such a winch while employees occupy the personnel platform only where the load on the winch line does not exceed 500 pounds and does not exceed the rated capacity of the winch and platform.

(12) *Traveling—equipment other than derricks.*

(i) Hoisting of employees while the equipment is traveling is prohibited, except for:

(A) Equipment that travels on fixed rails; or

(B) Where the employer demonstrates that there is no less hazardous way to perform the work.

(C) This exception does not apply to rubber-tired equipment.

(ii) Where employees are hoisted while the equipment is traveling, all of the following criteria must be met:

(A) Equipment travel must be restricted to a fixed track or runway.

(B) Where a runway is used, it must be a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the equipment being used to lift and travel with the personnel platform. An existing surface may be used as long as it meets these criteria.

(C) Equipment travel must be limited to boom length.

(D) The boom must be parallel to the direction of travel, except where it is safer to do otherwise.

(E) A complete trial run must be performed to test the route of travel before employees are allowed to occupy the platform. This trial run can be performed at the same time as the trial lift required by paragraph (h) of this section which tests the lift route.

(13) *Traveling—derricks.* Derricks are prohibited from traveling while personnel are hoisted.

(l) [*Reserved.*]

(m) *Pre-lift meeting.* A pre-lift meeting must be:

(1) Held to review the applicable requirements of this section and the procedures that will be followed.

(2) Attended by the equipment operator, signal person (if used for the

lift), employees to be hoisted, and the person responsible for the task to be performed.

(3) Held prior to the trial lift at each new work location, and must be repeated for any employees newly assigned to the operation.

(n) *Hoisting personnel near power lines.* Hoisting personnel within 20 feet of a power line that is up to 350 kV, and hoisting personnel within 50 feet of a power line that is over 350 kV, is prohibited, except for work covered by subpart V of this part (Power Transmission and Distribution).

(o) *Hoisting personnel in drill shafts.* When hoisting employees into and out of drill shafts that are up to and including 8 feet in diameter, all of the following requirements must be met:

(1) The employee must be in either a personnel platform or on a boatswain's chair.

(2) If using a personnel platform, paragraphs (a) through (n) of this section apply.

(3) If using a boatswain's chair:

(i) The following paragraphs of this section apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "boatswain's chair."

(ii) A signal person must be stationed at the shaft opening.

(iii) The employee must be hoisted in a slow, controlled descent and ascent.

(iv) The employee must use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick.

(v) The fall protection equipment must meet the applicable requirements in § 1926.502.

(vi) The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vii) No more than one person must be hoisted at a time.

(p) *Hoisting personnel for pile driving operations.* When hoisting an employee in pile driving operations, the following requirements must be met:

(1) The employee must be in a personnel platform or boatswain's chair.

(2) For lattice boom cranes: Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached. For telescopic boom cranes: Clearly mark the cable (so that it can be easily seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(3) If using a personnel platform, paragraphs (b) through (n) of this section apply.

(4) If using a boatswain's chair:

(i) The following paragraphs of this section apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (j), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), and (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "boatswains chair."

(ii) The employee must be hoisted in a slow, controlled descent and ascent.

(iii) The employee must use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhaul ball.

(iv) The fall protection equipment must meet the applicable requirements in § 1926.502.

(v) The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vi) No more than one person must be hoisted at a time.

(q) [*Reserved.*]

(r) *Hoisting personnel for marine transfer.* When hoisting employees solely for transfer to or from a marine worksite, the following requirements must be met:

(1) The employee must be in either a personnel platform or a marine-hoisted personnel transfer device.

(2) If using a personnel platform, paragraphs (a) through (n) of this section apply.

(3) If using a marine-hoisted personnel transfer device:

(i) The following paragraphs of this section apply: (a), (c)(2), (d)(1), (d)(3), (d)(4), (e)(1) through (5), (e)(12), (f)(1), (g), (h), (j), (k)(1), (k)(8), (k)(9), (k)(10)(ii), (k)(11)(i), (k)(12), (m), and (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "marine-hoisted personnel transfer device."

(ii) The transfer device must be used only for transferring workers.

(iii) The number of workers occupying the transfer device must not exceed the maximum number it was designed to hold.

(iv) Each employee must wear a U.S. Coast Guard personal flotation device approved for industrial use.

(s) *Hoisting personnel for storage-tank (steel or concrete), shaft and chimney operations.* When hoisting an employee in storage tank (steel or concrete), shaft and chimney operations, the following requirements must be met:

(1) The employee must be in a personnel platform except when the employer can demonstrate that use of a personnel platform is infeasible; in such a case, a boatswain's chair must be used.

(2) If using a personnel platform, paragraphs (a) through (n) of this section apply.

(3) If using a boatswain's chair:

(i) The following paragraphs of this section apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), (n). Where the terms "personnel platform" or "platform" are used in these paragraphs, substitute them with "boatswains chair."

(ii) The employee must be hoisted in a slow, controlled descent and ascent.

(iii) The employee must use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick. When there is no adequate structure for attachment of personal fall arrest equipment as required in § 1926.502(d)(15), the attachment must be to the lower load block or overhaul ball.

(iv) The fall protection equipment must meet the applicable requirements in § 1926.502.

(v) The boatswain's chair itself (excluding the personal fall arrest system anchorages), must be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vi) No more than one person must be hoisted at a time.

§ 1926.1432 Multiple-crane/derrick lifts—supplemental requirements.

(a) *Plan development.* Before beginning a crane/derrick operation in which more than one crane/derrick will be supporting the load, the operation must be planned. The planning must meet the following requirements:

(1) The plan must be developed by a qualified person.

(2) The plan must be designed to ensure that the requirements of this subpart are met.

(3) Where the qualified person determines that engineering expertise is needed for the planning, the employer must ensure that it is provided.

(b) *Plan implementation.*

(1) The multiple-crane/derrick lift must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by

one or more qualified persons (lift director).

(2) The lift director must review the plan in a meeting with all workers who will be involved with the operation.

§ 1926.1433 Design, construction and testing.

The following requirements apply to equipment that has a manufacturer-rated hoisting/lifting capacity of more than 2,000 pounds.

(a) Crawler, truck and locomotive cranes manufactured prior to November 8, 2010 must meet the applicable requirements for design, construction, and testing as prescribed in ANSI B30.5–1968 (incorporated by reference, *see* § 1926.6), PCSA Std. No. 2 (1968) (incorporated by reference, *see* § 1926.6), the requirements in paragraph (b) of this section, or the applicable DIN standards that were in effect at the time of manufacture.

(b) Mobile (including crawler and truck) and locomotive cranes manufactured on or after November 8, 2010 must meet the following portions of ASME B30.5–2004 (incorporated by reference, *see* § 1926.6) as applicable:

(1) In section 5–1.1.1 ("Load Ratings—Where Stability Governs Lifting Performance"), paragraphs (a)—(d) (including subparagraphs).

(2) In section 5–1.1.2 ("Load Ratings—Where Structural Competence Governs Lifting Performance"), paragraph (b).

(3) Section 5–1.2 ("Stability (Backward and Forward)").

(4) In section 5–1.3.1 ("Boom Hoist Mechanism"), paragraphs (a), (b)(1) and (b)(2), except that when using rotation resistant rope, § 1926.1414(c)(4)(ii)(A) applies.

(5) In section 5–1.3.2 ("Load Hoist Mechanism"), paragraphs (a)(2) through (a)(4) (including subparagraphs), (b) (including subparagraphs), (c) (first sentence only) and (d).

(6) Section 5–1.3.3 ("Telescoping Boom").

(7) Section 5–1.4 ("Swing Mechanism").

(8) In section 5–1.5 ("Crane Travel"), all provisions except 5–1.5.3(d).

(9) In section 5–1.6 ("Controls"), all provisions except 5–1.6.1 (c).

(10) Section 5–1.7.4 ("Sheaves").

(11) Section 5–1.7.5 ("Sheave sizes").

(12) In section 5–1.9.1 ("Booms"), paragraph (f).

(13) Section 5–1.9.3 ("Outriggers").

(14) Section 5–1.9.4 ("Locomotive Crane Equipment").

(15) Section 5–1.9.7 ("Clutch and Brake Protection").

(16) In section 5–1.9.11 ("Miscellaneous equipment"), paragraphs (a), (c), (e), and (f).

(c) Prototype testing: mobile (including crawler and truck) and locomotive cranes manufactured on or after November 8, 2010 must meet the prototype testing requirements in Test Option A or Test Option B of this section. Tower cranes manufactured on or after November 8, 2010 must meet the prototype testing requirements in BS EN 14439:2006 (incorporated by reference, *see* § 1926.6).

Note: Prototype testing of crawler, locomotive and truck cranes manufactured prior to November 8, 2010 must conform to paragraph (a) of this section.

(1) *Test Option A.*

(i) The following applies to equipment with cantilevered booms (such as hydraulic boom cranes): All the tests listed in SAE J1063 (Nov. 1993) Table 1 (incorporated by reference, *see* § 1926.6) must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J1063 (Nov. 1993) Table 2 (incorporated by reference, *see* § 1926.6) must be met.

(ii) The following applies to equipment with pendant supported lattice booms: All the tests listed in SAE J987 (Jun. 2003) Table 1 (incorporated by reference, *see* § 1926.6) must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J987 (Jun. 2003) Table 2 (incorporated by reference, *see* § 1926.6) must be met.

(2) *Test Option B.* The testing and verification requirements of BS EN 13000:2004 (incorporated by reference, *see* § 1926.6) must be met. In applying BS EN 13000:2004, the following additional requirements must be met:

(i) The following applies to equipment with cantilevered booms (such as hydraulic boom cranes): The analysis methodology (computer modeling) must demonstrate that all load cases listed in SAE J1063 (Nov. 1993) (incorporated by reference, *see* § 1926.6) meet the strength margins listed in SAE J1063 (Nov. 1993) Table 2.

(ii) The following applies to equipment with pendant supported lattice booms: The analysis methodology (computer modeling) must demonstrate that all load cases listed in SAE J987 (Jun. 2003) (incorporated by reference, *see* § 1926.6) meet the strength margins listed in SAE J987 (Jun. 2003) Table 2.

(iii) *Analysis verification.* The physical testing requirements under SAE J1063 (Nov. 1993) (incorporated by reference, *see* § 1926.6) and SAE J987 (Jun. 2003) (incorporated by reference, *see* § 1926.6) must be met unless the reliability of the analysis methodology (computer modeling) has been demonstrated by a documented history of verification through strain gauge measuring or strain gauge measuring in combination with other physical testing.

(d) All equipment covered by this subpart must meet the following requirements:

(1) *Rated capacity and related information.* The information available in the cab (*see* § 1926.1417(c)) regarding "rated capacity" and related information must include, at a minimum, the following information:

(i) A complete range of the manufacturer's equipment rated capacities, as follows:

(A) At all manufacturer approved operating radii, boom angles, work areas, boom lengths and configurations, jib lengths and angles (or offset).

(B) Alternate ratings for use and nonuse of option equipment which affects rated capacities, such as outriggers, stabilizers, and extra counterweights.

(ii) A work area chart for which capacities are listed in the load chart. (**Note:** An example of this type of chart is in ASME B30.5–2004, section 5–1.1.3, Figure 11).

(iii) The work area figure and load chart must clearly indicate the areas where no load is to be handled.

(iv) Recommended reeving for the hoist lines must be shown.

(v) Recommended parts of hoist reeving, size, and type of wire rope for various equipment loads.

(vi) Recommended boom hoist reeving diagram, where applicable; size, type and length of wire rope.

(vii) Tire pressure (where applicable).

(viii) Caution or warnings relative to limitations on equipment and operating procedures, including an indication of the least stable direction.

(ix) Position of the gantry and requirements for intermediate boom suspension (where applicable).

(x) Instructions for boom erection and conditions under which the boom, or boom and jib combinations, may be raised or lowered.

(xi) Whether the hoist holding mechanism is automatically or manually controlled, whether free fall is available, or any combination of these.

(xii) The maximum telescopic travel length of each boom telescopic section.

(xiii) Whether sections are telescoped manually or with power.

(xiv) The sequence and procedure for extending and retracting the telescopic boom section.

(xv) Maximum loads permitted during the boom extending operation, and any limiting conditions or cautions.

(xvi) Hydraulic relief valve settings specified by the manufacturer.

(2) Load hooks (including latched and unlatched types), ball assemblies and load blocks must be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths and the number of parts of the line in use.

(3) Hook and ball assemblies and load blocks must be marked with their rated capacity and weight.

(4) *Latching hooks.*

(i) Hooks must be equipped with latches, except where the requirements of paragraph (d)(4)(ii) of this section are met.

(ii) Hooks without latches, or with latches removed or disabled, must not be used unless:

(A) A qualified person has determined that it is safer to hoist and place the load without latches (or with the latches removed/tied-back).

(B) Routes for the loads are pre-planned to ensure that no employee is required to work in the fall zone except for employees necessary for the hooking or unhooking of the load.

(iii) The latch must close the throat opening and be designed to retain slings or other lifting devices/accessories in the hook when the rigging apparatus is slack.

(5) *Posted warnings.* Posted warnings required by this subpart as well as those originally supplied with the equipment by the manufacturer must be maintained in legible condition.

(6) An accessible fire extinguisher must be on the equipment.

(7) *Cabs.* Equipment with cabs must meet the following requirements:

(i) Cabs must be designed with a form of adjustable ventilation and method for clearing the windshield for maintaining visibility and air circulation. Examples of means for adjustable ventilation include air conditioner or window that can be opened (for ventilation and air circulation); examples of means for maintaining visibility include heater (for preventing windshield icing), defroster, fan, windshield wiper.

(ii) Cab doors (swinging, sliding) must be designed to prevent inadvertent opening or closing while traveling or operating the machine. Swinging doors adjacent to the operator must open outward. Sliding operator doors must open rearward.

(iii) *Windows.*

(A) The cab must have windows in front and on both sides of the operator. Forward vertical visibility must be sufficient to give the operator a view of the boom point at all times.

(B) Windows may have sections designed to be opened or readily removed. Windows with sections designed to be opened must be designed so that they can be secured to prevent inadvertent closure.

(C) Windows must be of safety glass or material with similar optical and safety properties, that introduce no visible distortion or otherwise obscure visibility that interferes with the safe operation of the equipment.

(iv) A clear passageway must be provided from the operator's station to an exit door on the operator's side.

(v) Areas of the cab roof that serve as a workstation for rigging, maintenance or other equipment-related tasks must be capable of supporting 250 pounds without permanent distortion.

(8) Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, and other parts or components that reciprocate, rotate or otherwise move must be guarded where contact by employees (except for maintenance and repair employees) is possible in the performance of normal duties.

(9) All exhaust pipes, turbochargers, and charge air coolers must be insulated or guarded where contact by employees (except for maintenance and repair employees) is possible in the performance of normal duties.

(10) Hydraulic and pneumatic lines must be protected from damage to the extent feasible.

(11) The equipment must be designed so that exhaust fumes are not discharged in the cab and are discharged in a direction away from the operator.

(12) *Friction mechanisms.* Where friction mechanisms (such as brakes and clutches) are used to control the boom hoist or load line hoist, they must be:

(i) Of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.

(ii) Adjustable to permit compensation for lining wear to maintain proper operation.

(13) *Hydraulic load hoists.* Hydraulic drums must have an integrally mounted holding device or internal static brake to prevent load hoist movement in the event of hydraulic failure.

(e) The employer's obligations under paragraphs (a) through (c) and (d)(7) through (13) of this section are met where the equipment has not changed (except in accordance with § 1926.1434 (Equipment modifications)) and it can refer to documentation from the manufacturer showing that the equipment has been designed, constructed and tested in accordance with those paragraphs.

§ 1926.1434 Equipment modifications.

(a) Modifications or additions which affect the capacity or safe operation of the equipment are prohibited except where the requirements of paragraphs (a)(1), (a)(2), (a)(3), (a)(4), or (a)(5) of this section are met.

(1) *Manufacturer review and approval.*

(i) The manufacturer approves the modifications/additions in writing.

(ii) The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.

(iii) The original safety factor of the equipment is not reduced.

(2) *Manufacturer refusal to review request.* The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/addition, but it declines to review the technical merits of the proposal or fails, within 30 days, to acknowledge the request or initiate the review, and all of the following are met:

(i) A registered professional engineer who is a qualified person with respect to the equipment involved:

(A) Approves the modification/addition and specifies the equipment configurations to which that approval applies, and

(B) Modifies load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition.

(ii) The original safety factor of the equipment is not reduced.

(3) *Unavailable manufacturer.* The manufacturer is unavailable and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

(4) *Manufacturer does not complete the review within 120 days of the request.* The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/addition, agrees to review the technical merits of the proposal, but fails to complete the review of the proposal within 120 days of the date it was provided the detailed description of the proposed modification/addition, and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

(5) *Multiple manufacturers of equipment designed for use on marine work sites.* The equipment is designed for marine work sites, contains major structural components from more than one manufacturer, and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

(b) Modifications or additions which affect the capacity or safe operation of the equipment are prohibited where the manufacturer, after a review of the technical safety merits of the proposed modification/addition, rejects the proposal and explains the reasons for

the rejection in a written response. If the manufacturer rejects the proposal but does not explain the reasons for the rejection in writing, the employer may treat this as a manufacturer refusal to review the request under paragraph (a)(2) of this section.

(c) The provisions in paragraphs (a) and (b) of this section do not apply to modifications made or approved by the U.S. military.

§ 1926.1435 Tower cranes.

(a) This section contains supplemental requirements for tower cranes; all sections of this subpart apply to tower cranes unless specified otherwise.

(b) *Erecting, climbing and dismantling.*

(1) Section 1926.1403 (Assembly/Disassembly—selection of manufacturer or employer procedures), § 1926.1404 (Assembly/Disassembly—general requirements (applies to all assembly and disassembly operations)), § 1926.1405 (Disassembly—additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures)), and § 1926.1406 (Assembly/Disassembly—employer procedures—general requirements), apply to tower cranes (except as otherwise specified), except that the term "assembly/disassembly" is replaced by "erecting, climbing and dismantling," and the term "disassembly" is replaced by "dismantling."

(2) *Dangerous areas (self-erecting tower cranes).* In addition to the requirements in § 1926.1404(e), for self-erecting tower cranes, the following applies: Employees must not be in or under the tower, jib, or rotating portion of the crane during erecting, climbing and dismantling operations until the crane is secured in a locked position and the competent person in charge indicates it is safe to enter this area, unless the manufacturer's instructions direct otherwise and only the necessary personnel are permitted in this area.

(3) *Foundations and structural supports.* Tower crane foundations and structural supports (including both the portions of the structure used for support and the means of attachment) must be designed by the manufacturer or a registered professional engineer.

(4) *Addressing specific hazards.* The requirements in § 1926.1404(h)(1) through (9) apply. In addition, the A/D director must address the following:

(i) *Foundations and structural supports.* The A/D director must determine that tower crane foundations and structural supports are installed in accordance with their design.

(ii) *Loss of backward stability.* Backward stability before swinging self erecting cranes or cranes on traveling or static undercarriages.

(iii) *Wind speed.* Wind must not exceed the speed recommended by the manufacturer or, where manufacturer does not specify this information, the speed determined by a qualified person.

(5) *Plumb tolerance.* Towers must be erected plumb to the manufacturer's tolerance and verified by a qualified person. Where the manufacturer does not specify plumb tolerance, the crane tower must be plumb to a tolerance of at least 1:500 (approximately 1 inch in 40 feet).

(6) *Multiple tower crane jobsites.* On jobsites where more than one fixed jib (hammerhead) tower crane is installed, the cranes must be located such that no crane can come in contact with the structure of another crane. Cranes are permitted to pass over one another.

(7) *Climbing procedures.* Prior to, and during, all climbing procedures (including inside climbing and top climbing), the employer must:

(i) Comply with all manufacturer prohibitions.

(ii) Have a registered professional engineer verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages and supporting floors.

(8) *Counterweight/ballast.*

(i) Equipment must not be erected, dismantled or operated without the amount and position of counterweight and/or ballast in place as specified by the manufacturer or a registered professional engineer familiar with the equipment.

(ii) The maximum counterweight and/or ballast specified by the manufacturer or registered professional engineer familiar with the equipment must not be exceeded.

(c) *Signs.* The size and location of signs installed on tower cranes must be in accordance with manufacturer specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve in writing the size and location of any signs.

(d) *Safety devices.*

(1) Section 1926.1415 does not apply to tower cranes.

(2) The following safety devices are required on all tower cranes unless otherwise specified:

(i) Boom stops on luffing boom type tower cranes.

(ii) Jib stops on luffing boom type tower cranes if equipped with a jib attachment.

(iii) Travel rail end stops at both ends of travel rail.

(iv) Travel rail clamps on all travel bogies.

(v) Integrally mounted check valves on all load supporting hydraulic cylinders.

(vi) Hydraulic system pressure limiting device.

(vii) The following brakes, which must automatically set in the event of pressure loss or power failure, are required:

(A) A hoist brake on all hoists.

(B) Swing brake.

(C) Trolley brake.

(D) Rail travel brake.

(viii) Deadman control or forced neutral return control (hand) levers.

(ix) Emergency stop switch at the operator's station.

(x) Trolley end stops must be provided at both ends of travel of the trolley.

(3) *Proper operation required.* Operations must not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. The equipment must be taken out of service, and operations must not resume until the device is again working properly. *See* § 1926.1417(f). Alternative measures are not permitted to be used.

(e) *Operational aids.*

(1) Section 1926.1416 does not apply to tower cranes.

(2) The devices listed in this section ("operational aids") are required on all tower cranes covered by this subpart, unless otherwise specified.

(3) Operations must not begin unless the operational aids are in proper working order, except where the employer meets the specified temporary alternative measures. More protective alternative measures specified by the tower crane manufacturer, if any, must be followed. *See* § 1926.1417(j) for additional requirements.

(4) If an operational aid stops working properly during operations, the operator must safely stop operations until the temporary alternative measures are implemented or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted and is not considered a modification under § 1926.1434.

(5) *Category I operational aids and alternative measures.* Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 calendar days after the deficiency occurs. *Exception:* If the employer documents that it has ordered

the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receipt of the parts.

(i) *Trolley travel limiting device.* The travel of the trolley must be restricted at both ends of the jib by a trolley travel limiting device to prevent the trolley from running into the trolley end stops. *Temporary alternative measures:*

(A) *Option A.* The trolley rope must be marked (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the trolley prior to the end stops.

(B) *Option B.* A spotter who is in direct communication with the operator must be used when operations are conducted within 10 feet of the outer or inner trolley end stops.

(ii) *Boom hoist limiting device.* The range of the boom must be limited at the minimum and maximum radius. *Temporary alternative measures:* Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the boom hoist within the minimum and maximum boom radius, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(iii) *Anti two-blocking device.* The tower crane must be equipped with a device which automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage at all points where two-blocking could occur. *Temporary alternative measures:* Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(iv) *Hoist drum lower limiting device.* Tower cranes manufactured after November 8, 2011 must be equipped with a device that prevents the last 2 wraps of hoist cable from being spooled off the drum. *Temporary alternative measures:* Mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the hoist prior to last 2 wraps of hoist cable being spooled off the drum, or use a spotter who is in direct communication with the operator to inform the operator when this point is reached

(v) *Load moment limiting device.* The tower crane must have a device that prevents moment overloading. *Temporary alternative measures:* A radius indicating device must be used (if the tower crane is not equipped with a radius indicating device, the radius must be measured to ensure the load is within the rated capacity of the crane). In addition, the weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information must be provided to the operator prior to the lift.

(vi) *Hoist line pull limiting device.* The capacity of the hoist must be limited to prevent overloading, including each individual gear ratio if equipped with a multiple speed hoist transmission. *Temporary alternative measures:* The operator must ensure that the weight of the load does not exceed the capacity of the hoist (including for each individual gear ratio if equipped with a multiple speed hoist transmission).

(vii) *Rail travel limiting device.* The travel distance in each direction must be limited to prevent the travel bogies from running into the end stops or buffers. *Temporary alternative measures:* A spotter who is in direct communication with the operator must be used when operations are conducted within 10 feet of either end of the travel rail end stops; the spotter must inform the operator of the distance of the travel bogies from the end stops or buffers.

(viii) *Boom hoist drum positive locking device and control.* The boom hoist drum must be equipped with a control that will enable the operator to positively lock the boom hoist drum from the cab. *Temporary alternative measures:* The device must be manually set when required if an electric, hydraulic or automatic control is not functioning.

(6) *Category II operational aids and alternative measures.* Operational aids listed in this paragraph that are not working properly must be repaired no later than 30 calendar days after the deficiency occurs. *Exception:* If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the parts.

(i) *Boom angle or hook radius indicator.*

(A) Luffing boom tower cranes must have a boom angle indicator readable from the operator's station.

(B) Hammerhead tower cranes manufactured after November 8, 2011 must have a hook radius indicator readable from the operator's station.

(C) *Temporary alternative measures:* Hook radii or boom angle must be determined by measuring the hook radii or boom angle with a measuring device.

(ii) *Trolley travel deceleration device.* The trolley speed must be automatically reduced prior to the trolley reaching the end limit in both directions. *Temporary alternative measure:* The employer must post a notice in the cab of the crane notifying the operator that the trolley travel deceleration device is malfunctioning and instructing the operator to take special care to reduce the trolley speed when approaching the trolley end limits.

(iii) *Boom hoist deceleration device.* The boom speed must be automatically reduced prior to the boom reaching the minimum or maximum radius limit. *Temporary alternative measure:* The employer must post a notice in the cab of the crane notifying the operator that the boom hoist deceleration device is malfunctioning and instructing the operator to take special care to reduce the boom speed when approaching the minimum or maximum radius limits.

(iv) *Load hoist deceleration device.* The load speed must be automatically reduced prior to the hoist reaching the upper limit. *Temporary alternative measure:* The employer must post a notice in the cab of the crane notifying the operator that the load hoist deceleration device is malfunctioning and instructing the operator to take special care to reduce the load speed when approaching the upper limits.

(v) *Wind speed indicator.* A device must be provided to display the wind speed and must be mounted above the upper rotating structure on tower cranes. On self erecting cranes, it must be mounted at or above the jib level. *Temporary alternative measures:* Use of wind speed information from a properly functioning indicating device on another tower crane on the same site, or a qualified person estimates the wind speed.

(vi) *Load indicating device.* Cranes manufactured after November 8, 2011 must have a device that displays the magnitude of the load on the hook. Displays that are part of load moment limiting devices that display the load on the hook meet this requirement. *Temporary alternative measures:* The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable

means. This information must be provided to the operator prior to the lift.

(f) *Inspections.*

(1) Section 1926.1412 (Inspections) applies to tower cranes, except that the term "assembly" is replaced by "erection." Section 1926.1413 (Wire rope—inspection) applies to tower cranes.

(2) *Pre-erection inspection.* Before each crane component is erected, it must be inspected by a qualified person for damage or excessive wear.

(i) The qualified person must pay particular attention to components that will be difficult to inspect thoroughly during shift inspections.

(ii) If the qualified person determines that a component is damaged or worn to the extent that it would create a safety hazard if used on the crane, that component must not be erected on the crane unless it is repaired and, upon reinspection by the qualified person, found to no longer create a safety hazard.

(iii) If the qualified person determines that, though not presently a safety hazard, the component needs to be monitored, the employer must ensure that the component is checked in the monthly inspections. Any such determination must be documented, and the documentation must be available to any individual who conducts a monthly inspection.

(3) *Post-erection inspection.* In addition to the requirements in § 1926.1412(c), the following requirements must be met:

(i) A load test using certified weights, or scaled weights using a certified scale with a current certificate of calibration, must be conducted after each erection.

(ii) The load test must be conducted in accordance with the manufacturer's instructions when available. Where these instructions are unavailable, the test must be conducted in accordance with written load test procedures developed by a registered professional engineer familiar with the type of equipment involved.

(4) *Monthly.* The following additional items must be included:

(i) Tower (mast) bolts and other structural bolts (for loose or dislodged condition) from the base of the tower crane up or, if the crane is tied to or braced by the structure, those above the upper-most brace support.

(ii) The upper-most tie-in, braces, floor supports and floor wedges where the tower crane is supported by the structure, for loose or dislodged components.

(5) *Annual.* In addition to the items that must be inspected under § 1926.1412(f), all turntable and tower bolts must be inspected for proper condition and torque.

§ 1926.1436 Derricks.

(a) This section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this subpart apply to derricks unless specified otherwise. A derrick is powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting mechanism. The mast/equivalent member and/or the load is moved by the hoisting mechanism (typically base-mounted) and operating ropes. Derricks include: A-frame, basket, breast, Chicago boom, gin pole (except gin poles used for erection of communication towers), guy, shearleg, stiffleg, and variations of such equipment.

(b) *Operation—procedures.*

(1) Section 1926.1417 (Operation) applies except for § 1926.1417(c) (Accessibility of procedures).

(2) *Load chart contents.* Load charts must contain at least the following information:

(i) Rated capacity at corresponding ranges of boom angle or operating radii.

(ii) Specific lengths of components to which the rated capacities apply.

(iii) Required parts for hoist reeving.

(iv) Size and construction of rope must be included on the load chart or in the operating manual.

(3) *Load chart location.*

(i) *Permanent installations.* For permanently installed derricks with fixed lengths of boom, guy, and mast, a load chart must be posted where it is visible to personnel responsible for the operation of the equipment.

(ii) *Non-permanent installations.* For derricks that are not permanently installed, the load chart must be readily available at the job site to personnel responsible for the operation of the equipment.

(c) Construction.

(1) *General requirements.*

(i) Derricks must be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's/builder's procedures and within its rated capacity.

(ii) Welding of load sustaining members must conform to recommended practices in ANSI/AWS D14.3–94 (incorporated by reference, *see* § 1926.6) or AWS D1.1/D1.1M:2002 (incorporated by reference, *see* § 1926.6).

(2) *Guy derricks.*

(i) The minimum number of guys must be 6, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations.

(ii) Guy derricks must not be used unless the employer has the following guy information from the manufacturer or a qualified person, when not available from the manufacturer:

(A) The number of guys.

(B) The spacing around the mast.

(C) The size, grade, and construction of rope to be used for each guy.

(iii) For guy derricks manufactured after December 18, 1970, in addition to the information required in paragraph (c)(2)(ii) of this section, the employer must have the following guy information from the manufacturer or a qualified person, when not available from the manufacturer:

(A) The amount of initial sag or tension.

(B) The amount of tension in guy line rope at anchor.

(iv) The mast base must permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack.

(v) The mast cap must:

(A) Permit the mast to rotate freely.

(B) Withstand tilting and cramping caused by the guy loads.

(C) Be secured to the mast to prevent disengagement during erection.

(D) Be provided with means for attaching guy ropes.

(3) *Stiffleg derricks.*

(i) The mast must be supported in the vertical position by at least two stifflegs; one end of each must be connected to the top of the mast and the other end securely anchored.

(ii) The stifflegs must be capable of withstanding the loads imposed at any point of operation within the load chart range.

(iii) The mast base must:

(A) Permit the mast to rotate freely (when necessary).

(B) Permit deflection of the mast without binding.

(iv) The mast must be prevented from lifting out of its socket when the mast is in tension.

(v) The stiffleg connecting member at the top of the mast must:

(A) Permit the mast to rotate freely (when necessary).

(B) Withstand the loads imposed by the action of the stifflegs.

(C) Be secured so as to oppose separating forces.

(4) *Gin pole derricks.*

(i) Guy lines must be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. *Exception:* Where the size and/or

spacing of guy lines do not result in the gin pole being stable in both boomed and vertical positions, the employer must ensure that the derrick is not used in an unstable position.

(ii) The base of the gin pole must permit movement of the pole (when necessary).

(iii) The gin pole must be anchored at the base against horizontal forces (when such forces are present).

(5) *Chicago boom derricks.* The fittings for stepping the boom and for attaching the topping lift must be arranged to:

(i) Permit the derrick to swing at all permitted operating radii and mounting heights between fittings.

(ii) Accommodate attachment to the upright member of the host structure.

(iii) Withstand the forces applied when configured and operated in accordance with the manufacturer's/builder's procedures and within its rated capacity.

(iv) Prevent the boom or topping lift from lifting out under tensile forces.

(d) *Anchoring and guying.*

(1) Load anchoring data developed by the manufacturer or a qualified person must be used.

(2) *Guy derricks.*

(i) The mast base must be anchored.

(ii) The guys must be secured to the ground or other firm anchorage.

(iii) The anchorage and guying must be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application.

(3) *Stiffleg derricks.*

(i) The mast base and stifflegs must be anchored.

(ii) The mast base and stifflegs must be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular stiffleg spacing and slope specified for the application.

(e) *Swingers and hoists.*

(1) The boom, swinger mechanisms and hoists must be suitable for the derrick work intended and must be anchored to prevent displacement from the imposed loads.

(2) *Hoists.*

(i) Base mounted drum hoists must meet the requirements in the following sections of ASME B30.7–2001 (incorporated by reference, *see* § 1926.6):

(A) Sections 7–1.1 ("Load ratings and markings").

(B) Section 7–1.2 ("Construction"), except: 7–1.2.13 ("Operator's cab"); 7–1.2.15 ("Fire extinguishers").

(C) Section 7–1.3 ("Installation").

(D) Applicable terms in section 7–0.2 ("Definitions").

(ii) *Load tests for new hoists.* The employer must ensure that new hoists are load tested to a minimum of 110% of rated capacity, but not more than 125% of rated capacity, unless otherwise recommended by the manufacturer. This requirement is met where the manufacturer has conducted this testing.

(iii) *Repaired or modified hoists.* Hoists that have had repairs, modifications or additions affecting their capacity or safe operation must be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing must be conducted in accordance with paragraphs (e)(2)(ii) and (iv) of this section.

(iv) *Load test procedure.* Load tests required by paragraphs (e)(2)(ii) or (e)(2)(iii) of this section must be conducted as follows:

(A) The test load must be hoisted a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s).

(B) The test load must be lowered, stopped and held with the brake(s).

(C) The hoist must not be used unless a competent person determines that the test has been passed.

(f) *Operational aids.*

(1) Section 1926.1416 (Operational aids) applies, except for § 1926.1416(d)(1) (Boom hoist limiting device), § 1926.1416(e)(1) (Boom angle or radius indicator), and § 1926.1416(e)(4) (Load weighing and similar devices).

(2) *Boom angle aid.* A boom angle indicator is not required but if the derrick is not equipped with a functioning one, the employer must ensure that either:

(i) The boom hoist cable must be marked with caution and stop marks. The stop marks must correspond to maximum and minimum allowable boom angles. The caution and stop marks must be in view of the operator, or a spotter who is in direct communication with the operator; or

(ii) An electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, is used.

(3) *Load weight/capacity devices.*

(i) Derricks manufactured more than one year after November 8, 2010 with a maximum rated capacity over 6,000 pounds must have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. *Temporary alternative measures:* The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information must be provided to the operator prior to the lift. *See* § 1926.1417(j) for additional requirements.

(ii) A load weight/capacity device that is not working properly must be repaired no later than 30 days after the deficiency occurs. *Exception:* If the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 days, the repair must be completed within 7 days of receipt of the parts.

(g) *Post-assembly approval and testing—new or reinstalled derricks.*

(1) *Anchorages.*

(i) Anchorages, including the structure to which the derrick is attached (if applicable), must be approved by a qualified person.

(ii) If using a rock or hairpin anchorage, the qualified person must determine if any special testing of the anchorage is needed. If so, it must be tested accordingly.

(2) *Functional test.* Prior to initial use, new or reinstalled derricks must be tested by a competent person with no hook load to verify proper operation. This test must include:

(i) Lifting and lowering the hook(s) through the full range of hook travel.

(ii) Raising and lowering the boom through the full range of boom travel.

(iii) Swinging in each direction through the full range of swing.

(iv) Actuating the anti two-block and boom hoist limit devices (if provided).

(v) Actuating locking, limiting and indicating devices (if provided).

(3) *Load test.* Prior to initial use, new or reinstalled derricks must be load tested by a competent person. The test load must meet the following requirements:

(i) Test loads must be at least 100% and no more than 110% of the rated capacity, unless otherwise recommended by the manufacturer or qualified person, but in no event must the test load be less than the maximum anticipated load.

(ii) The test must consist of:

(A) Hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake(s).

(B) Swinging the derrick, if applicable, the full range of its swing, at

the maximum allowable working radius for the test load.

(C) Booming the derrick up and down within the allowable working radius for the test load.

(D) Lowering, stopping and holding the load with the brake(s).

(iii) The derrick must not be used unless the competent person determines that the test has been passed.

(4) *Documentation.* Tests conducted under this paragraph must be documented. The document must contain the date, test results and the name of the tester. The document must be retained until the derrick is re-tested or dismantled, whichever occurs first. All such documents must be available, during the applicable document retention period, to all persons who conduct inspections in accordance with § 1926.1412.

(h) *Load testing repaired or modified derricks.* Derricks that have had repairs, modifications or additions affecting the derrick's capacity or safe operation must be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing must be conducted and documented in accordance with paragraph (g) of this section.

(i) [*Reserved.*]

(j) *Power failure procedures.* If power fails during operations, the derrick operator must safely stop operations. This must include:

(1) Setting all brakes or locking devices.

(2) Moving all clutch and other power controls to the off position.

(k) *Use of winch heads.*

(1) Ropes must not be handled on a winch head without the knowledge of the operator.

(2) While a winch head is being used, the operator must be within reach of the power unit control lever.

(l) [*Reserved.*]

(m) *Securing the boom.*

(1) When the boom is being held in a fixed position, dogs, pawls, or other positive holding mechanisms on the boom hoist must be engaged.

(2) When taken out of service for 30 days or more, the boom must be secured by one of the following methods:

(i) Laid down.

(ii) Secured to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block.

(iii) For guy derricks, lifted to a vertical position and secured to the mast.

(iv) For stiffleg derricks, secured against the stiffleg.

(n) The process of jumping the derrick must be supervised by the A/D director.

(o) Derrick operations must be supervised by a competent person.

(p) *Inspections.* In addition to the requirements in § 1926.1412, the following additional items must be included in the inspections:

(1) *Daily:* Guys for proper tension.

(2) *Annual.*

(i) Gudgeon pin for cracks, wear, and distortion.

(ii) Foundation supports for continued ability to sustain the imposed loads.

(q) *Qualification and Training.* The employer must train each operator of a derrick on the safe operation of equipment the individual will operate. Section 1926.1427 of this subpart (Operator qualification and certification) does not apply.

§ 1926.1437 Floating cranes/derricks and land cranes/derricks on barges.

(a) This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation (*i.e.,* vessel/flotation device). The sections of this subpart apply to floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation, unless specified otherwise. The requirements of this section do not apply when using jacked barges when the jacks are deployed to the river, lake, or sea bed and the barge is fully supported by the jacks.

(b) *General requirements.* The requirements in paragraphs (c) through (k) of this section apply to both floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.

(c) *Work area control.*

(1) The requirements of § 1926.1424 (Work area control) apply, except for § 1926.1424(a)(2)(ii).

(2) The employer must either:

(i) Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas; or

(ii) Clearly mark the hazard areas by a combination of warning signs (such as, "Danger—Swing/Crush Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the employer must train each employee to understand what these markings signify.

(d) *Keeping clear of the load.* Section 1926.1425 does not apply.

(e) *Additional safety devices.* In addition to the safety devices listed in § 1926.1415, the following safety devices are required:

(1) Barge, pontoon, vessel or other means of flotation list and trim device. The safety device must be located in the cab or, when there is no cab, at the operator's station.

(2) Positive equipment house lock.

(3) *Wind speed and direction indicator.* A competent person must determine if wind is a factor that needs to be considered; if wind needs to be considered, a wind speed and direction indicator must be used.

(f) *Operational aids.*

(1) An anti two-block device is required only when hoisting personnel or hoisting over an occupied cofferdam or shaft.

(2) Section 1926.1416(e)(4) (Load weighing and similar devices) does not apply to dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, and pile driving work performed under this section.

(g) *Accessibility of procedures applicable to equipment operation.* If the crane/derrick has a cab, the requirements of § 1926.1417(c) apply. If the crane/derrick does not have a cab, the employer must ensure that:

(1) Rated capacities (load charts) are posted at the operator's station. If the operator's station is moveable (such as with pendant-controlled equipment), the load charts are posted on the equipment.

(2) Procedures applicable to the operation of the equipment (other than load charts), recommended operating speeds, special hazard warnings, instructions and operators manual, must be readily available on board the vessel/flotation device.

(h) *Inspections.* In addition to meeting the requirements of § 1926.1412 for inspecting the crane/derrick, the employer must inspect the barge, pontoons, vessel or other means of flotation used to support a floating crane/derrick or land crane/derrick, and ensure that:

(1) *Shift.* For each shift inspection, the means used to secure/attach the equipment to the vessel/flotation device is in proper condition, including wear, corrosion, loose or missing fasteners, defective welds, and (when applicable) insufficient tension.

(2) *Monthly.* For each monthly inspection:

(i) The means used to secure/attach the equipment to the vessel/flotation device is in proper condition, including inspection for wear, corrosion, and, when applicable, insufficient tension.

(ii) The vessel/flotation device is not taking on water.

(iii) The deckload is properly secured.

(iv) The vessel/flotation device is watertight based on the condition of the chain lockers, storage, fuel compartments, and hatches.

(v) The firefighting and lifesaving equipment is in place and functional.

(3) The shift and monthly inspections are conducted by a competent person, and:

(i) If any deficiency is identified, an immediate determination is made by a qualified person whether the deficiency constitutes a hazard.

(ii) If the deficiency is determined to constitute a hazard, the vessel/flotation device is removed from service until the deficiency has been corrected.

(4) *Annual: external vessel/flotation device inspection.* For each annual inspection:

(i) The external portion of the barge, pontoons, vessel or other means of flotation used is inspected annually by a qualified person who has expertise with respect to vessels/flotation devices and that the inspection includes the following items:

(A) The items identified in paragraphs (h)(1) (*Shift*) and (h)(2) (*Monthly*) of this section.

(B) Cleats, bitts, chocks, fenders, capstans, ladders, and stanchions, for significant corrosion, wear, deterioration, or deformation that could impair the function of these items.

(C) External evidence of leaks and structural damage; evidence of leaks and damage below the waterline may be determined through internal inspection of the vessel/flotation device.

(D) Four-corner draft readings.

(E) Firefighting equipment for serviceability.

(ii) Rescue skiffs, lifelines, work vests, life preservers and ring buoys are inspected for proper condition.

(iii) If any deficiency is identified, an immediate determination is made by the qualified person whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly inspections.

(A) If the qualified person determines that the deficiency constitutes a hazard, the vessel/flotation device is removed from service until it has been corrected. *See* requirements in § 1926.1417(f).

(B) If the qualified person determines that, though not presently a hazard, the deficiency needs to be monitored, the deficiency is checked in the monthly inspections.

(5) *Four-year: internal vessel/flotation device inspection.* For each four-year inspection:

(i) A marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices surveys the internal portion of the barge, pontoons, vessel, or other means of flotation.

(ii) If the surveyor identifies a deficiency, an immediate determination is made by the surveyor as to whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly or annual inspections, as appropriate.

(A) If the surveyor determines that the deficiency constitutes a hazard, the vessel/flotation device is removed from service until it has been corrected.

(B) If the surveyor determines that, though not presently a hazard, the deficiency needs to be monitored, the deficiency is checked in the monthly or annual inspections, as appropriate.

(6) *Documentation.* The monthly and annual inspections required in paragraphs (h)(2) and (h)(4) of this section are documented in accordance with §§ 1926.1412 (e)(3) and 1926.1412(f)(7), respectively, and that the four-year inspection required in paragraph (h)(5) of this section is documented in accordance with § 1926.1412(f)(7), except that the documentation for that inspection must be retained for a minimum of 4 years. All such documents must be made available, during the applicable document retention period, to all persons who conduct inspections in accordance with § 1926.1412.

(i) [*Reserved.*]

(j) *Working with a diver.* The employer must meet the following additional requirements when working with a diver in the water:

(1) If a crane/derrick is used to get a diver into and out of the water, it must not be used for any other purpose until the diver is back on board. When used for more than one diver, it must not be used for any other purpose until all divers are back on board.

(2) The operator must remain at the controls of the crane/derrick at all times.

(3) In addition to the requirements in §§ 1926.1419 through 1926.1422 (Signals), either:

(i) A clear line of sight must be maintained between the operator and tender; or

(ii) The signals between the operator and tender must be transmitted electronically.

(4) The means used to secure the crane/derrick to the vessel/flotation device (*see* paragraph (n)(5) of this section) must not allow any amount of shifting in any direction.

(k) Manufacturer's specifications and limitations.

(1) The employer must ensure that the barge, pontoons, vessel, or other means of flotation must be capable of withstanding imposed environmental, operational and in-transit loads when used in accordance with the manufacturer's specifications and limitations.

(2) The employer must ensure that the manufacturer's specifications and limitations with respect to environmental, operational, and in-transit loads for a barge, pontoon, vessel, or other means of flotation are not exceeded or violated.

(3) When the manufacturer's specifications and limitations are unavailable, the employer must ensure that the specifications and limitations established by a qualified person with respect to environmental, operational and in-transit loads for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.

(l) [*Reserved.*]

(m) *Floating cranes/derricks.* For equipment designed by the manufacturer (or employer) for marine use by permanent attachment to barges, pontoons, vessels or other means of flotation:

(1) *Load charts.*

(i) The employer must not exceed the manufacturer load charts applicable to operations on water. When using these charts, the employer must comply with all parameters and limitations (such as dynamic and environmental parameters) applicable to the use of the charts.

(ii) The employer must ensure that load charts take into consideration a minimum wind speed of 40 miles per hour.

(2) The employer must ensure that the requirements for maximum allowable list and maximum allowable trim as specified in Table M1 of this section are met.

TABLE M1

Rated capacity	Maximum allowable list (degrees)	Maximum allowable trim (degrees)
Equipment designed for marine use by permanent attachment (other than derricks):		
25 tons or less	5	5
Over 25 tons	7	7
Derricks designed for marine use by permanent attachment:		
Any rated capacity	10	10

(3) The employer must ensure that the equipment is stable under the conditions specified in Tables M2 and M3 of this section. (**Note**: Freeboard is the vertical distance between the water line and the main deck of the vessel.)

TABLE M2

Operated at	Wind speed (mph)	Minimum freeboard (ft)
Rated capacity	60	2
Rated capacity plus 25%	60	1
High boom, no load ..	60	2

TABLE M3

Operated at	Wind speed
For backward stability of the boom: High boom, no load, full back list (least stable condition).	90 mph.

(4) If the equipment is employer-made, it must not be used unless the employer has documents demonstrating that the load charts and applicable parameters for use meet the requirements of paragraphs (m)(1) through (3) of this section. Such documents must be signed by a registered professional engineer who is a qualified person with respect to the design of this type of equipment (including the means of flotation).

(5) The employer must ensure that the barge, pontoons, vessel or other means of flotation used:

(i) Are structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all planned and actual deck loads and ballasted compartments.

(ii) Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free-surface effect.

(iii) Have access to void compartments to allow for inspection and pumping.

(n) *Land cranes/derricks.* For land cranes/derricks used on barges, pontoons, vessels or other means of flotation, the employer must ensure that:

(1) The rated capacity of the equipment (including but not limited to modification of load charts) applicable for use on land is reduced to:

(i) Account for increased loading from list, trim, wave action, and wind.

(ii) Be applicable to a specified location(s) on the specific barge, pontoons, vessel or other means of flotation that will be used, under the environmental conditions expected and encountered.

(iii) The conditions required in paragraphs (n)(3) and (n)(4) of this section are met.

(2) The rated capacity modification required in paragraph (n)(1) of this section is performed by the equipment manufacturer, or a qualified person who has expertise with respect to both land crane/derrick capacity and the stability of vessels/flotation devices.

(3) For list and trim.

(i) The maximum allowable list and the maximum allowable trim for the barge, pontoon, vessel or other means of flotation must not exceed the amount necessary to ensure that the conditions in paragraph (n)(4) of this section are met. In addition, the maximum allowable list and the maximum allowable trim does not exceed the least of the following: 5 degrees, the amount specified by the crane/derrick manufacturer, or, when, an amount is not so specified, the amount specified by the qualified person.

(ii) The maximum allowable list and the maximum allowable trim for the land crane/derrick does not exceed the amount specified by the crane/derrick manufacturer, or, when, an amount is not so specified, the amount specified by the qualified person.

(4) For the following conditions:

(i) All deck surfaces of the barge, pontoons, vessel or other means of flotation used are above water.

(ii) The entire bottom area of the barge, pontoons, vessel or other means of flotation used is submerged.

(5) Physical attachment, corralling, rails system and centerline cable system meet the requirements in Option (1), Option (2), Option (3), or Option (4) of this section, and that whichever option is used also meets the requirements of paragraph (n)(5)(v) of this section.

(i) *Option (1)—Physical attachment.* The crane/derrick is physically attached to the barge, pontoons, vessel or other means of flotation. Methods of physical attachment include crossed-cable systems attached to the crane/derrick and vessel/flotation device, bolting or welding the crane/derrick to the vessel/flotation device, strapping the crane/derrick to the vessel/flotation device with chains, or other methods of physical attachment.

(ii) *Option (2)—Corralling.* The crane/derrick is prevented from shifting by installing barricade restraints (*i.e.,* a corralling system). Employers must ensure that corralling systems do not allow the equipment to shift by any amount of shifting in any direction.

(iii) *Option (3)—Rails.* The crane/derrick must be prevented from shifting by being mounted on a rail system. Employers must ensure that rail clamps and rail stops are used unless the system is designed to prevent movement during operation by other means.

(iv) *Option (4)—Centerline cable system.* The crane/derrick is prevented from shifting by being mounted to a wire rope system. The employer must ensure that the wire rope system meets the following requirements:

(A) The wire rope and attachments are of sufficient size and strength to support the side load of crane/derrick.

(B) The wire rope is attached physically to the vessel/flotation device.

(C) The wire rope is attached to the crane/derrick by appropriate attachment methods (such as shackles or sheaves) on the undercarriage, and that the method used will allow the crew to secure the crane/derrick from movement during operation and to move the crane/derrick longitudinally along the vessel/flotation device for repositioning.

(D) Means are installed to prevent the crane/derrick from passing the forward or aft end of the wire rope attachments.

(E) The crane/derrick is secured from movement during operation.

(v) The systems/means used to comply with Option (1), Option (2), Option (3), or Option (4) of this section are designed by a marine engineer, registered professional engineer familiar with floating crane/derrick design, or qualified person familiar with floating crane/derrick design.

(6) *Exception.* For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement specified by paragraph (n)(5) of this section to use Option (1), Option (2), Option (3), or Option (4) does not apply when the employer demonstrates implementation of a plan and procedures that meet the following requirements:

(i) A marine engineer or registered professional engineer familiar with floating crane/derrick design develops and signs a written plan for the use of the mobile auxiliary crane.

(ii) The plan is designed so that the applicable requirements of this section are met despite the position, travel, operation, and lack of physical attachment (or corralling, use of rails or cable system) of the mobile auxiliary crane.

(iii) The plan specifies the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate, and the parameters and limitations of such movements and operation.

(iv) The deck is marked to identify the permitted areas for positioning, travel, and operation.

(v) The plan specifies the dynamic and environmental conditions that must be present for use of the plan.

(vi) If the dynamic and environmental conditions in paragraph (n)(6)(v) of this section are exceeded, the mobile auxiliary crane is attached physically or corralled in accordance with Option (1),

Option (2) or Option (4) of paragraph (n)(5) of this section.

(7) The barge, pontoons, vessel or other means of flotation used:

(i) Are structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all anticipated deck loads and ballasted compartments.

(ii) Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free surface effect.

(iii) Have access to void compartments to allow for inspection and pumping.

§ 1926.1438 Overhead & gantry cranes.

(a) *Permanently installed overhead and gantry cranes.* The requirements of § 1910.179, except for § 1910.179(b)(1), and not the requirements of this subpart CC, apply to the following equipment when used in construction and permanently installed in a facility: overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.

(b) *Overhead and gantry cranes that are not permanently installed in a facility.*

(1) This paragraph applies to the following equipment when used in construction and not permanently installed in a facility: Overhead and gantry cranes, overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment having the same fundamental characteristics, irrespective of whether it travels on tracks, wheels, or other means.

(2) The following requirements apply to equipment identified in paragraph (b)(1) of this section:

(i) Sections 1926.1400 through 1926.1414; §§ 1926.1417 through 1926.1425; § 1926.1426(d), §§ 1926.1427 through 1926.1434; § 1926.1437, § 1926.1439, and § 1926.1441.

(ii) The following portions of § 1910.179:

(A) Paragraphs (b)(5),(6),(7); (e)(1),(3),(5),(6); (f)(1),(4); (g); (h)(1),(3); (k); and (n) of § 1910.179.

(B) The definitions in § 1910.179(a) except for "hoist" and "load." For those words, the definitions in § 1926.1401 apply.

(C) Section 1910.179(b)(2), but only where the equipment identified in paragraph (b)(1) of this section (§ 1926.1438) was manufactured before September 19, 2001.

(iii) For equipment manufactured on or after September 19, 2001, the following sections of ASME B30.2–2005 (incorporated by reference, *see* § 1926.6) apply: 2–1.3.1; 2–1.3.2; 2–1.4.1; 2–1.6; 2–1.7.2; 2–1.8.2; 2–1.9.1; 2–1.9.2; 2–1.11; 2–1.12.2; 2–1.13.7; 2–1.14.2; 2–1.14.3; 2–1.14.5; 2–1.15.; 2–2.2.2; 2–3.2.1.1. In addition, 2–3.5 applies, except in 2–3.5.1(b), "29 CFR 1910.147" is substituted for "ANSI Z244.1."

§ 1926.1439 Dedicated pile drivers.

(a) The provisions of subpart CC apply to dedicated pile drivers, except as specified in this section.

(b) Section 1926.1416(d)(3) (Anti two-blocking device) does not apply.

(c) Section 1926.1416(e)(4) (Load weighing and similar devices) applies only to dedicated pile drivers manufactured after November 8, 2011.

(d) In § 1926.1433, only §§ 1926.1433(d) and (e) apply to dedicated pile drivers.

§ 1926.1440 Sideboom cranes.

(a) The provisions of this standard apply, except § 1926.1402 (Ground conditions), § 1926.1415 (Safety devices), § 1926.1416 (Operational aids), and § 1926.1427 (Operator qualification and certification).

(b) Section 1926.1426 (Free fall and controlled load lowering) applies, except § 1926.1426(a)(2)(i). Sideboom cranes in which the boom is designed to free fall (live boom) are permitted only if manufactured prior to November 8, 2010.

(c) Sideboom cranes mounted on wheel or crawler tractors must meet all of the following requirements of ASME B30.14–2004 (incorporated by reference, *see* § 1926.6):

(1) Section 14–1.1 ("Load Ratings").

(2) Section 14–1.3 ("Side Boom Tractor Travel").

(3) Section 14–1.5 ("Ropes and Reeving Accessories").

(4) Section 14–1.7.1 ("Booms").

(5) Section 14–1.7.2 ("General Requirements—Exhaust Gases").

(6) Section 14–1.7.3 ("General Requirements—Stabilizers (Wheel-Type Side Boom Tractors)").

(7) Section 14–1.7.4 ("General Requirements—Welded Construction").

(8) Section 14–1.7.6 ("General Requirements—Clutch and Brake Protection").

(9) Section 14–2.2.2 ("Testing—Rated Load Test"), except that it applies only to equipment that has been altered or modified.

(10) In section 14–3.1.2 ("Operator Qualifications"), paragraph (a), except the phrase "When required by law."

(11) In section 14–3.1.3 ("Operating Practices"), paragraphs (e), (f)(1)—(f)(4), (f)(6), (f)(7), (h), and (i).

(12) In section 14–3.2.3 ("Moving the Load"), paragraphs (j), (l), and (m).

§ 1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.

The following paragraphs of this section specify requirements for employers using equipment with a maximum rated hoisting/lifting capacity of 2,000 pounds or less.

(a) The employer using this equipment must comply with the following provisions of this subpart: § 1926.1400 (Scope); § 1926.1401 (Definitions); § 1926.1402 (Ground conditions); § 1926.1403 (Assembly/disassembly—selection of manufacturer or employer procedures); § 1926.1406 (Assembly/disassembly—employer procedures); §§ 1926.1407 through 1926.1411 (Power line safety); § 1926.1412(c) (*Post-assembly*); §§ 1926.1413 through 1926.1414 (Wire rope); § 1926.1418 (Authority to stop operation); §§ 1926.1419 through 1926.1422 (Signals); § 1926.1423 (Fall protection); § 1926.1425 (Keeping clear of the load) (except for § 1926.1425(c)(3) (qualified rigger)); § 1926.1426 (Free fall and controlled load lowering); § 1926.1432 (Multiple crane/derrick lifts—supplemental requirements); § 1926.1434 (Equipment modifications); § 1926.1435 (Tower cranes); § 1926.1436 (Derricks); § 1926.1437 (Floating cranes/derricks and land cranes/derricks on barges); § 1926.1438 (Overhead & gantry cranes).

(b) *Assembly/disassembly.*

(1) In addition to compliance with §§ 1926.1403 (Assembly/disassembly—selection of manufacturer or employer procedures) and 1926.1406 (Assembly/disassembly—employer procedures), the employer must also comply with § 1926.1441(b)(2)–(3).

(2) *Components and configuration.* The employer must ensure that:

(i) The selection of components, and the configuration of the equipment, that affect the capacity or safe operation of the equipment complies with either the:

(A) Manufacturer instructions, recommendations, limitations, and specifications. When these documents and information are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or

(B) Approved modifications that meet the requirements of § 1926.1434 (Equipment modifications).

(ii) *Post-assembly inspection.* Upon completion of assembly, the equipment is inspected to ensure that it is in compliance with paragraph (b)(2)(i) of

this section (*see* § 1926.1412(c) for post-assembly inspection requirements).

(3) *Manufacturer prohibitions.* The employer must comply with applicable manufacturer prohibitions.

(c) *Operation—procedures.*

(1) The employer must comply with all manufacturer procedures applicable to the operational functions of the equipment, including its use with attachments.

(2) *Unavailable operation procedures.* The employer must:

(i) When the manufacturer's procedures are unavailable, develop, and ensure compliance with, all procedures necessary for the safe operation of the equipment and attachments.

(ii) Ensure that procedures for the operational controls are developed by a qualified person.

(iii) Ensure that procedures related to the capacity of the equipment are developed and signed by a registered professional engineer familiar with the equipment.

(3) *Accessibility.* The employer must ensure that:

(i) The load chart is available to the operator at the control station;

(ii) Procedures applicable to the operation of the equipment, recommended operating speeds, special hazard warnings, instructions, and operator's manual are readily available for use by the operator.

(iii) When rated capacities are available at the control station only in electronic form and a failure occurs that makes the rated capacities inaccessible, the operator immediately ceases operations or follows safe shut-down procedures until the rated capacities (in electronic or other form) are available.

(d) *Safety devices and operational aids.*

(1) The employer must ensure that safety devices and operational aids that are part of the original equipment are maintained in accordance with manufacturer procedures.

(2) *Anti two-blocking.* The employer must ensure that equipment covered by this section manufactured more than one year after November 8, 2010 have either an anti two-block device that meets the requirements of § 1926.1416(d)(3), or is designed so that, in the event of a two-block situation, no damage or load failure will occur (for example, by using a power unit that stalls in response to a two-block situation).

(e) *Operator qualifications.* The employer must train each operator, prior to operating the equipment, on the safe operation of the type of equipment the operator will be using.

(f) *Signal person qualifications.* The employer must train each signal person in the proper use of signals applicable to the use of the equipment.

(g) [*Reserved.*]

(h) *Inspections.* The employer must ensure that equipment is inspected in accordance with manufacturer procedures.

(i) [*Reserved.*]

(j) *Hoisting personnel.* The employer must ensure that equipment covered by this section is not used to hoist personnel.

(k) *Design.* The employer must ensure that the equipment is designed by a qualified engineer.

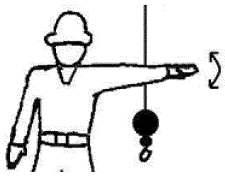
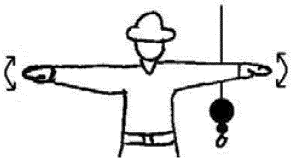
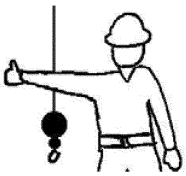
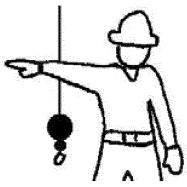
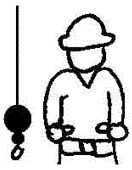
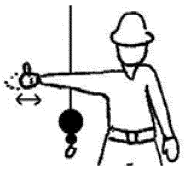
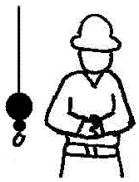
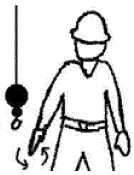
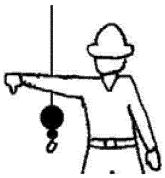
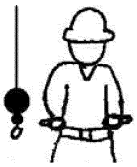
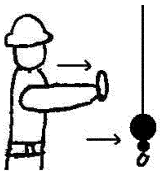
§ 1926.1442 Severability.

Should a court of competent jurisdiction hold any provision(s) of subpart CC to be invalid, such action shall not affect any other provision of the subpart.

BILLING CODE 4510–26–P

Appendix A to Subpart CC of Part 1926—Standard Hand Signals

48174 **Federal Register** / Vol. 75, No. 152 / Monday, August 9, 2010 / Rules and Regulations

 **STOP –** With arm extended horizontally to the side, palm down, arm is swung back and forth.	 **EMERGENCY STOP** – With both arms extended horizontally to the side, palms down, arms are swung back and forth.	**HOIST –** With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.
 **RAISE BOOM –** With arm extended horizontally to the side, thumb points up with other fingers closed.	 **SWING –** With arm extended horizontally, index finger points in direction that boom is to swing.	 **RETRACT TELESCOPING BOOM –** With hands to the front at waist level, thumbs point at each other with other fingers closed.
 **RAISE THE BOOM AND LOWER THE LOAD –** With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.	 **DOG EVERYTHING –** Hands held together at waist level.	 **LOWER –** With arm and index finger pointing down, hand and finger make small circles.
 **LOWER BOOM –** With arm extended horizontally to the side, thumb points down with other fingers closed.	 **EXTEND TELESCOPING BOOM –** With hands to the front at waist level, thumbs point outward with other fingers closed.	 **TRAVEL/TOWER TRAVEL** – With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.

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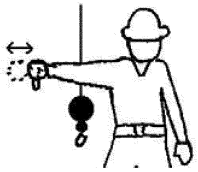
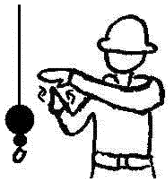
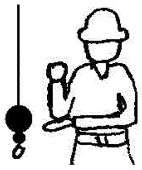
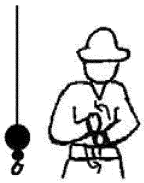
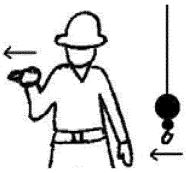
 **LOWER THE BOOM AND RAISE THE LOAD** – With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.	 **MOVE SLOWLY** – A hand is placed in front of the hand that is giving the action signal.	 **USE AUXILIARY HOIST** (whipline) – With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.
 **CRAWLER CRANE TRAVEL, BOTH TRACKS** – Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.	**USE MAIN HOIST** – A hand taps on top of the head. Then regular signal is given to indicate desired action.	**CRAWLER CRANE TRAVEL, ONE TRACK** – Indicate track to be locked by raising fist on that side. Rotate other fist in front of body in direction that other track is to travel.
 **TROLLEY TRAVEL** – With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.		

Appendix B to Subpart CC of Part 1926—Assembly/Disassembly: Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement

1. Section 1926.1404(f)(1) provides that when pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where the requirements of § 1926.1404(f)(2) are met. The exception in § 1926.1404(f)(2) applies when the employer demonstrates that site constraints require one or more employees to be under the boom, jib, or other components when pins (or similar devices) are being removed. In such a situation, the A/D director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom.

The following scenario is an example of how the exception applies: A boom cannot be disassembled on the ground because of aboveground piping (as might be found, for example, in an oil refinery) that precludes lowering the boom to the ground. The boom must therefore be disassembled in the air, and the employees who remove the pins must perform that work from an aerial lift whose base is positioned on one side (the near side) of the boom. To gain access to the pins on the far side, the aerial lift basket must move under the boom, since, due to lack of room, the aerial lift cannot be repositioned on the far side. Due to lack of room, the aerial lift cannot be repositioned on the far side, so the aerial basket must move under the boom to gain access to the pins on the far side.

To minimize the risk of unintended dangerous movement while the pins are removed, the A/D director uses an assist crane that is rigged to support the boom section that is being detached, using particular care to ensure that the section end that is near the employee(s) removing the pins is well supported. The duration and extent of exposure is minimized by removing the far side pins first, moving the aerial lift basket as soon as possible to the near side so that the employees are no longer under the boom, and then removing the near side pins.

2. Section 1926.1404(h)(6)(i) provides that, during assembly/disassembly, the center of gravity of the load must be identified if that is necessary for the method used for maintaining stability. Section 1926.1404(h)(6)(ii) states that, where there is insufficient information to accurately identify the center of gravity, measures designed to prevent unintended dangerous movement resulting from an inaccurate

identification of the center of gravity must be used.

An example of the application of § 1926.1404(h)(6)(ii) is as follows: The boom is assembled by lowering boom sections sequentially into place using an assist crane. The A/D director's plan is to keep the boom sections stable while they are lowered into place by attaching the assist crane hoist line above the center of gravity of each section. However, in assembling the non-symmetrical top section of the boom, the A/D director is not able to determine where to attach the assist crane hoist line so that it is above the center of gravity. In this situation, before raising the section, all personnel are kept clear of the section and the section is first raised a few inches to determine whether it tips when raised (if it did tip, it would indicate it is not rigged over the center of gravity). If this occurs, the hoist line is repositioned and the procedure repeated (with employees kept clear of the section while it is raised) until the A/D director determines that it is rigged over the center of gravity and can be moved into place without dangerous movement.

Appendix C to Subpart CC of Part 1926—Operator Certification: Written Examination: Technical Knowledge Criteria

This appendix contains information for employers, accredited testing organizations, auditors and government entities developing criteria for a written examination to test an individual's technical knowledge relating to the operation of cranes.

(a) General technical information.

(1) The functions and limitations of the crane and attachments.

(2) Wire rope:

(i) Background information necessary to understand the inspection and removal from service criteria in § 1926.1413 and § 1926.1414.

(ii) Capacity and when multi-part rope is needed.

(iii) Relationship between line pull and safe working load.

(iv) How to determine the manufacturer's recommended rope for the crane.

(3) Rigging devices and their use, such as:

(i) Slings.

(ii) Spreaders.

(iii) Lifting beams.

(iv) Wire rope fittings, such as clips, shackles and wedge sockets.

(v) Saddles (softeners).

(vi) Clamps (beams).

(4) The technical limitations of protective measures against electrical hazards:

(i) Grounding.

(ii) Proximity warning devices.

(iii) Insulated links.

(iv) Boom cages.

(v) Proximity to electric power lines, radii, and microwave structures.

(5) The effects of load share and load transfer in multi-crane lifts.

(6) Basic crane terms.

(7) The basics of machine power flow systems.

(i) Mechanical.

(ii) Electrical.

(iii) Pneumatic.

(iv) Hydraulic.

(v) Combination.

(8) The significance of the instruments and gauge readings.

(9) The effects of thermal expansion and contraction in hydraulic cylinders.

(10) Background information necessary to understand the requirements of pre-operation and inspection.

(11) How to use the safety devices and operational aids required under § 1926.1415 and § 1926.1416.

(12) The difference between duty-cycle and lifting operations.

(13) How to calculate net capacity for every possible configuration of the equipment using the manufacturer's load chart.

(14) How to use manufacturer-approved attachments and their effect on the equipment.

(15) How to obtain dimensions, weight, and center of gravity of the load.

(16) The effects of dynamic loading from:

(i) Wind.

(ii) Stopping and starting.

(iii) Impact loading.

(iv) Moving with the load.

(17) The effect of side loading.

(18) The principles of backward stability.

(b) Site information.

(1) How to identify the suitability of the supporting ground/surface to support the expected loads of the operation. Elements include:

(i) Weaknesses below the surface (such as voids, tanks, loose fill).

(ii) Weaknesses on the surface (such as retaining walls, slopes, excavations, depressions).

(2) Proper use of mats, blocking/cribbing, outriggers, stabilizers, or crawlers.

(3) Identification of site hazards such as power lines, piping, and traffic.

(4) How to review operation plans with supervisors and other workers (such as the signal person), including how to determine working height, boom length, load radius, and travel clearance.

(5) How to determine if there is adequate room for extension of crawlers or outriggers/stabilizers and counterweights.

(c) Operations.

(1) How to pick, carry, swing and place the load smoothly and safely on rubber tires and on outriggers/stabilizers or crawlers (where applicable).

(2) How to communicate at the site with supervisors, the crew and the signal person.

(3) Proper procedures and methods of reeving wire ropes and methods of reeving multiple-part lines and selecting the proper load block and/or ball.

(4) How to react to changes in conditions that affect the safe operation of the equipment.

(5) How to shut down and secure the equipment properly when leaving it unattended.

(6) Know how to apply the manufacturer's specifications for operating in various weather conditions, and understand how environmental conditions affect the safe operation of the equipment.

(7) How to properly level the equipment.

(8) How to verify the weight of the load and rigging prior to initiating the lift.

(9) How to determine where the load is to be picked up and placed and how to verify the radii.

(10) Know basic rigging procedures.

(11) How to carry out the shift inspection required in this subpart.

(12) Know that the following operations require specific procedures and skill levels:

(i) Multi-crane lifts.

(ii) Hoisting personnel.

(iii) Clamshell/dragline operations.

(iv) Pile driving and extracting.

(v) Concrete operations, including poured-in-place and tilt-up.

(vi) Demolition operations.

(vii) Operations on water.

(viii) Magnet operations.

(ix) Multi-drum operations.

(13) Know the proper procedures for operating safely under the following conditions:

(i) Traveling with suspended loads.

(ii) Approaching a two-block condition.

(iii) Operating near power lines.

(iv) Hoisting personnel.

(v) Using other than full outrigger/crawler or stabilizer extensions.

(vi) Lifting loads from beneath the surface of the water.

(vii) Using various approved counterweight configurations.

(viii) Handling loads out of the operator's vision ("operating in the blind").

(ix) Using electronic communication systems for signal communication.

(14) Know the proper procedures for load control and the use of hand-held tag lines.

(15) Know the emergency response procedure for:

(i) Fires.

(ii) Power line contact.

(iii) Loss of stability.

(iv) Control malfunction.

(v) Two-blocking.

(vi) Overload.

(vii) Carrier or travel malfunction.

(16) Know how to properly use outriggers and stabilizers in accordance with manufacturer specifications.

(d) Use of load charts.

(1) Know the terminology necessary to use load charts.

(2) Know how to ensure that the load chart is the appropriate chart for the equipment in its particular configuration and application.

(3) Know how to use load charts. This includes knowing:

(i) The operational limitations of load charts and footnotes.

(ii) How to relate the chart to the configuration of the crane, crawlers, or outriggers/stabilizers extended or retracted, jib erected or offset, and various counterweight configurations.

(iii) The difference between structural capacity and capacity limited by stability.

(iv) What is included in capacity ratings.

(v) The range diagram and its relationship to the load chart.

(vi) The work area chart and its relationship to the load chart.

(vii) Where to find and how to use the "parts-of-line" information.

(4) Know how to use the load chart together with the load indicators and/or load moment devices.

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