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PART L
CRANES, RIGGING AND PERSONNEL LIFTING

WAC 296-155-529 Scope and definitions.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-529, filed 12/31/12, effective 02/01/13. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-529, filed 11/04/08, effective 01/01/10.]

WAC 296-155-52900 Scope.

- (1) Except as provided in subsection (3) of this section, this part applies to the following:
 - (a) Power-operated cranes and derricks used in construction that can hoist, lower and horizontally move a suspended load (with or without attachments). Such equipment includes, but is not limited to: Articulating boom 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); cranes being used as dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as fixed jib ("hammerhead boom"), luffing boom and self-erecting); pedestal cranes; portal cranes; overhead/bridge and gantry cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment; and
 - (b) Personnel lifting with attached or suspended platforms using cranes or derricks (WAC 296-155-547).
- (2) Attachments. This standard applies to equipment included in subsection (1) 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;
 - Draglines;
 - Personnel platforms;
 - Augers or drills; and
 - Pile driving equipment.
- (3) The equipment listed below are exempted from WAC 296-155-531 and 296-155-532 (Crane certifier accreditation and crane certification) through 296-155-53300 (operator qualifications and certification):
 - (a) Cranes having a maximum rated capacity of one ton or less. See WAC 296-155-53414 for additional requirements.
 - (b) Powered industrial trucks (forklifts) when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load are exempted from WAC 296-155-532 crane certification. Operators must also follow the requirements in chapter 296-863 WAC, Forklifts and other powered industrial trucks.
 - (c) Service cranes with booms that rotate manually.

WAC 296-155-52900 (Cont.)

- (4) The equipment listed below are exempt from this part:
- (a) Equipment included in subsection (1) of this section while it has been converted or adapted for nonhoisting/lifting use. Such conversions/adaptions include, but are not limited to, power shovels, excavators, and concrete pumps.
 - (b) 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.
 - (c) Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles.
 - (d) Equipment originally designed as vehicle-mounted devices (for lifting personnel) and self-propelled elevating work platforms.
 - (e) Hydraulic jacking systems, including telescopic/hydraulic gantries.
 - (f) Stacker cranes.
 - (g) Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair.
 - (h) Equipment that hoists by using a come-a-long or chainfall.
 - (i) Dedicated drilling rigs.
 - (j) Gin poles used for the erection of communication towers.
 - (k) Tree trimming and tree removal work.
 - (l) Anchor handling or dredge-related operations with a vessel or barge using an affixed A-frame.
 - (m) Roustabouts.
 - (n) Machines equipped with a boom that is limited to up and down movement only and does not rotate.
 - (o) Conveyors.
 - (p) Pump hoists with booms that do not rotate.
 - (q) Cranes and their operators used on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work.
 - (r) Helicopter cranes.

WAC 296-155-52900 (Cont.)

- (s) Permanently installed overhead/bridge, gantry cranes, semi-gantry, cantilever cranes, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.
- (t) Digger derricks when used for activities that are covered under chapter 296-45 WAC, Safety standards for electrical workers, or chapter 296-32 WAC, Safety standards for telecommunications. Cranes other than digger derricks when used for activities that are covered under chapter 296-45 WAC, Safety standards for electrical workers, or chapter 296-32 WAC, Safety standards for telecommunications are **NOT** exempt.
- (u) Powered industrial trucks (forklifts) except when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load.

Note: Rigging requirements for material handling is located in Part F-1 of this chapter.

- (5) Digger derricks that do not meet the exemption criteria in subsection (4) of this section must comply with WAC 296-155-531 (crane certifier accreditation and crane certification) through WAC 296-155-53300 (Operator qualifications and certification) one hundred eighty days after the effective date of this section.
- (6) 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.
- (7) Work covered by chapter 296-45 WAC, Safety Standards for Electrical Workers is deemed in compliance with WAC 296-155-53408.
- (8) WAC 296-155-53400(35) through (39) does not apply to cranes designed for use on railroad tracks, when used on railroad tracks that are used as part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under C.F.R. 49, Part 213, and that comply with applicable Federal Railroad Administration requirements. See WAC 296-155-53400(39).

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-52900, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-52900, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-52900, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-52900, filed 11/04/08, effective 01/01/10.]

WAC 296-155-52901 Certification and proof load testing--Requirement. Effective January 1, 2010, all cranes and derricks covered in WAC 296-155-52900 and not exempt in subsection (3) of that section, must be certified and proof load tested annually by an accredited crane certifier recognized by the department.

Note: For additional inspection criteria and proof load testing requirements for specific types of cranes, see

- WAC 296-155-53202 for mobile cranes.
- WAC 296-155-53204 for articulating boom cranes.
- WAC 296-155-53206 for tower cranes.
- WAC 296-155-53208 for self-erecting tower cranes.
- WAC 296-155-53210 for overhead and bridge cranes.
- WAC 296-155-53212 for derricks.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-52901, filed 07/06/10, effective 09/01/10.]

WAC 296-155-52902 Definitions.

Accredited crane certifier means a crane inspector who has been accredited by the department.

A/D director (assembly/disassembly director) means an individual who meets the requirements in this part for an A/D director, irrespective of the person's formal job title or whether the person is nonmanagement or management personnel.

Angle of loading means the acute angle between horizontal and the leg of the rigging, often referred to as horizontal angle. See figures 18 and 33.

Anti two-block device means a device that, when activated, disengages all crane functions whose movement can cause two-blocking.

Apprentice operator or trainee means a crane operator who has not met requirements established by the department under RCW 49.17.430.

Articulating boom 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 components or attachments covered under this part. 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 height of the crane is an erection process.

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

Attachments mean any device that expands the range of tasks that can be done by the crane/derrick. 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.

Basket hitch means a method of rigging a sling in which the sling is passed around the load and both loop eyes or end fittings are attached to the lifting device.

Below-the-hook lifting device means a device used for attaching loads to a hoist. The device may contain components such as slings, hooks, rigging hardware, and lifting attachments.

Bird caging means the twisting of fiber or wire rope in an isolated area of the rope in the opposite direction of the rope lay, thereby causing it to take on the appearance of a bird cage.

Blocking (also referred to as "cribbing") means wood or other material used to support equipment or a component and distribute loads to the ground. It is typically used to support latticed 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. See "travel bogie."

Boom (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.

WAC 296-155-52902 (Cont.)

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

Braided wire rope means a wire rope formed by plaiting component wire ropes.

Bridle wire rope sling means a sling composed of multiple legs with the top ends gathered in a fitting that goes over the lifting hook.

Builder means the builder/constructor of derricks.

Cable laid endless sling-mechanical joint means a wire rope sling made endless from one continuous length of cable laid rope with the ends joined by one or more metallic fittings.

Cable laid grommet-hand tucked means an endless wire rope sling made from one continuous length of rope formed to make a body composed of six ropes around a rope core. The rope ends are tucked into the body, thus forming the core. No sleeves are used.

Center of gravity means 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 crane inspector means a crane certifier accredited by the department.

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

Choker hitch means a method of rigging a sling in which the sling is passed around the load, then through one loop eye, end fitting, or other device, with the other loop eye or end fitting attached to the lifting device. This hitch can be done with a sliding choker hook or similar device.

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

WAC 296-155-52902 (Cont.)

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.

Construction work means (for the purposes of this part) all or any part of excavation, construction, erection, alteration, repair, demolition, and dismantling of buildings and other structures and all related operations; the excavation, construction, alteration, and repair of sewers, trenches, caissons, conduits, pipelines, roads, and all related operations; the moving of buildings and other structures, and the construction, alteration, repair, or removal of wharfs, docks, bridges, culverts, trestles, piers, abutments, or any other related construction, alteration, repair, or removal work. Construction work does not include the normal day-to-day activities at manufacturing facilities or powerhouses.

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 projects, it is planning, quality and completion.

Counterjib (counterweight jib) means a horizontal member of the tower crane on which the counterweights and usually the hoisting machinery are mounted.

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

Crane means power-operated equipment used in construction that can hoist, lower, and horizontally move a suspended load. "Crane" includes, but is not limited to: Articulating boom 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; multipurpose 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 fixed jib, hammerhead boom, luffing boom, and self-erecting; pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment.

Crane/derrick type means cranes or derricks as established by American Society of Mechanical Engineers (ASME). Crane operator means an individual engaged in the operation of a crane.

Crane level indicator means a device for determining true horizontal (also see safety devices).

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

Critical lift means a lift that:

- Exceeds seventy-five percent of the crane or derrick rated load chart capacity; or
- Requires the use of more than one crane or derrick.

Cross rod means a wire used to join spirals of metal mesh to form a complete fabric. See Figure 22.

WAC 296-155-52902 (Cont.)

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 crane/derrick/signal persons.

Dedicated drilling rig means a machine which creates bore holes and/or shafts in the ground.

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 WAC 296-155-53302 (signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and; the equipment, the 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.

Derrick is an apparatus consisting of a mast or equivalent member held at the end by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes.

Design factor means the ratio between nominal or minimum breaking strength and rated load.

Digger derrick means a multipurpose vehicle-mounted machine which is primarily designed to accommodate components that dig holes, set poles and position materials and apparatus.

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 is 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 means when a person, object, or equipment makes contact or comes close in 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 part requires to be maintained from a power line.

Equipment criteria means instructions, recommendations, limitations and specifications.

Fabric (metal mesh) means the flexible portion of the sling exclusive of end fittings consisting of a series of transverse spirals and cross rods.

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.

WAC 296-155-52902 (Cont.)

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 means a point 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.

Free fall (of the load line) means when 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 rated load test means testing stability and operation of crane, carrier, wheels, tires, tracks, brakes, etc., under load, when lifting without outriggers and/or traveling with the load are permitted at the activity for the type of crane being tested.

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

Functional testing means the testing of a crane, typically done with a light load or no load, to verify the proper operation of a crane's primary function, i.e., hoisting, braking, booming, swinging, etc. A functional test is contrasted to testing the crane's structural integrity with heavy loads.

Gin pole derrick means a boom without a mast which has guys arranged from its top to permit leaning the mast in one or more directions. The load is lifted and lowered by ropes reeved through sheaves or blocks at the top of the mast and the lower block.

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

Ground crew means those individuals who are involved in the personnel lift, other than the hoisting equipment operator and the platform occupants. These individuals include riggers, signal persons, and supervision.

Gudgeon pins means a pin connecting the mast cap to the mast allowing rotation of the mast.

Guy means a rope used to steady or secure the mast, boom, or other member in the desired position.

Hairpin anchors means a hairpin-shaped, guy-supporting anchor that is placed on footings or walls before concrete is poured and held in place by the cured concrete.

Hitch (hitched) means a method of rigging (attaching) a sling temporarily to a load or object for the purpose of lifting.

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

Hoisting means 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.

Hoisting equipment means a machine for lifting and lowering a load and moving it horizontally. The machine may be fixed or mobile and be driven manually, by power, or by a combination of both.

Hook latch means a mechanical device used to close the throat opening of a hook.

WAC 296-155-52902 (Cont.)

Insulating link/device means an insulating device listed, labeled, or accepted by a nationally recognized testing laboratory in accordance with 29 C.F.R. 1910.7.

Intermediate rail means the middle member of a barrier along the edges of a platform, located approximately one-half the distance between the platform floor and top rail.

Jib means an extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles in the vertical plane of the boom. For tower cranes, see boom (tower cranes).

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 means equipment not originally designed by the manufacturer for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation.

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

Live boom means a boom whose lowering is controlled by a brake without the aid of other lowering retarding devices (free-fall capable).

Live load line means a load line whose lowering is controlled by a brake without the aid of other lowering retarding devices (free fall capable).

Load is the weight of the object being lifted or lowered, including the weight of the load-attaching equipment such as the load block, ropes, slings, shackles, and any other auxiliary attachment.

Load moment (or rated capacity) indicator means a system which aids the equipment operator by sensing the overturning moment on the equipment, i.e., load X 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 the overturning moment on the equipment, i.e., load X 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.

Load ratings means a set of rated loads for stipulated hoisting equipment configurations and operating conditions.

Load sustaining/bearing parts means those parts of a crane that support the crane or load and upon failure could cause dropping, uncontrolled shifting, or uncontrolled movement of the crane or load.

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

Luffing boom is a member hinged to the rotating superstructure and used for supporting the hoisting tackle.

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

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

WAC 296-155-52902 (Cont.)

Master coupling link means an alloy steel welded coupling link used as an intermediate link to join alloy steel chain to master links.

Master link means forged or welded steel link used to support all members (legs) of an alloy steel chain sling or wire rope sling.

Mechanical coupling link (alloy steel chain) means a nonwelded, mechanically closed link used primarily to attach fittings to allow steel chain.

Mobile cranes 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.

Multipurpose 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 part. 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 part.

Multiple lift rigging means a rigging assembly manufactured by wire rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane.

Nationally recognized accrediting agency is an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations.

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).

Nonstandard tower crane base means any deviation from the structural support or base configuration recommended by the crane manufacturer.

Occasional or routine maintenance and repair work means regular, customary and foreseeable work necessary to keep equipment in good repair and/or condition. This also includes regular, customary and foreseeable work necessary to return equipment to sound condition after damage.

Operational aid means an accessory that provides information to facilitate operation of a crane or that takes control of particular functions without action of the operator when a limiting condition is sensed. Examples of such devices include, but are not limited to, the following: Anti-two-block device, rated capacity indicator, rated capacity (load) limiter, boom angle or radius indicator, lattice boom hoist disconnect device, boom length indicator, drum rotation indicator, load indicator, and wind speed indicator.

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

Operator is a person who is operating the equipment.

Outriggers means extendable or fixed members attached to the mounting base, which rests on supports at the outer ends, used to support the crane.

WAC 296-155-52902 (Cont.)

Overhead/bridge and gantry cranes includes overhead/bridge cranes, cranes on monorails, under hung 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.

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, and a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these.

Personnel lifting means raising, lowering, or transporting personnel using a crane/derrick.

Personnel platform – boom attached means a platform attached to the boom of the crane.

Personnel platform – suspended means a platform attached to a crane/derrick using wire rope, chain, or jointed attachment and that has no installed motion controls for the platform itself.

Personnel platform suspension system means the rope or chain slings and other components, including fastening devices, used to connect the crane/derrick to the personnel platform.

Platform occupant means a person who is within the guardrail barrier while the personnel platform is in a hoisted position.

Platform rating means the maximum capacity of a personnel lifting platform, established by the platform manufacturer, in terms of total weight and the number of occupants allowed.

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 controlled lowering means a system or device in the power train, other than the load hoist brake, that can regulate the lowering rate of speed of the load hoist mechanism.

Powerhouse means a plant wherein electric energy is produced by conversion from some other form of energy (e.g., chemical, nuclear, solar, mechanical, or hydraulic) by means of suitable apparatus. This includes all generating station auxiliaries and other associated equipment required for the operation of the plant. Not included are stations producing power exclusively for use with communication systems.

Power lines means electrical distribution and electrical transmission 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 that has been listed, labeled or accepted by a nationally recognized testing laboratory in accordance with 29 C.F.R. 1910.7.

Qualified crane operator means a crane operator who meets the requirements established by the department under RCW 49.17.430.

WAC 296-155-52902 (Cont.)

Qualified evaluator (not a third party) means a person employed by the signal person's or the rigger's employer (as applicable) who has demonstrated that he/she is competent in accurately assessing whether individuals meet the qualification requirements in this part for a signal person or a rigger.

Qualified evaluator (third party) means an entity that, due its independence and expertise, has demonstrated that it is competent accurately assessing whether individuals meet the qualification requirements in this part for a signal person or a rigger.

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 requirements in WAC 296-155-53306.

Qualified signal person is a signal person who meets the requirements in WAC 296-155-53302.

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.

Rotation resistant rope means a type of wire rope construction which reduces the tendency of a rope to rotate about its axis under load. Usually, this consists of an inner system of core strands laid in one direction covered by an outer system of strands laid in the opposite direction.

RPE means a registered professional engineer licensed under RCW 18.43.040(1).

RPSE means a registered professional structural engineer licensed under RCW 18.43.040(1).

Running wire rope is 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.

Safety devices, examples of safety devices are, but are not limited to, the following: Horn, boom/jib or trolley stops, crane level indicator, hydraulic holding device/check valve, rail clamps, rail stops, brakes, deadman control or forced neutral return control, emergency stop switch, guards, handrails, audible and visual alarms, etc.

WAC 296-155-52902 (Cont.)

Safety or health standard means a standard adopted under this chapter.

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

Side-boom 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.

Sling means an assembly to be used for lifting when connected to a lifting mechanism. The upper portion of the sling is connected to the lifting mechanism and the lower supports the load, as described in this part.

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

Spiral means a single transverse coil that is the basic element from which metal mesh is fabricated.

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.

Stabilizer means an extendable or fixed member attached to the mounting base to increase the stability of the crane, but that may not have the capability of relieving all of the weight from the wheels or tracks.

Standard method means the hand signals established in the applicable ASME B30 series and WAC 296-155-56400, Mobile Crane Hand Signal Chart.

Standing wire rope means a supporting wire rope which maintains a constant distance between the points of attachment to the two components connected by the wire rope.

Superstructure: See upperworks.

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

Taglines 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 communication with a diver.

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

Toe board means a vertical barrier at foot level, along the edges of the platform, to protect against material from falling over the edge.

Top rail means the top member of a barrier along the edges of a platform to protect against persons from falling off the platform.

Tower crane means 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 a luffing jib and/or tower attachments are not considered tower cranes under this part.

WAC 296-155-52902 (Cont.)

Travel means the function of the hoisting equipment moving under its own power from one location to another.

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

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

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".

Vertical hitch means a method of rigging a sling in which the load is attached to the loop eye or end fitting at one end of the sling and the loop eye or end fitting at the other end attached to the lifting device. Any hitch less than five degrees from the vertical may be considered a vertical hitch.

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.

Working load means the external load applied to the hoisting equipment, including the personnel lifting platform, its contents, and the load attaching equipment, such as lowered load block, shackles, and slings.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-52902, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-52902, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-52902, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-52902, filed 11/04/08, effective 01/01/10.]

WAC 296-155-531 Crane certifier accreditation process.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-531, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53100 Accreditation of crane certifiers and derricks--Requirements.

- (1) Any person engaging in the testing, examination or inspection for the certification of a crane, used in lifting at a construction site, must apply for and obtain a certificate of accreditation from the department pursuant to this rule. For the purposes of this rule an "accredited crane certifier" refers to any individual holding a certificate of accreditation pursuant to this regulation.

Any person authorized by the department to certify maritime cranes prior to the effective date of this rule may continue to perform services under this regulation until January 1, 2012. Any accredited crane certifier desiring to continue providing services pursuant to this rule must have applied for and obtained a certificate of accreditation under these rules from the department prior to January 1, 2012. Maritime certifiers wishing to perform construction crane certifications must notify the department that they will perform construction crane certifications. In addition, the maritime certifier must specify which cranes they are qualified to inspect under their maritime certificate. The department may issue these individuals a provisional accreditation specifying the crane types they are authorized to inspect which will be valid through December 31, 2011, or upon expiration of their maritime certification, whichever is earlier. Any provisionally accredited crane certifier desiring to continue providing services pursuant to this rule must have applied for and obtained a certificate of accreditation under these rules from the department prior to January 1, 2012.

- (2) Crane certifiers accredited by any other state or governmental entity may be authorized to inspect cranes in Washington state provided the certifier submits an application and resume along with the certificate of accreditation from that state or governmental entity, and the types of cranes they are authorized to inspect. The department may issue these individuals a provisional accreditation specifying the crane types they are authorized to inspect which will be valid through December 31, 2011, or upon expiration of their out-of-state certification, whichever is earlier. Any provisionally accredited crane certifier desiring to continue providing services pursuant to this rule must have applied for and obtained a certificate of accreditation under these rules from the department prior to January 1, 2012.

- (3) No person that has modified, altered, or repaired a crane which affected a load sustaining member of the crane may conduct the certifying inspection and proof load testing of that particular crane within the same certification period.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53100, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53102 Accreditation--Application form and applicant qualifications.

- (1) An accreditation to certify cranes pursuant to this rule may be obtained by submitting a completed application to the division of occupational safety and health (DOSH) and successfully completing written examinations developed and administered by the department or its authorized representative. Application forms may be obtained by calling the:

Crane certification section of DOSH 360-902-4943 or by written request to:

P.O. Box 44650, Olympia, WA 98504-4650

- (2) An applicant seeking an accreditation must satisfy all of the following criteria:
 - (a) An application with an attached resume must be submitted to the department based on experience with the various crane types per the ASME B30 series. The application and resume must include knowledge, training and experience with verifiable references.

WAC 296-155-53102 (Cont.)

- (b) All applicants must possess knowledge of chapter 296-155 WAC, Safety standards for construction work, as well as American Society of Mechanical Engineers (ASME) standards, relating to the design, testing, inspection and operation of cranes, including those specifically applicable to the types of cranes for which an accreditation will be issued.
 - (c) All applicants must demonstrate at least five years crane related experience, of which two years must be actual crane inspection activities. The other three years may include experience in duties such as a crane operator, crane mechanic, crane shop foreman, crane operations supervision, or rigging specialist. Related education may be substituted for related experience at a ratio of two years of education for one year of experience up to three years. Related education could include such courses in engineering, physics, applied mathematics, applied science courses in nondestructive testing, construction technology, technical courses in heavy equipment mechanic, welding technology, etc.
- (3) Application form. Any application for accreditation will be accepted by the department upon the filing of a completed application. All information and attachments must be given under penalty of perjury. The application must include, but not be limited to, the following:
- (a) A statement of the crane types per the ASME B30 series the applicant desires to certify pursuant to the accreditation.
 - (b) A statement of qualifications and experience, including their capacities, satisfying at a minimum the criteria set forth in this section as well as any and all other qualifications the applicant wishes the department to consider.
 - (c) Any other relevant information the applicant desires to be considered by the department.
- (4) Written examinations. Applicants to be approved for accreditation must successfully complete the written examinations administered by the department or its authorized representative.
- (a) Once the department receives the application and resume, the department will make the determination and notify the applicant if they meet the minimum qualifications to take the written examinations.
 - (b) The first written examination will include a general knowledge of operation, testing, inspection and maintenance requirements, and the duties and recordkeeping responsibilities required by this rule.
 - (c) The other written examinations will include safe operating and engineering principles and practices with respect to specific crane types subject to the accreditation, including inspection and proof loading requirements.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53102, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53104 Issuance of accreditation.

- (1) The department may impose restrictions on the scope and use of the accreditation, such as limiting it to specific types of cranes based upon the qualifications of the applicant. The accreditation issued by the department will identify any limitations imposed by the department and the types of cranes the certifier is authorized to certify.

WAC 296-155-53104 (Cont.)

- (2) The department must deny issuance of an accreditation if the applicant does not satisfy the requirements of this rule.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53104, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53106 Accreditation application--Processing time.

- (1) Within forty-five calendar days of receipt of a completed application for an accreditation, the department must inform the applicant in writing that it is either complete and accepted for filing or that it is deficient and what specific information or documentation is required to complete the application and will inform the applicant if the applicant is eligible to take the written examination. An application is considered complete if it is in compliance with the requirements of this rule.

- (2) Within seventy-five calendar days from the date of completion of the written examinations, the department must inform the applicant in writing of its decision regarding the issuance of the certificate of accreditation.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53106, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53108 Duration and renewal of an accreditation.

- (1) The accreditation will be valid for three years. Crane certifiers must complete forty hours of crane related training every three years, in courses recognized by the department.

Application for renewal must be filed with the department not less than sixty days prior to expiration of the accredited crane certifier's certification. A renewal may be obtained by filing a completed application for renewal meeting the requirements of WAC 296-155-53102 hereof providing the applicant has been actively inspecting cranes during their prior accreditation period. An applicant is considered active if he/she has certified/inspected at least twenty-one cranes during their accreditation period. If the applicant certified cranes in another state, then that applicant must provide documentation showing they were active during their accreditation period. An applicant who has not certified/inspected at least twenty-one cranes during the accreditation period may take the written exams to become recertified.

- (2) At a minimum, all applicants for renewal must successfully complete the written examinations every six years.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-53108, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53108, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53110 Revocation or suspension of an accreditation.

- (1) The department may suspend or revoke a certificate issued under the provisions of these rules upon the following grounds:

- (a) Permitting the duplication or use of one's own accreditation certificate by another;
- (b) Performing work for which accreditation has not been received;
- (c) Any person who obtains accreditation through fraudulent representation of accreditation requirements such as education, training, professional registration, or experience;
- (d) Any person who falsifies training documentation;

WAC 296-155-53110 (Cont.)

- (e) The holder of the certificate is found to be incompetent to carry out the work for which the certificate was issued;
 - (f) Gross negligence, gross incompetence, a pattern of incompetence, or fraud in the certification of a crane;
 - (g) Willful or deliberate disregard of any occupational safety standard while certifying a crane;
 - (h) Misrepresentation of a material fact in applying for, or obtaining, a license to certify under this chapter;
 - (i) Failure by an accredited crane certifier to maintain records;
 - (j) Failure by an accredited crane certifier to report crane safety deficiencies affecting the safe operation of a crane while in the process of conducting an annual certification inspection;
 - (k) Failure to meet or comply with the requirements of this rule or the limitations imposed on the accreditation; or
 - (l) Performance of work not in compliance with applicable laws and regulations.
- (2) Before any certificate may be suspended or revoked, the certificate holder must be given written notice of the department's intention, mailed by certified mail, return receipt requested to the address as shown on the application form. The notice must specify the reasons for the department action. The department must also include within the notice of revocation or suspension specific conditions which must be met before the applicant will be entitled to apply for a new certification.
- (3) A suspension or revocation order may be appealed to division of occupational safety and health (DOSH) or the board of industrial insurance appeals within fifteen working days after the suspension or revocation order is entered. The notice of appeal may be filed with the department or the board of industrial insurance appeals and must include the accredited certifier's name, address, certifier number, telephone number, reason for appeal, their signature and date. DOSH may reassume jurisdiction over the matter following timelines set out for appeal in WAC 296-900-17005. Should DOSH reassume jurisdiction over the matter, the process for reassumption outlined in WAC 296-900-17005 must be followed. If the accredited certifier does not agree with the department's redetermination, the matter will be forwarded to the board of industrial insurance appeals upon receiving further appeal from the accredited certifier. The board of industrial insurance appeals must hold the hearing in accordance with procedures established in RCW 49.17.140. Any party aggrieved by an order of the board of industrial insurance appeals may obtain superior court review in the manner provided in RCW 49.17.150.
- (4) The filing of an appeal must not stay the suspension or revocation, and such action must remain in effect until such time as the applicant presents proof that the specified written conditions required by the department are met or until otherwise ordered after resolution of the appeal.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53110, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53110, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53112 Monitoring of accredited crane certifiers.

The division of occupational safety and health must monitor accredited crane certifiers to ensure that these certifiers certify cranes in accordance with all applicable Washington state laws and regulations. Monitoring activities will include, but not be limited to, audits of crane certifier's activities, complaint inspections, referrals, or accident investigations.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53112, filed 11/04/08, effective 01/01/09.]

WAC 296-155-53114 Issuance of temporary and annual certificates of operation.

- (1) Accredited crane certifiers will issue a temporary certificate of operation if upon inspection and load proof testing no deficiencies were found that would affect the safe operation of the crane.
- (2) The accredited crane certifier will submit inspection worksheets and proof of load testing to the department within ten working days from the completion of the inspection and load proof test for consideration of the department for the issuance of a permanent certificate of operation.
- (3) If the accredited crane certifier upon inspection of a crane identifies deficiencies that would affect the safe operation or load handling capabilities of the crane, the accredited crane certifier must notify the department within five working days from completion of the on-site inspection by submitting the worksheet that identifies the deficiencies. If deficiencies are found that affect the safe operation or load handling capabilities of the crane, no temporary certificate of operation will be issued until all identified deficiencies have been corrected and verified by an on-site visit by an accredited crane certifier.
- (4) After the accredited crane certifier has verified that all deficiencies have been corrected and the crane has successfully passed a load proof test, the accredited crane certifier will issue a temporary certificate of operation. The accredited crane certifier will submit inspection worksheets and proof of load testing to the owner or lessee and within ten days of completion of the inspection to the department for consideration of the department for the issuance of an annual certificate of operation.
- (5) The accredited crane certifier must attach an identification sticker if not already attached and legible to each crane. The identification sticker number must be entered on the inspection worksheet submitted to the department. Identification stickers may only be removed by a department representative or an accredited crane certifier.
- (6) Certificates of operation issued by the department under the crane certification program established in this section are valid for one year from the effective date of the temporary operating certificate issued by the certified crane inspector.
- (7) The temporary or annual certificate of operation must be posted in the operator's cab or with the operator's manual.
- (8) Maintaining required records. Accredited crane certifiers are required to maintain complete and accurate records pertaining to each crane of all inspections, tests and other work performed as well as copies of all notices of crane safety deficiencies, verifications of correction of crane safety deficiencies, and crane certifications issued for the previous five years and provide these records to the department upon request. Failure by an accredited crane certifier to maintain required records may result in accreditation suspension or revocation.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53114, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53114, filed 11/04/08, effective 01/01/10.]

WAC 296-155-532 Crane certification requirements for cranes.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-532, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53200 General inspection criteria, wire rope inspection and removal criteria, and preproof load test requirements for all cranes.

- (1) The accredited crane certifier must review the following documents as part of the crane certification process:
 - (a) Crane maintenance records of critical components to ensure maintenance of these components has been performed in accordance with the manufacturer's recommendations.
 - (b) Crane monthly and annual inspection documentation.
- (2) Safety devices. Make sure all safety devices are installed on equipment in accordance with the requirements located in WAC 296-155-53410.
- (3) Operational aids. Operations must not begin unless operational aids are in proper working order, except where the owner or lessee meets the specified temporary alternative measures. See WAC 296-155-53412 for the list of operational aids.

Note: All accredited crane certifiers must meet and follow the requirements relating to fall protection, located in chapter 296-155 WAC, Part C-1, Fall restraint and fall arrest.

- (4) General.
 - (a) The accredited crane certifier must determine that the configurations of the crane are in accordance with the manufacturer's equipment criteria.
 - (b) Where the manufacturer equipment criteria are unavailable, a registered professional engineer (RPE), familiar with the type of equipment involved, must ensure criteria are developed for the equipment configuration.
- (5) Wire rope.
 - (a) Wire ropes must meet the crane or wire rope manufacturer's specifications for size, type and inspection requirements. In the absence of the manufacturer's specifications, follow the requirements for removal criteria located in this section, including Table 1.

WAC 296-155-53200 (Cont.)

Table 1 - Wire Rope Inspection/Removal Criteria (See also Figure 1 - Wire Rope)						
Category of Crane Types	Running Ropes.* # of broken wires in		Rotation Resistant.* # of broken wires in		Standing Ropes.* # of broken wires	
	1 rope lay	1 strand in 1 lay	Specified diameters		In 1 lay beyond end connection	At end connection
Mobile	6	3	2 (in 6xd)	4 (in 30xd)	3	2
Articulating	6	3	Consult rope mfg.	Consult rope mfg.	3	2
Tower	12	4	2 (in 6xd)	4 (in 30xd)	3	3
Self-Erector	6	3	2 (in 6xd)	4 (in 30xd)	3	2
Overhead & Bridge	12	4	2 (in 6xd)	4 (in 30xd)	--	--
Derricks	6	3	Consult rope mfg.	Consult rope mfg.	3	2

*** Also remove if you detect 1 wire broken at the contact point with the core or adjacent strand; so called valley breaks or evidence from any heat damage from any cause.**

Note: xd means times the "diameter."

- (b) The accredited crane certifier must perform a complete and thorough inspection covering the surface of the working range plus three additional wraps on the drum of the wire ropes.
- (c) If a deficiency is identified, an immediate determination must be made by the accredited crane certifier as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the crane must not be certified until:
 - (i) The wire rope is replaced and verified by the accredited crane certifier; or
 - (ii) If the deficiency is localized, the problem is corrected by severing the wire rope; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited.
- (d) Remove wire rope from service if reduction from nominal diameter is greater than five percent.
- (e) Replacement rope must be of a compatible size and have a strength rating at least as great as the original rope furnished or recommended by the crane manufacturer.

WAC 296-155-53200 (Cont.)

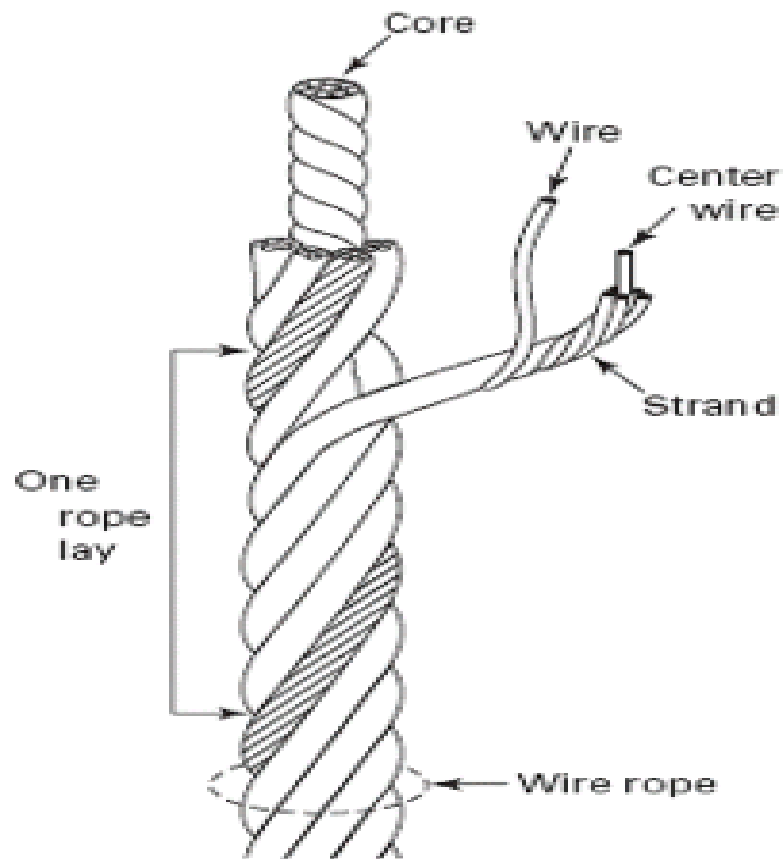


Figure 1-Wire Rope.

- (6) Sheaves.
- (a) Sheave grooves must be free from surface defects that could damage the rope. The cross-sectional radius at the bottom of the groove should be such as to form a close fitting saddle for the size of rope used. The sides of the groove must be tapered outward and rounded at the rim to facilitate entrance of the rope into the groove. Flange rims must run true about the axis of rotation.
 - (b) Sheave guards must be in place to:
 - (i) Guide the rope back into the sheave groove, when using ropes that can be momentarily unloaded.
 - (ii) Prevent ropes from becoming fouled when the block is lying on the ground with loose ropes.
 - (c) Sheave bearings, except for permanently lubricated ones, must have a means of lubrication.

WAC 296-155-53200 (Cont.)

- (7) Prior to performing a proof load test:
- (a) A safe test area must be selected and all traffic and unauthorized personnel and equipment must be cleared from test area. This test area must be roped off or otherwise secured to prevent entry of unauthorized personnel and equipment;
 - (b) Rigging gear must be inspected by a qualified person prior to using for load test of crane;
 - (c) The employer must ensure all load test personnel understand the safety procedures of the test;
 - (d) Proof load tests, with the exception of tower cranes, are overload tests and extreme caution must be observed at all times. Personnel must remain clear of suspended loads and areas where they could be struck in the event of boom failure. The test load must be raised only to a height sufficient to perform the test;
 - (e) During tests, safe operating speeds must be employed. Rated speeds in accordance with manufacturer's specifications need not be attained. Emphasis must be placed on the ability to safely control loads through all motions at normal speeds;
 - (f) Proof load tests require the use of freely suspended certified weights, or scaled weights using a certified scale with a current certificate of calibration; however, line pull test can be accomplished using a static test; and a certified scale with a current certificate of calibration;
 - (g) Proof load tests must not exceed the manufacturer's specifications. Where these specifications are unavailable, a registered professional engineer familiar with the type of equipment involved must develop written specifications.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53200, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-53200, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53200, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53202 Additional inspection criteria and proof load testing--Mobile cranes.

- (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must conduct a visual inspection of the following components, if applicable, which can be visually inspected without disassembly (not including removal of inspection covers):
- (a) All control and drive mechanisms for adjustments interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter;
 - (b) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation;
 - (c) Hydraulic system for proper fluid level;
 - (d) Safety latches on hooks for damage;
 - (e) Hooks for deformation, cracks, excessive wear, or damage such as from chemicals or heat;
 - (f) A legible and applicable operator's manual and load chart is in the operator's cab or station;

WAC 296-155-53202 (Cont.)

- (g) A portable fire extinguisher, with a basic minimum extinguishing rating of ten BC must be installed in the cab or at the machinery housing;
- (h) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable;
- (i) Wire rope reeving for compliance with the manufacturer's specifications;
- (j) Wire rope, in accordance with WAC 296-155-53200(5);
- (k) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation;
- (l) Tires (when in use) for proper inflation and condition;
- (m) Ground conditions around the equipment for proper support, including ground settling under and around outriggers and supporting foundations, ground water accumulation, or similar conditions;
- (n) The equipment for level position;
- (o) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view;
- (p) Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling;
- (q) Equipment structure (including the boom and, if equipped, the jib):
 - (i) Structural members: Deformed, cracked, or significantly corroded.
 - (ii) Bolts, rivets and other fasteners: Loose, failed or significantly corroded.
 - (iii) Welds for cracks.
- (r) Sheaves and drums for cracks or significant wear;
- (s) Parts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear;
- (t) Brake and clutch system parts, linings, pawls and ratchets for excessive wear;
- (u) Safety devices and operational aids for proper operation (including significant inaccuracies);
- (v) Gasoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature), condition and operation;
- (w) Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch;
- (x) Travel steering, brakes, and locking devices, for proper operation;
- (y) Tires for damage or excessive wear;

WAC 296-155-53202 (Cont.)

- (z) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:
 - (i) Flexible hose or its junction with the fittings for indications of leaks.
 - (ii) Threaded or clamped joints for leaks.
 - (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.
 - (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing.
 - (aa) Hydraulic and pneumatic pumps and motors, as follows:
 - (i) Performance indicators: Unusual noises or vibration, low operating speed.
 - (ii) Loose bolts or fasteners.
 - (iii) Shaft seals and joints between pump sections for leaks.
 - (bb) Hydraulic and pneumatic cylinders, as follows:
 - (i) Drifting.
 - (ii) Rod seals and welded joints for leaks.
 - (iii) Cylinder rods for scores, nicks and dents.
 - (iv) Case (barrel) for significant dents.
 - (v) Rod eyes and connecting joints: Loose or deformed.
 - (cc) Outrigger pads/floats and slider pads for excessive wear or cracks; cribbing/dunnage for proper installation;
 - (dd) Electrical components and wiring for cracked or split insulation and loose or corroded terminations;
 - (ee) Legible warning labels and decals as required by the manufacturer;
 - (ff) Operator seat: Missing or unusable;
 - (gg) Equipped with original, or the equivalent, steps, ladders, handrails, guards;
 - (hh) Steps, ladders, handrails, and guards are in safe and usable condition;
- (2) Crane deficiencies. If the accredited crane certifier determines other findings need to be monitored, the accredited crane certifier must provide written notification to the owner or lessee.

WAC 296-155-53202 (Cont.)

- (3) Operational testing. An operational test must be made without a load applied to the hook of the following items if they are applicable to the crane to ensure they function correctly:
- (a) Load lifting/hoisting and lowering mechanisms;
 - (b) Boom lifting/hoisting and lowering mechanisms;
 - (c) Boom extension and retraction mechanism;
 - (d) Swing mechanism;
 - (e) Travel mechanism;
 - (f) Brakes and clutches;
 - (g) Limit, locking, and safety devices;
 - (h) Suspension systems for cranes that work on rubber (tires); and
 - (i) During the operational testing, special attention must be paid to hydraulic and pneumatic valves: Spools (sticking, improper return to neutral, and leaks); leaks; valve housing cracks; relief valves.
- (4) Annual and quadrennial proof load testing.
- (a) Proof load tests must be completed on all hoist lines to at least one hundred percent but not to exceed one hundred and ten percent as configured. Any hoist line not proof load tested is not considered certified. The test load must be at least one hundred percent but not to exceed one hundred and ten percent of rated capacity (i.e., for the crane's configuration of reeving, boom length, etc.). The rated capacity must be the capacity shown on the posted load chart or as limited by other factors such as hook block capacity or wire rope line pull if the crane is not fully reeved. The test load includes the weight of (or deduction values for) the hook, block, slings, and auxiliary lifting devices (and for some cranes hoist wire rope not accounted for in load charts), and the combined weight deduction values must be subtracted from the nominal test load in order to determine the amount of test weights to be used. Follow original equipment manufacturer (OEM) load chart instructions for weight deduction values. Check accuracy of load indicators where installed. Test procedures for these cranes must follow OEM procedures and recommendations.
 - (b) Annual proof load testing. After the crane has passed the visual and operational tests, a proof load test must be conducted in the as-configured condition and must be performed within the structural section of the manufacturer's load chart, as applicable. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
 - (c) Free rated load test ("on rubber"). Check the stability and operation of crane, carrier, wheels, tires, tracks, brakes, etc., under load by performing the following tests, when lifting without outriggers and/or traveling with the load are permitted at the activity for the type of crane being tested.

WAC 296-155-53202 (Cont.)

Note: Ensure all free rated load tests “on rubber” lifting requirements established by the OEM are complied with. Attach taglines to the load to control oscillation. For cranes with outriggers, extend outriggers and maintain minimal clearance (three to four inches) above ground. Test personnel must stand clear of tires during load tests. This test is only required if the owner/lessee wants an “on rubber” certification. If the crane has “on rubber” capabilities and the owner does not desire this certification, the crane certifier must document it on the certification document.

- (i) Maximum free rated load. Hoist maximum free rated test load at minimum possible radius over the rear (or over the front as required by the OEM). Slowly boom down to the maximum radius for the load, with boom and load hoist pawls (dogs) engaged where applicable, complete (d)(i)(A) and (B) of this subsection.
 - (A) Rotate through the appropriate working arc;
 - (B) Travel a minimum of fifty feet with test load over the rear (or front as required by the OEM) with the boom parallel to the longitudinal axis of the crane carrier.
- (ii) Stability test. Repeat the step in (d)(i) of this subsection with a test load corresponding to the radii determined as follows: For telescoping boom cranes, test with the boom approximately halfway between fully retracted and fully extended but do not exceed OEM's boom length limitation for lifting on rubber. If no ratings are governed by stability, no stability test is required.

Note: When lifting test loads, always lift the load well within the maximum radius and slowly boom down to a premeasured radius. Lift the test load only high enough to perform the required tests.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53202, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-53202, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53202, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53204 Additional inspection criteria and proof load testing--Articulating boom cranes.

- (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect the following items, if applicable, on cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers):
 - (a) All control and drive mechanisms for adjustments interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter;
 - (b) Safety devices for malfunction;
 - (c) All hydraulic hoses, particularly those which flex in normal operation of crane functions;
 - (d) Hooks and latches for deformation, chemical damage, cracks, and wear;
 - (e) Rope reeving for compliance with crane manufacturer's specifications;
 - (f) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation;

WAC 296-155-53204 (Cont.)

- (g) Hydraulic system for proper oil level and leaks;
- (h) Excessively worn or damaged tires. Recommended inflation pressure, cuts, and loose wheel nuts;
- (i) Connecting pins and locking device for wear and damage;
- (j) Deformed, cracked, or corroded members in the crane structure and carrier;
- (k) Loose bolts, particularly mounting bolts;
- (l) Cracked or worn sheaves and drums;
- (m) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and locking devices;
- (n) Excessive wear on brake and clutch system parts and lining;
- (o) Travel steering, braking, and locking devices, for malfunction;
- (p) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:
 - (i) Flexible hose or its junction with the fittings for indications of leaks.
 - (ii) Threaded or clamped joints for leaks.
 - (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.
 - (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing;
- (q) Hydraulic and pneumatic pumps and motors, as follows:
 - (i) Performance indicators: Unusual noises or vibration, low operating speed.
 - (ii) Loose bolts or fasteners.
 - (iii) Shaft seals and joints between pump sections for leaks;
- (r) Hydraulic and pneumatic cylinders, as follows:
 - (i) Drifting.
 - (ii) Rod seals and welded joints for leaks.
 - (iii) Cylinder rods for scores, nicks and dents.
 - (iv) Case (barrel) for significant dents.

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- (s) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable;
 - (t) Legible warning labels and decals as required by the manufacturer;
 - (u) A portable fire extinguisher, with a basic minimum extinguishing rating of ten BC must be installed in the cab or at the machinery housing;
 - (v) A legible and applicable operator's manual and load chart is in the operator's cab or station.
- (2) Annual proof load testing of articulating boom cranes.
- (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed within the structural and stability section of the manufacturer's load chart, as applicable. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
 - (b) Test loads must not be less than one hundred percent or more than one hundred and ten percent of the rated load, unless otherwise recommended by the manufacturer.
 - (c) Hoist the test load to assure that the load is supported by the crane and held by the hoist brake(s).
 - (d) Swing the crane, if applicable, the full range of its swing.
 - (e) Boom the crane up and down within allowable working radius for the test load.
 - (f) Lower the test load, stop and hold the load with the brake(s).

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53204, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53204, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53206 Additional inspection criteria and proof load testing--Tower cranes.

- (1) Tower cranes and tower crane assembly parts must be inspected by a crane certifier both prior to assembly, following erection of the tower crane, after each climbing operation, or reconfiguring the boom, jib, or counterjib before placing the crane in service.
- (2) The accredited crane certifier must verify a registered professional structural engineer, licensed under chapter 18.43 RCW, has certified that the crane foundations/structural supports and underlying soil are adequate support for the tower crane with its maximum overturning moment.
- (3) Prior to erecting a tower crane on a nonstandard tower crane base, the accredited crane certifier must verify that the engineering configuration of this base has been reviewed and acknowledged as acceptable by an independent registered professional structural engineer, licensed under chapter 18.43 RCW.
- (4) The accredited crane certifier must review the following documents as part of the crane certification process for the current location and inspection period:
 - (a) Crane maintenance records of critical components to ensure maintenance of these components has been performed in accordance with the manufacturer's recommendations;

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- (b) Crane monthly and annual inspection documentation.
- (5) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect the following items, if applicable, on tower cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers):
- (a) All control and drive mechanisms for interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter;
 - (b) Motion limiting devices for proper operation with the crane unloaded; each motion should be inched into its limiting device by carefully running at slow speed;
 - (c) Load limiting devices for proper operation and accuracy of settings;
 - (d) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation;
 - (e) Hydraulic system for proper fluid level;
 - (f) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:
 - (i) Flexible hose or its junction with the fittings for indications of leaks.
 - (ii) Threaded or clamped joints for leaks.
 - (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.
 - (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing;
 - (g) Hydraulic and pneumatic pumps and motors, as follows:
 - (i) Performance indicators: Unusual noises or vibration, low operating speed.
 - (ii) Loose bolts or fasteners.
 - (iii) Shaft seals and joints between pump sections for leaks;
 - (h) Hydraulic and pneumatic cylinders, as follows:
 - (i) Drifting.
 - (ii) Rod seals and welded joints for leaks.
 - (iii) Cylinder rods for scores, nicks and dents.
 - (iv) Case (barrel) for significant dents;

WAC 296-155-53206 (Cont.)

- (i) Electrical components for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation, wiring for cracked or split insulation, and loose or corroded terminations;
- (j) Stationary cranes for manufacturer's recommended grounding of structure and power supply. Rail traveling cranes for grounding of each rail and the power supply per the manufacturer's recommendations;
- (k) Runway rail and clamps. Inspect for loose, broken or missing clamps;
- (l) Hooks and safety latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat;
- (m) Wedges and supports of climbing cranes for looseness or dislocation;
- (n) Braces or guys supporting cranes' masts (towers) and anchor bolt base connections for looseness;
- (o) Crane structure (including the boom, jib and counter jib):
 - (i) Structural members: Deformed, cracked, or significantly corroded.
 - (ii) Bolts, rivets and other fasteners: Loose, failed or significantly corroded.
 - (iii) Welds for cracks.
- (p) Cracked or worn sheaves and drums;
- (q) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices, sprockets, and drive chains or belts;
- (r) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets;
- (s) Load, wind, and other indicators for inaccuracies outside the tolerances recommended by the manufacturer;
- (t) Travel mechanisms for malfunction, excessive wear or damage;
- (u) A legible and applicable operator's manual and load chart is in the operator's cab;
- (v) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable;
- (w) A portable fire extinguisher, with a basic minimum extinguishing rating of ten BC must be installed in the cab or at the machinery housing;
- (x) When applicable, tower tie-in collars, struts, and connections to building structure are structurally sound, free of cracks, distortion, excessive wear or corrosion. Pins and structural bolts are tight and installed per the manufacturer's specification;
- (y) Ballast blocks in place and secured per manufacturer's recommendations;
- (z) For cranes that telescope, the raising mechanism operates within the manufacturer's specifications;

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- (aa) For cranes that top climb, the climbing frame operates within the manufacturer's specifications;
 - (bb) A means to prevent traveling tower cranes running into stops while under power;
 - (cc) A functional audible warning alarm that automatically sounds whenever the traveling tower crane travels;
 - (dd) Wire rope reeving for compliance with the manufacturer's specifications;
 - (ee) Wire rope, in accordance with WAC 296-155-53200(5);
 - (ff) Safety devices and operational aids for proper operation (including significant inaccuracies);
 - (gg) Legible warning labels and decals as required by the manufacturer;
 - (hh) Steps, ladders, handrails and guards are in safe and usable condition.
- (6) Additional requirements for tower cranes prior to performing a proof load test.

Note: General requirements relating to preproof load tests for all cranes are located in WAC 296-155-53200.

- (a) When tower cranes are erected, and before placing in service, all functional motions, motion limiting, load limiting devices, locking and safety devices, brakes and clutches must be tested for operation and be within the manufacturer's specification prior to placing the crane in operation.
- (b) Proof load tests require the use of certified weights, or scaled weights using a certified scale with a current certificate of calibration.
- (c) Functional motion test must be at crane manufacturer's rated load. Each test must include:
 - (i) Load hoisting and lowering;
 - (ii) Jib (boom) hoisting and lowering, or trolley travel;
 - (iii) Slewing motion;
 - (iv) Travel motion when rail mounted;
 - (v) Brakes and clutches; and
 - (vi) Limit, locking, and safety devices.

Note: Functional motion tests made after climbing or telescoping may be performed without load.

- (d) The functional motion test listed in (c) of this subsection must continue until all controls, drives, and braking systems have been engaged and have functioned per the crane manufacturer's specifications.

WAC 296-155-53206 (Cont.)

- (e) Order in which tests of tower cranes are to be performed is as follows:
 - (i) Functional motion test without rated load;
 - (ii) Functional motion test at crane manufacturer's rated load. For other than traveling cranes, these tests may be combined with test of base structural support or foundation system given in (c) of this subsection;
 - (iii) Test of base structural support or foundation under (f) of this subsection.
 - (f) During functional motion tests, the crane's base structural support or foundation system must be visually checked by the accredited crane certifier. If any part of the crane's base structural support or foundation system shows excessive visual displacement, visual distress, or audible distress, then the lifted load must be lowered at hoist creep speed and all crane operations are to cease. An evaluation must then be made by the accredited crane certifier.
- (7) Proof load testing of tower cranes. Setting hoist load limits for tower cranes.
- (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed according to the manufacturer's recommendations. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
 - (b) Tower crane hoist load limit switches must be set in accordance with the manufacturer's specifications using specified certified weights. Procedure is to be verified by the accredited crane certifier. In the absence of the manufacturer's specifications, hoist load limit switches must be verified by means of a static test using test loads of one hundred and two and one-half percent to one hundred and ten percent of the applicable ratings. Test loads are to be lifted at creep speed until just clear of the ground.
 - (c) Setting of hoist load limits must be documented on the form provided by the department. A copy of the completed form and inspection worksheets must be sent to the department within ten days upon completion of the examination.
 - (d) After erection of fixed freestanding tower cranes, the base structural support or foundation system on which the crane is supported must be tested before placing the crane in service. The test must be conducted with the crane manufacturer's rated load placed at maximum radius permitted by site conditions. When the base structural support or foundation is symmetrical, the crane's jib (boom) must be rotated through ninety degrees with ten minute stops at the starting position and at each forty-five degree position. When the support is asymmetrical, the crane's jib (boom) must be rotated through three hundred and sixty degrees with ten minute stops at the starting position and at each forty-five degree position.
 - (e) After erection of rail traveling tower cranes, the base structural support or foundation system to which the rail is attached must be tested before placing the crane in service. The test must be conducted with the crane manufacturer's rated load placed at maximum radius permitted by site conditions. The jib (boom) must be located over the bogie. The crane must travel the entire length of runway, returning with the same load over the bogie on the opposite rail.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53206, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-53206, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53206, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53208 Additional inspection criteria and proof load testing--Self-erecting tower cranes.

- (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect the following items, if applicable, on cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers):
 - (a) For cranes that telescope the internal tower by a climbing frame, the climbing mechanism is structurally sound; is free of cracks, distortion, excessive wear or corrosion; operates within the manufacturer's specifications;
 - (b) Structural bolts are tightened;
 - (c) All control and drive mechanisms for interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter;
 - (d) Motion limiting devices for proper operation with the crane unloaded; each motion should be inched into its limiting device by carefully running at slow speed;
 - (e) Load limiting devices for proper operation and accuracy of settings;
 - (f) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation;
 - (g) Hydraulic system for proper fluid level;
 - (h) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:
 - (i) Flexible hose or its junction with the fittings for indications of leaks.
 - (ii) Threaded or clamped joints for leaks.
 - (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.
 - (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing;
 - (i) Hydraulic and pneumatic pumps and motors, as follows:
 - (i) Performance indicators: Unusual noises or vibration, low operating speed.
 - (ii) Loose bolts or fasteners.
 - (iii) Shaft seals and joints between pump sections for leaks;
 - (j) Hydraulic and pneumatic cylinders, as follows:
 - (i) Drifting.
 - (ii) Rod seals and welded joints for leaks.

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- (iii) Cylinder rods for scores, nicks and dents.
- (iv) Case (barrel) for significant dents;
- (k) Electrical components for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation, wiring for cracked or split insulation, and loose or corroded terminations;
- (l) Ensure crane is grounded per manufacturer's specifications;
- (m) Hooks and safety latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat;
- (n) Crane structure (including the boom, jib and counter jib):
 - (i) Structural members: Deformed, cracked, or significantly corroded.
 - (ii) Bolts, rivets and other fasteners: Loose, failed or significantly corroded.
 - (iii) Welds for cracks;
- (o) Cracked or worn sheaves and drums;
- (p) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices, sprockets, and drive chains or belts;
- (q) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets;
- (r) Load, wind, and other indicators for inaccuracies outside the tolerances recommended by the manufacturer;
- (s) A legible and applicable operator's manual and load chart is in the operator's station;
- (t) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable;
- (u) A portable fire extinguisher, with a basic minimum extinguishing rating of ten BC must be installed in the cab or at the machinery housing;
- (v) Ballast blocks in place and secured per manufacturer's recommendations;
- (w) Wire rope reeving for compliance with the manufacturer's specifications;
- (x) Wire rope, in accordance with WAC 296-155-53200(5);
- (y) Safety devices and operational aids for proper operation (including significant inaccuracies);
- (z) Legible warning labels and decals as required by the manufacturer;
- (aa) Steps, ladders, handrails and guards are in safe and usable condition.

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(2) Additional requirements for self-erecting tower cranes prior to performing a proof load test.

Note: General requirements relating to preproof load tests for all cranes are located in WAC 296-155-53200.

- (a) Functional motion test must be at crane manufacturer's rated load. Each test must include:
 - (i) Load hoisting and lowering;
 - (ii) Jib (boom) hoisting and lowering, or trolley travel;
 - (iii) Slewing motion;
 - (iv) Brakes and clutches;
 - (v) Limit, locking, and safety devices.
 - (b) The functional motion test listed in (a) of this subsection must continue until all controls, drives, and braking systems have been engaged and have functioned per the crane manufacturer's specifications.
 - (c) Order in which tests of self-erecting tower cranes are to be performed is as follows:
 - (i) Functional motion test without rated load;
 - (ii) Functional motion test at crane manufacturer's rated load. These tests may be combined with test of base structural support or foundation system given in (a) of this subsection.
 - (d) During functional motion tests, the crane's base structural support or foundation system must be visually checked by the accredited crane certifier. If any part of the crane's base structural support or foundation system shows excessive visual displacement, visual distress, or audible distress, then the lifted load must be lowered at hoist creep speed and all crane operations are to cease. An evaluation must then be made by the accredited crane certifier.
- (3) Annual proof load testing of self-erecting tower cranes.
- (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed according to the manufacturer's recommendations. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
 - (b) The structural support or foundation examination during proof load test:
 - (i) This test must be conducted with the rated load placed at maximum radius permitted by site conditions. The superstructure must be rotated through three hundred sixty degrees with five-minute stops at each outrigger position. If any part of the support structure becomes displaced or distressed, all crane operations must stop until an evaluation is made by a qualified person.

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- (ii) For rail-mounted cranes, a load test must be conducted with the jib in the position causing maximum loading on one wheel or bogie. The test must comprise traveling the entire length of the runway, then returning with the same load on the other rail. If a sleeper or support becomes displaced or damaged, crane operations must stop until an evaluation is made by a qualified person or until track ballast has been reset, or repairs made and a satisfactory test performed.
- (c) Self-erecting tower crane hoist load limit switches must be set in accordance with the manufacturer's specifications using specified certified weights. Procedure is to be verified by the accredited crane certifier.
- (d) Setting of hoist load limits must be documented on the form provided by the department. A copy of the completed form and inspection worksheets must be sent to the department within ten days upon completion of the examination.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53208, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53210 Additional inspection criteria and proof load testing--Overhead/bridge and gantry bridge cranes.

- (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect, without disassembly, and if applicable, the following items on overhead and bridge cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers):
 - (a) Controllers. Control mechanisms for interfering with proper operation. Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter;
 - (b) Load hooks. Inspect for damage wear to hook nuts, safety latch and hook swivel. Check for deformation, cracks, excessive wear, or damage such as from chemicals or heat. Inspect blocks for wear to sheaves, check plates, and pins. Check for loose pins, bolts and guards;
 - (c) Sheaves and bearings. Check all sheaves and bearings for lubrication and excessive wear. Ensure sheaves turn freely. Check sheave pin locking device;
 - (d) Structural supports. Inspect for damage or bent girders, girder seat top plate, diaphragms and structural column connections. Check for loose bolts or rivets, and cracks;
 - (e) Bridge inspection.
 - (i) Check complete structure for broken, cracked, damaged, missing, or corroded parts and members.
 - (ii) Handrails, walkways, and ladders. Inspect for loose, missing, bent, deteriorated or misaligned members, loose bolts, rivets, broken welds and hangers;
 - (f) Brackets. Check for cracked or corroded welds, missing or loose bolts, bent or cracked brackets;
 - (g) End stops. Inspect for damaged wheels, broken welds, loose or missing bolts, damaged bumpers, missing pins or damaged plates;

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- (h) Runway rail and clamps. Inspect for loose, broken or missing clamps. Check the condition of railhead and side wear, rail splice plates and/or welds, rail gaps and associated bolts, wedges, connectors and rail switches;
- (i) Crane alignment. Inspect for proper bridge end float while crane travels in both directions on runway. Check all corner connections for rust, shear marks, loose or missing bolts, nuts and washers. Inspect square marks and legibility of dimension;
- (j) Wheels and bearings. Inspect wheels for wear, flat spots, chips, flange wear, cracks, loose axle pins, or securing devices. Check bearing clearance, chatter, loose bearing caps and lubrication;
- (k) Trolley. Check for loose, missing, broken or bent members. Inspect for loose, faulty or missing coupling guards. Check for broken, loose or missing axle pins. Inspect for axle pins displaying excessive wear;
- (l) Trolley rail. Inspect for bent or damaged members, loose bolts, rivets, guards, trolley rail clamps, end stops and broken welds. Check condition of rail head and side wear, rail splice plates and/or welds and rail gaps;
- (m) Trolley conductors. Inspect insulators and clamps, loose connectors, bent, pitted or damaged wires or collectors;
- (n) Shafts, couplings, and bearings. Inspect shafts for vibration, cuts and nicks, loose or worn keyways and misalignment. Check coupling for wear, loose bolts or keys and misalignment. Inspect bearing for clearance, chatter, loose bearing caps and proper lubrication;
- (o) Gearing. Inspect gears for worn teeth, cracked teeth, superficial root cracks, pitting, unusual indentation or wear marks, full contact or end loading, loose set screws and keys. Check guards and covers. Inspect gear cases for excessive noise and vibration, proper lubrication and leaking;
- (p) Wire rope and drum. Inspect wire rope for damage. Check rope clip fittings and associated mounting hardware for wear and damage. Inspect drum grooves for excessive wear. Inspect drum pedestal and bearing condition. Check for cracks in drum;
- (q) Electrical items. Check all contacts for proper alignment and evidence of excess heating or unusual arcing. Inspect all coils, contact leads, shunts and wires, fuses or overload devices for loose connections and evidence of overheating. Inspect panel board and arc shields for cracks, loose bolts, dirt and moisture. Check panel marking for legibility. Inspect speed control resistors for damaged insulation, cracked or broken grids, loose connections, bolts and brackets;
- (r) Motor. Inspect for damage, bearing noise, vibration and lubrication, spark and cleanliness of commutator and brush wear, loose hold down bolts and motor brackets. Inspect commutator or slip rings for evidence of overheating and brush sparking. Inspect motor leads and insulators, damaged or deteriorated insulation and loose connections. Inspect brush holder for proper clearance to commutator or slip rings, and freedom of brushes;
- (s) Brakes. Inspect for wear in linkage, pins and cams, weakness of springs, wear and condition of lining, smoothness of the drum, heat check crack and clearance between drum or disk. Inspect for improper solenoid air gap; evidence of overheating; damaged brass, and loose core laminations; delay or restriction in opening of brakes;

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- (t) Hoist brakes. Inspect for wear in linkage, pins and cams, weakness of springs, wear and condition of lining, smoothness of drum, heat check cracks and clearance between drum or disk. Inspect for improper solenoid air gap; evidence of overheating; damaged brass, and loose core laminations; delay or restriction in opening of brakes;
 - (u) Limit switches. Remove covers and inspect all electrical and mechanical components for malfunction including contacts, springs, ratchets, pins, arm and insulators, rollers, cams and dogs. Inspect cover gaskets, counterweight guides. Check all securing bolts and guards. Check for weather or moisture damage. Check for proper operation;
 - (v) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable;
 - (w) Operation of crane controls. Operate all crane controls and check for proper operation. Check for smooth and regular motions without abnormal sensations, hesitations, binding, vibrations, shimmy, or irregularity;
 - (x) Warning device/fire protection. Inspect for proper operation of sirens, horns, bells and lights. Check switches and inspect wiring and connections;
 - (y) A legible and applicable operator's manual and load chart is in the operator's cab or station;
 - (z) A portable fire extinguisher, with a basic minimum extinguishing rating of ten BC must be installed in the cab or at the machinery housing.
- (2) Annual proof load testing of bridge/overhead cranes.
- (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed according to the manufacturer's recommendations or a registered professional structural engineer (RPSE). This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
 - (b) The proof load test must be at least one hundred percent but not to exceed one hundred twenty-five percent of the rated capacity.
 - (c) This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
 - (d) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s).
 - (e) Transport the test load by means of the trolley for the full length of the bridge, as practical.
 - (f) Transport the test load by means of the bridge for the full length of the runway in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the left-hand end of the crane as practical.
 - (g) Lower the test load, and stop and hold the test load with the brake(s).

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- (h) Mechanical load brake tests. Hoist test load and hold for five minutes.

Release the holding brake, either mechanically or electrically to verify mechanical load brake function or hoist the rated load then lower, monitoring the hoist for any speed control issues.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53210, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53210, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53212 Additional inspection criteria and proof load testing--Derricks.

- (1) After it is determined that the derrick configurations meet the criteria in WAC 296-155-53200, the accredited derrick certifier must visually inspect the following items, if applicable, on derricks for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers):
 - (a) All control and drive mechanisms for adjustments interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter;
 - (b) All chords and lacing, tension in guys, plumb of the mast, external indication of deterioration or leakage in air or hydraulic systems;
 - (c) Derrick hooks for deformation or cracks, distortion causing an increase in throat opening of five percent not to exceed one-quarter inch or as recommended by the manufacturer. Any wear exceeding ten percent (or as recommended by the manufacturer) of the original section dimension of the hook;
 - (d) Rope reeving for noncompliance with derrick manufacturer's specifications;
 - (e) Hoist brakes, clutches, and operating levers;
 - (f) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt and moisture accumulation;
 - (g) Structural members for deformation, cracks, and corrosion;
 - (h) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable;
 - (i) Bolts and rivets for tightness;
 - (j) Parts such as pins, bearings, shafts, gears, sheaves, drums, rollers, locking and clamping devices, for wear, cracks, and distortion;
 - (k) Gudgeon pin for cracks, wear and distortion;
 - (l) Foundation or supports for continued ability to sustain the imposed loads;
 - (m) A legible and applicable operator's manual and load chart is in the operator's cab or station;
 - (n) A portable fire extinguisher, with a basic minimum extinguishing rating of ten BC must be installed in the cab or at the machinery housing.

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- (2) Annual proof load testing of derricks.
- (a) Annual proof load testing. After the derrick has passed the visual and operational tests, the accredited derrick certifier must ensure a proof load test is conducted and must be performed at the maximum and minimum boom angles or radii or as close to these as practical and at such intermediate radii as the derrick manufacturer or RPSE may deem necessary. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.
- (b) Proof load tests and safe working load ratings must be based on the designed load ratings at the ranges of boom angle or operating radii. Proof loads must be as per the manufacturer's recommendations. When the manufacturer recommendations are not available follow the requirements in Table 2 below:

Table 2 - Derrick Load Test	
Safe Working Load SWL	Proof Load
Up to 20 tons	25 percent in excess
20-50 tons	5 tons in excess
Over 50 tons	10 percent in excess

- (c) Hoist the test load a few inches and hold to verify that the load is supported by the derrick and held by the hoist brake(s).
- (d) Swing the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load.
- (e) Boom the derrick up and down within the allowable working radius for the test load.
- (f) Lower the test load, stop and hold the load with the brake(s).
- (g) After satisfactory completion of a proof load test, the derrick and all component parts thereof shall be carefully examined in all applicable requirements in this section.
- (h) This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53212, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53212, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53214 Crane decertification and reinstatement.

- (1) If any of the following occur, the certification becomes invalid and must be inspected by an accredited crane certifier:
- (a) Contact with an energized power line;

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- (b) Any overload, other than proof load testing, or one that has been approved in writing in advance by the crane manufacturer or a RPE;
- (c) Any significant modifications or significant repairs of a load sustaining/bearing part that affects the safe operation of the crane/derrick.
- (d) Any deficiency that affects the safe operation of the crane or derrick that has been identified by a qualified person or through an inspection by the department of labor and industries.

Note: Replacement of hoisting rope does not constitute decertification.

- (2) The owner or lessee must notify the crane certification section by phone, (360) 902-4943 or fax (360) 902-5438, or e-mail at lnicranes@lni.wa.gov within twenty-four hours if any of the above occurs.
- (3) The certification may be reinstated only after affected components have been reinspected by an accredited crane certifier. If the accredited crane certifier identifies any deficiencies during the reinspection, the deficiencies must be corrected before the certification can be reinstated. If the accredited crane certifier believes proof load testing should be conducted prior to reinstatement of the certification, proof load testing must be conducted. In the case of major modifications or repairs to important load sustaining/bearing parts, proof load testing must be performed prior to reinstatement. The accredited crane certifier must notify the department that the certification has been reinstated.

[Statutory Authority: Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53214, filed 11/04/08, effective 01/01/10.]

WAC 296-155-533 Qualifications and certification.

[Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-533, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53300 Operator qualifications and certification.

- (1) Prior to operating any crane covered under chapter 296-155 WAC, Part L, with the exception of the trainee/apprentice requirements outlined in subsection (2) of this section and those cranes exempt in WAC 296-155-52900(3), the employer must ensure that the operator meets the following requirements:
 - (a) Has a valid crane operator certificate, for the type of crane to be operated, issued by a crane operator testing organization which has an accredited program, accredited by a nationally recognized accrediting agency. The operator certification must include a successful passing of a written and practical examination for each crane category listed in Table 3 and by crane type for mobile cranes.
 - (b) A determination through a written test that:
 - (i) The individual knows the information necessary for safe operation of the specific type of crane/derrick the individual will operate, including all of the following:
 - (A) The controls and operational/performance characteristics.
 - (B) Use of, and the ability to calculate, load/capacity information on a variety of configurations of the crane/derrick.
 - (C) Procedures for preventing and responding to power line contact.

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- (D) Technical knowledge similar to the subject matter criteria listed in WAC 296-155-56420 of this part applicable to the specific type of crane/derrick the individual will operate. Use of WAC 296-155-56420 criteria meets the requirements of this provision.
- (E) Technical knowledge applicable to:
 - (I) The suitability of the supporting ground and surface to handle expected loads.
 - (II) Site hazards.
 - (III) Site access.
- (F) This part, 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 (i) of this subsection.
- (c) A determination through a practical test that the individual has the skills necessary for safe operation of the crane/derrick, including the following:
 - (i) Ability to recognize, from visual and auditory observation, the items listed in WAC 296-155-53405(2).
 - (ii) Operational and maneuvering skills.
 - (iii) Application of load chart information.
 - (iv) Application of safe shut-down and securing procedures.

Notes:

- *An operator's certificate issued by the accredited testing agency is valid for a five-year period, and must be renewed to ensure operators maintain qualified operator status.*
- *For self-erecting tower cranes, the department will accept a tower crane certification issued by a nationally accrediting testing agency.*
- *For derricks, the department will accept, at a minimum, a lattice boom truck or crawler mobile crane operator's certificate.*
- *An operator will be deemed qualified to operate a crane if the operator is certified under (a) of this subsection for the type and capacity of the crane or for higher-capacity crane of the same type.*
- (d) If there is no accredited written or practical test for operator certification available, the employer must ensure the operator has been completely trained, evaluated and tested by the employer on the operating procedures for the piece of equipment in use as recommended by the crane/ equipment manufacturer and the applicable ASME standard. This process must be documented and made available upon request.
- (e) Has crane hours of experience as shown in Table 3; and
- (f) Pass a substance abuse test conducted by a recognized laboratory.

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Exemption: When it is necessary in the performance of their duties, manufacture representatives, factory representatives and maintenance personnel are not required to be certified crane operators.

Table 3 Crane Operator Experience for Cranes Used in the Construction Industry		
The 5 Categories of Cranes and their Types	Number of Hours of Actual Crane Operating Experience	Number of Hours of Crane Related Experience
(1) Mobile Cranes		
(a) Lattice Boom Crawler Cranes (LBC)	300 tons and above 1000 Hours	300 tons and above 1000 Hours
	Under 300 tons 500 Hours	Under 300 tons 500 Hours
(b) Lattice Boom Truck Cranes (LBT)	300 tons and above 1000 Hours	300 tons and above 1000 Hours
	Under 300 tons 500 Hours	Under 300 tons 500 Hours
(c) Large Telescopic Boom Cranes (Swing Cab) (TLL) (including digger derricks)	Over 130 tons 750 Hours	Over 130 tons 750 Hours
	Over 40 tons to 130 tons 250 Hours	Over 40 tons to 130 tons 250 Hours
	40 tons and under 40 Hours	40 tons and under 40 Hours
(d) Small Telescopic Boom Cranes (Fixed Cab) (TSS) (including digger derricks)	15 tons and above 40 Hours	15 tons and above 40 Hours
	Over 5 tons and under 15 tons 20 Hours	Over 5 tons and under 15 tons 20 Hours
	5 tons and under 8 hours	5 tons and under 16 hours
(2) Articulating Boom Cranes	20 Hours	20 Hours

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(3) Tower Cranes		
(a) Hammerhead	500 Hours	500 Hours
(b) Luffer	500 Hours	500 Hours
(c) Self-Erecting	50 Hours	50 Hours
(4) Overhead/Bridge and Gantry Cranes		
(a) Cab Operated	40 Hours	40 Hours
(b) Pendant/Remote	40 Hours	40 Hours
(5) Derricks (not including digger derricks)	20 Hours	500 Hours
<p>Hours of actual crane operating experience. For all cranes: Time while the operator is at the controls of the crane; and/or has direct control of that crane; and/or a combination of operating hours within the same crane type. For mobile cranes: It also includes time while installing/removing boom sections, luffing boom, jib, extending and retracting outriggers/stabilizers, leveling crane, and replacing hoisting rope. For tower cranes: It includes time while jumping (increasing the height of the tower/mast).</p> <p><i>Note: Additional actual crane operator experience may account for crane related experience.</i></p>		
<p>Hours of crane related experience: Time as a signalperson/bellman, oiler, crane mechanic, crane inspector, formal classroom training, crane simulator operation, and a combination of operating hours on other categories of cranes.</p>		

Note: Cranes and other lifting machines covered under this part that are exempt can be found in WAC 296-155-52900(3).

- (2) Prequalification/certification training period. An employee who is not a qualified crane operator as outlined in subsection (1) of this section is permitted to operate the crane as part of his/her training providing the following requirements are met:
- (a) The employee ("trainee/apprentice") must be provided with sufficient training prior to operating the crane to enable the trainee to operate the crane safely under limitations established by this section (including continuous supervision) and any additional limitations established by the employer.
 - (b) The tasks performed by the trainee/apprentice while operating the crane must be within the trainee's ability, as determined by the supervising qualified crane operator.
 - (c) Qualified crane/derrick operator. While operating the crane/derrick, the trainee/apprentice must be continuously supervised by a qualified crane/derrick operator who meets the following requirements:
 - (i) The qualified crane/derrick operator is an employee or agent of the trainee's/apprentice's employer.
 - (ii) The qualified crane/derrick operator under this section is familiar with the proper use of the crane's/derrick's controls.

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- (iii) While supervising the trainee/apprentice, the qualified crane/derrick operator performs no tasks that detract from the qualified crane/derrick operator's ability to supervise the trainee/apprentice.
 - (iv) For cranes other than tower cranes: The qualified crane/derrick operator and the trainee/apprentice must be in direct line of sight of each other. In addition, they must communicate verbally or by hand signal.
 - (v) For tower cranes: The qualified crane operator and the trainee/apprentice must be in direct communication with each other.
- (d) The trainee/apprentice must not operate the crane in any of the following circumstances:
- (i) If any part of the crane, load line or load (including rigging and lifting accessories), if operated up to the crane's maximum working radius in the work zone, could get within twenty feet of a power line that is up to three hundred fifty kV, or within fifty feet of a power line that is over three hundred fifty kV;
 - (ii) If the crane is used to hoist personnel;
 - (iii) In a multiple-crane or multiple load line lift situations; or
 - (iv) Multiple-lift rigging, as defined in WAC 296-155-52902, can only be accomplished by the trainee/apprentice when the qualified crane operator determines that the trainee's/apprentice's skills are sufficient for this high-skill work.
 - (v) Critical lifts, as defined in WAC 296-155-52902, can only be accomplished by the trainee/apprentice when the qualified crane operator determines that the trainee's/apprentice's skills are sufficient for this high-skill work.
- (3) The employer must obtain documentation showing hours of crane operator experience and crane related experience separated out by crane type and capacity.
- Note: The employer may accept a signed declaration from the crane operator attesting to actual hours of crane operator experience and crane related experience separated out by crane type and capacity. For sample declaration form see WAC 296-155-56425.*
- (4) The department may recognize crane operator certification from another state or territory of the United States as equivalent to qualified crane operator requirements if the department determines that the other jurisdiction's credentialing standards are substantially similar to the qualified crane operator requirements.
- (5) Crane operator experience and crane related experience must be documented and separated out by crane type and capacity; this documentation need only show the minimum amount of hours as outlined in Table 3 above. If the employer is documenting crane operating and/or related crane experience hours, the employer must provide a copy of the hours to the operator as soon as practical, if requested.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53300, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53300, filed 12/20/11, effective 02/01/12. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 10-14-100 (Order 10-11), § 296-155-53300, filed 07/06/10, effective 09/01/10. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 08-22-080 (Order 07-28), § 296-155-53300, filed 11/04/08, effective 01/01/10.]

WAC 296-155-53302 Signal person qualifications.

- (1) The signal person must meet the qualification requirements (subsection (3) of this section) prior to giving any signals to a crane/derrick operator. This requirement must be met by using either Option (1) or Option (2).
 - (a) Option (1) - Third-party qualified evaluator. The signal person has documentation from a third-party qualified evaluator showing that the signal person meets the qualification requirements listed in subsection (3) of this section.
 - (b) Option (2) - Employer's qualified evaluator. The employer has its qualified evaluator assess the individual and determine that the individual meets the qualification requirements listed in subsection (3) of this section and provides documentation of that determination. An assessment by an employer's qualified evaluator under this option is not portable meaning other employers are not permitted to use this qualification to meet the requirements of this section.
 - (c) 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 subsection (3) of this section.
- (2) If subsequent actions by the signal person indicate that the individual may not meet the qualification requirements listed in subsection (3) of this section, the employer must not allow the individual to continue working as a signal person until retraining is provided and a reassessment is made in accordance with subsection (1) of this section that confirms that the individual meets the qualification requirements.
- (3) Qualification requirements. Each signal person must:
 - (a) Know and understand the type of signals used. For example, if hand signals are used, the signal person must know and understand the standard method for hand signals.
 - (b) Be competent in the application of the type of signals used.
 - (c) Have a basic understanding of crane/derrick operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.
 - (d) Know and understand the relevant requirements of WAC 296-155-53406 and this section.
 - (e) Demonstrate that they meet the requirements in (a) through (d) of this subsection through an oral or written test, and through a practical test. All tests must be documented.
- (4) Qualification period. A signal person qualification cannot exceed a five-year period; this qualification must be renewed every five years to ensure signal persons maintain qualified status. At a minimum, this renewal must include a documented written or oral or practical exam.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53302, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53304 Repair, Inspection and Maintenance Employee Qualifications.

- (1) Repair, inspection, and maintenance personnel are permitted to operate the crane/derrick only where all of the following requirements are met:
 - (a) The operation is limited to those functions necessary to perform maintenance, inspect or verify the performance of the crane/derrick.

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- (b) The personnel either:
 - (i) Operate the crane/derrick under the direct supervision of an operator who meets the requirements of WAC 296-155-53300, Operator qualification and certification; or
 - (ii) Are familiar with the operation, safe limitations, characteristics and hazards associated with the type of crane/derrick.
- (2) Maintenance and repair personnel must meet the definition of a qualified person with respect to the crane/derrick and maintenance/repair tasks performed.
[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53304, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53306 Rigger Qualifications.

- (1) The rigger must meet the qualification requirements (subsection (3) of this section) prior to performing hoisting activities for assembly and disassembly work (WAC 296-155-53402 (19)(a)). A qualified rigger is required whenever 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 (WAC 296-155-53400 (43)(c)). This requirement must be met by using either Option (1) or Option (2).
 - (a) Option (1) - Third-party qualified evaluator. The rigger has documentation from a third-party qualified evaluator showing that the rigger meets the qualification requirements listed in subsection (3) of this section.
 - (b) Option (2) - Employer's qualified evaluator. The employer has its qualified evaluator assess the individual and determine that the individual meets the qualification requirements listed in subsection (3) of this section and provides documentation of that determination. An assessment by an employer's qualified evaluator under this option is not portable meaning other employers are not permitted to use this qualification to meet the requirements of this section.
 - (c) The employer must make the documentation for whichever option is used available at the site while the rigger is employed by the employer. The documentation must specify each type of rigging for which the rigger meets the requirements of subsection (3) of this section.
- (2) If subsequent actions by the rigger indicate that the individual may not meet the qualification requirements listed in subsection (3) of this section, the employer must not allow the individual to continue working as a rigger until retraining is provided and a reassessment is made in accordance with subsection (1) of this section that confirms that the individual meets the qualification requirements.
- (3) Qualification requirements. Each rigger must:
 - (a) Know and understand the requirements located in ASME B30.7-2006, Base-Mounted Drum Hoists, B30.9-2010, Slings, B30.10-2009, Hooks, B30.16-2007, Overhead Hoists (Underhung), B30.20-2010, Below-the-Hook Lifting Devices, B30.21-2005, Manually Lever Operated Hoists and B30.26-2004, Rigging Hardware, as applicable.
 - (b) Know and understand the type of sling and hitch used. For example, if synthetic web slings are used, the rigger must know and understand the removal criteria for this type of sling and how to properly use the sling.

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- (c) Be competent in the application of the type of hitches used.
- (d) Have a basic understanding of slings, rigging hardware and below-the-hook lifting devices (as applicable); their limitations, rigging practices, associated hazards and inspection requirements.
- (e) Know and understand load weight estimation, center of gravity, effect of angles on rigging components, load turning, knots/tag lines, chain hoist/come-a-long usage, winch and block usage, and basic hand signals, as applicable.
- (f) Know and understand the relevant requirements of WAC 296-155-556 through 296-155-56220 and this section.
- (g) Demonstrate that they meet the requirements in (a) through (e) of this subsection through a written test and through a practical test. All tests must be documented.

Notes:

- *The provisions of subsection (3)(g) of this section are not required until February 1, 2013.*
- *This section does not require that each and every worker associated with the rigging of a component or structure to be a “fully qualified rigger” as defined in this section, the requirement is for at least one of the workers to be a fully qualified rigger. However, all other associated workers must be qualified by training or experience to perform their assigned tasks (WAC 296-155-035(2)).*

- (4) Qualification period. A rigger qualification cannot exceed a five-year period; this qualification must be renewed every five years to ensure riggers maintain qualified status. At a minimum, this renewal must include a documented written exam.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53306, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53306, filed 12/20/11, effective 02/01/12.]

WAC 296-155-534 General Requirements for All Cranes and Derricks.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-534, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53400 General Requirements.

- (1) All cranes and derricks covered under this part, except for those exempted in WAC 296-155-52900(3), must be certified annually by an accredited certifier recognized by the department, for detailed information about this certification see WAC 296-155-532.
- (2) All crane and derrick operators covered under this part, except for those exempted in WAC 296-155-52900(3), must be qualified as required by WAC 296-155-533.
- (3)
 - (a) Cranes must meet the requirements for design, construction, installation and testing as prescribed in the applicable ASME standard at the time the crane or derrick was manufactured.
 - (b) Where manufacturer's specifications are not available the limitations assigned to the crane must be based on the determinations of a registered professional engineer (RPE), competent in this field and such determinations must be appropriately documented and recorded.
 - (c) Attachments used with cranes must not exceed the capacity, rating, or scope recommended by the manufacturer or RPE.

WAC 296-155-53400 (Cont.)

- (4) Unavailable operation procedures.
 - (a) Where the manufacturer procedures are unavailable, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the crane/derrick and attachments.
 - (b) Procedures for the operational controls must be developed by a qualified person.
 - (c) Procedures related to the capacity of the crane/derrick must be developed and signed by a registered professional engineer familiar with this equipment.
- (5) Warning decals and placards must be installed and legible as prescribed by this part and the crane manufacturer.
- (6) The procedures applicable to the operation of the crane/derrick including a legible and applicable operator's manual and load rating chart, written in the English language with customary grammar and punctuation, must be in the operator's cab or station when the crane is in operation. 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.
- (7) Rated capacity and related information. The information available in the operator's cab or station (see WAC 296-155-53400(6)) regarding "rated capacity" and related information must include, at a minimum, the following information:
 - (a) A complete range of the manufacturer's rated capacities, as follows:
 - (i) At all manufacturer approved operating radii, boom angles, work areas, boom lengths and configurations, jib lengths and angles (or offset).
 - (ii) Alternate ratings for use and nonuse of optional equipment which affects rated capacities, such as outriggers, stabilizers, and extra counterweights.
 - (iii) When available from the manufacturer load ratings where structural competence governs lifting performance must be identified.
 - (b) A work area chart for which capacities are listed in the load chart.

Note: An example of this type of chart for mobile cranes is in WAC 296-155-56435.

- (c) The work area figure and load chart must clearly indicate the areas where no load is to be handled.
- (d) Recommended reeving for the hoist lines must be shown.
- (e) Recommended parts of hoist reeving, size, and type of wire rope for various crane loads.
- (f) Recommended boom hoist reeving diagram, where applicable; size, type, and length of wire rope.
- (g) Tire pressure (where applicable).

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- (h) Caution or warnings relative to limitations on cranes and operating procedures, including an indication of the least stable direction.
 - (i) Position of the gantry and requirements for intermediate boom suspension (where applicable).
 - (j) Instructions for boom erection and conditions under which the boom, or boom and jib combinations, may be raised or lowered.
 - (k) Whether the hoist holding mechanism is automatically or manually controlled, whether free fall is available, or any combination of these.
 - (l) The maximum telescopic travel length of each boom telescopic section.
 - (m) Whether sections are telescoped manually or with power.
 - (n) The sequence and procedure for extending and retracting the telescopic boom section.
 - (o) Maximum loads permitted during the boom extending operation, and any limiting conditions or cautions.
 - (p) Hydraulic relief valve settings specified by the manufacturer.
- (8) All manufacturer procedures applicable to the operational functions of cranes/derricks, including its use with attachments must be complied with.
- (9) The operator must not engage in any practice or activity that diverts his/her attention while actually engaged in operating the crane/derrick, such as the use of cellular phones (other than when used for signal communications).
- (10) A portable fire extinguisher, with a basic minimum extinguisher rating of 10 BC, must be installed in the cab or at the machinery housing. Additional requirements relating to portable fire extinguishers can be found in WAC 296-800-300.
- (11) Cabs. Cranes/derricks with cabs must meet the following requirements:
- (a) 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.
 - (b) 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.
 - (c) Windows.
 - (i) 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.
 - (ii) 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.

WAC 296-155-53400 (Cont.)

- (iii) 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.
 - (d) A clear passageway must be provided from the operator's station to an exit door on the operator's side.
 - (e) Areas of the cab roof that serve as a workstation for rigging, maintenance, or other equipment-related tasks must be capable of supporting two hundred fifty pounds without permanent distortion.
 - (12) Personal belongings must be stored in such a manner as to not interfere with access or operation of the crane.
 - (13) Rigging gear, tools, oil cans, waste, and other articles must be stored in the toolbox or another appropriate location, and must not be permitted to lie loose in or about the cab or operator's work station.
 - (14) Operating controls must be properly marked to indicate the function of the controls in each position.
 - (15) The employer must designate a competent person who must inspect the cranes and components daily when used, and periodically during use to make sure it is in safe operating condition. Any deficiencies that effect the safe operation of the crane must be repaired, or defective parts replaced, before continued use.
- Note: For additional requirements relating to inspections see WAC 296-155-53405.*
- (16) 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.
 - (17) While in operation, belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment must be guarded if such parts are exposed to contact by employees, or otherwise create a hazard. Guarding must meet the requirements of chapter 296-806 WAC, Machine safety.
 - (18) Neither the load nor the boom is allowed to be lowered below the point where less than two full wraps of rope remain on their respective drums.
 - (19) All exhaust pipes, turbochargers, and charge air coolers must be guarded or insulated in areas where contact by employees is possible in the performance of normal duties and are discharged in a direction away from the operator.
 - (20) Hydraulic and pneumatic lines must be protected from damage to the extent feasible.
 - (21) Friction mechanisms. Where friction mechanisms (such as brakes and clutches) are used to control the boom hoist or load line hoist, they must be:
 - (a) Of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.
 - (b) Adjustable to permit compensation for lining wear to maintain proper operation.
 - (22) 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.

WAC 296-155-53400 (Cont.)

- (23) Whenever internal combustion engine powered crane/derrick exhausts in enclosed spaces, tests must be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres. (See chapter 296-62 WAC, General occupational health standards and chapter 296-841 WAC, Airborne contaminants.)
- (24) If access to the cab roof is necessary, a ladder or steps must be provided to give access to a cab roof.
- (25) All steps, running boards, and ladders must be of substantial construction and in good repair at all times.
- (26) Guardrails, handholds, and steps must be provided on cranes for easy access to the cab in accordance with Parts C-1 and J of this chapter.
- (27) Platforms and walkways must have antiskid surfaces.
- (28) Cranes/derricks fuel tank filler pipe must be located in such a position, or protected in such a manner, as to not allow spill or overflow to run onto the engine, exhaust, or electrical equipment of any crane being fueled. In addition, cranes/derricks must be refueled as follows:
 - (a) Make sure the engine is turned off before refueling.
 - (b) When refueling with gasoline using portable containers, make sure only an approved safety-type can with an automatic closing cap and flame arrester is used.
 - (c) Smoking or open flames is prohibited in the refueling area.
- (29) Crane hook ball assemblies and load blocks.
 - (a) 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.
 - (b) Crane hooks must be equipped with latches or self-locking devices unless a qualified person determines that it is safer to hoist and place the load without latches (or with the latches removed/tied back or otherwise disabled) and routes for the loads are preplanned 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.
 - (c) The latch or self-locking device when used must bridge the throat opening of the hook for the purpose of retaining slings or other lifting devices under slack conditions.
- (30) Repair or replace a hook when it shows:
 - (a) Any cracks, nicks, or gouges.
 - (b) Wear of more than ten percent of the original sectional dimension, or as recommended by the manufacturer.
 - (c) Any visibly apparent bend or twist from the plane of the unbent hook.
 - (d) Any distortion causing an increase in the throat opening of five percent, not to exceed one-fourth inch or as recommended by the manufacturer.
 - (e) Repair or replace hook latches or self-locking devices when they become inoperative.

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(31) A qualified person must determine if a damaged hook needs to be replaced or can be repaired.

(32) When repairing a hook, the requirements below must be followed:

- (a) Unless otherwise recommended by the manufacturer, only a qualified person can repair cracks, nicks and gouges by grinding longitudinally, following the contour of the hook.

Note: The dimension of the hook cannot be reduced more than ten percent of its original value, unless otherwise recommended by the manufacturer.

- (b) All other repairs must be performed by the hook manufacturer or the qualified person.
- (c) Weld repairs or reshaping must not be performed on hooks, unless approved by the manufacturer.

(33) Replacement parts, such as load pins for clevis hooks must be at least equal to the original manufacturer's specifications.

Note: For requirements relating to wedge sockets, see WAC 296-155-56115(2).

(34) Before traveling a crane with a load, it must be determined that this practice is not prohibited by the manufacturer. If not, a qualified person must be responsible for the operation. Decisions such as the necessity to reduce crane ratings, load position, boom location, ground support, travel route, and speed of movement must be in accordance with that person's determination. Specified tire pressure must be maintained. The boom should be carried in line with the direction of travel. Sudden starts and stops should be avoided.

(35) The crane/derrick must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent as determined by a competent person, so that, in conjunction (if necessary) with the use of supporting materials, the crane/derrick manufacturer's specifications for adequate support and degree of level of the crane/derrick are met. The requirement for the ground to be drained does not apply to marshes/wetlands. For additional requirements for self-erecting tower cranes, see WAC 296-155-54100.

(36) The controlling entity must:

- (a) Ensure that ground preparations necessary to meet the requirements in subsection (35) of this section are provided.
- (b) Inform the user of the crane/derrick and the operator of the location of hazards beneath the crane/derrick 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) if they are available to the controlling entity 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.

(37) If there is no controlling entity for the project, the requirement in subsection (36)(a) 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 subsection (35) of this section.

(38) If the assembly/disassembly director or the operator determines that ground conditions do not meet the requirements in subsection (35) 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 subsection (35) of this section can be met.

WAC 296-155-53400 (Cont.)

- (39) 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 C.F.R. Part 213, and that comply with applicable Federal Railroad Administration requirements.
- (40) Multiple crane/derrick coordination. 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.
- (41) Multiple crane or multiple load line lifts.
 - (a) Plan development. Before beginning a crane/derrick operation in which more than one crane/derrick will be supporting the load or multiple load lines on one crane will be supporting the load, the operation must be planned. The planning must meet the following requirements:
 - (i) The plan must be developed by a qualified person.
 - (ii) The plan must be designed to ensure that the requirements of this part are met.
 - (iii) Where the qualified person determines that engineering expertise is needed for the planning, the employer must ensure that it is provided.
 - (b) Plan implementation.
 - (i) The multiple-crane/derrick lift or multiple load line lifts 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).
 - (ii) The lift director must review the plan in a meeting with all workers who will be involved with the operation.
- (42) Work area control. Swing radius hazards.
 - (a) The requirements in (b) of this subsection apply where there are accessible areas in which the crane'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 crane or another object.
 - (b) To prevent employees from entering these hazard areas, the employer must:
 - (i) Train each employee assigned to work on or near the crane (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.

WAC 296-155-53400 (Cont.)

Exception: When the employer can demonstrate that it is neither feasible to erect such barriers on the ground nor on the crane, 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 crane that identify the hazard areas. In addition, the employer must train each employee to understand what these markings signify.

- (c) 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 subsection (43)(c)(i) of this section, the operator must not rotate the superstructure until the operator is informed in accordance with a prearranged system of communication that the employee is in a safe position.
 - (d) 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.
- (43) 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 is allowed to be within the fall zone, except for employees:
 - (i) Engaged in hooking, unhooking or guiding a load; or
 - (ii) Engaged in the initial attachment of the load to a component structure; or
 - (iii) 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:
 - (i) The materials being hoisted must be rigged to prevent unintentional displacement.
 - (ii) Hooks with self-closing latches or their equivalent must be used, see subsection 29(b) of this section. "J" hooks are permitted to be used for setting wooden trusses.
 - (iii) 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.

WAC 296-155-53400 (Cont.)

- (e) During a tilt-up or tilt-down operation:
 - (i) Employees are not allowed to be directly under the load.
 - (ii) Only employees' essential to the operation are allowed to be in the fall zone (but not directly under the suspended load).

Note: 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:

- *Physically guide the load;*
- *Closely monitor and give instructions regarding the load's movement; or*
- *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).*

- (f) 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 subsections (44) through (47) of this section.

(44) Boom free fall prohibitions.

- (a) The use of cranes 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 listed in Table 4 located in WAC 296-155-53408, clearance distance to each side of the power line; or any part of the area extending the Table 4 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.
- (b) The use of cranes in which the boom is designed to free fall (live boom) is permitted only where none of the circumstances listed in (a) of this subsection are present and:
 - (i) The crane was manufactured prior to October 31, 1984; or
 - (ii) The crane is a floating crane or a land crane on a vessel/flotation device.

WAC 296-155-53400 (Cont.)

- (45) Preventing boom free fall. Where the use of a crane with a boom that is designed to free fall (live boom) is prohibited (see subsection (44)(a) of this section), 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:
- (a) 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).
 - (b) Hydraulic drums must have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.
 - (c) Neither clutches nor hydraulic motors must be considered brake or locking devices for purposes of this part.
 - (d) Hydraulic boom cylinders must have an integrally mounted holding device.
- (46) 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.
- (47) 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:
- (a) An employee is directly under the load.
 - (b) An employee is being hoisted.
 - (c) The load is directly over a power line, or over any part of the area listed in Table 4, located in WAC 296-155-53408, clearance distance to each side of the power line; or any part of the area extending the Table 4 of WAC 296-155-53408, clearance distance to each side of the power line is within the radius of vertical travel of the load.
 - (d) The load is over a shaft.
 - (e) The load is over a cofferdam, except where there are no employees in the fall zone of the load.
- (48) Employees must not be allowed to ride on the hook or load.
- (49) The hoist rope must not be wrapped around the load.
- (50) All loads must be attached to the hook by means of suitable slings or other devices of sufficient lifting capacity.
- (51) When moving a load it must be well secured and balanced in the sling or lifting device before it is lifted more than a few inches.

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- (52) Leaving the crane/derrick unattended. The operator must not leave the controls while the load is suspended, except where all of the following are met:
- (a) The operator remains adjacent to the crane/derrick and is not engaged in any other duties.
 - (b) The load is to be held suspended for a period of time exceeding normal lifting operations.
 - (c) 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.
 - (d) Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees, including those listed in subsection (43)(b), (d), and (e) of this section, are permitted in the fall zone.

Exemption: The provisions in this section 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.

Note: For additional requirements relating to leaving the crane unattended for tower, self-erecting, overhead/bridge and derricks see:

- WAC 296-155-53915, *Tower cranes-Operations*;
- WAC 296-155-54115, *Self-erecting tower cranes-Operations*;
- WAC 296-155-54215, *Overhead/bridge cranes and gantry cranes-Operations*;
- WAC 296-155-54320, *Derricks-Operations*.

- (53) While moving the load the lift and swing path must be clear of obstructions.
- (54) Before starting to lift the following conditions must be met:
- (a) The hoist rope must not be kinked.
 - (b) Multiple-part lines must not be twisted around each other.
 - (c) The hook must be brought over the load in such a manner as to minimize swinging.
 - (d) If the competent person determines that there is slack rope condition requiring respooling of the rope, it must be verified (before starting the lift) that the rope is seated on the drum and in the sheaves as the slack is removed.
 - (e) The competent person must adjust the crane/derrick and/or operations to address the effect of wind, ice, and snow on equipment stability and rated capacity.
 - (f) If possible, the load must be free to be lifted; it is neither caught nor attached to other objects.
- (55) During lifting operations, care must be taken that there is no sudden acceleration or deceleration of the moving load and that the load boom or other parts of the crane do not contact any obstruction. Rotational speed of the crane/derrick must be such that the load does not swing out beyond the radius at which it can be controlled.

WAC 296-155-53400 (Cont.)

- (56) Side loading of booms (jibs) must be limited to freely suspended loads. Cranes must not be used for dragging loads sideways.
- (57) The operator must test the brakes each time a load that is ninety percent 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 ninety percent or more of the maximum line pull, this requirement applies to the first lift but not to successive lifts.
- (58) Modifications or additions which affect the capacity or safe operation of the crane/derrick are prohibited except where the requirements of (a) or (b) of this subsection are met. For recertification requirements see WAC 296-155-53214 (1)(c).
 - (a) 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 crane/derrick is not reduced.
 - (b) Where manufacturer is unavailable or has refused to review a 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 thirty 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 crane/derrick involved:
 - (A) Approves the modification/addition and specifies the crane/derrick 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 crane/derrick is not reduced.
 - (c) Manufacturer does not complete the review within one hundred twenty 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 one hundred twenty days of the date it was provided the detailed description of the proposed modification/addition, and the requirements of subsection (58)(b)(i) and (ii) of this section are met.
 - (d) Multiple manufacturers of equipment designed for use on marine worksites. The equipment is designed for marine worksites, contains major structural components from more than one manufacturer, and the requirements of subsection (58)(b)(i) and (ii) of this section are met.

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- (59) No modifications or additions which affect the capacity or safe operation of the crane can be made by the employer without the manufacturers' written approval. If components of more than one crane manufacturer are being combined, the employer must obtain written approval from all manufacturers prior to use. If the manufacturer(s) is/are not available a registered professional structural engineer's (RPSE) written approval must be obtained. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals, must be changed accordingly. In no case must the original safety factor of the crane be reduced.

Note: The provisions in subsections (58) and (59) of this section do not apply to modifications made or approved by the U.S. military.

- (60) All applicable controls must be tested by the operator at the start of a new shift, if possible. If any controls fail to operate properly, they must be adjusted or repaired before operations are initiated.
- (61) Except for proof load testing required under WAC 296-155-53202 through 296-155-53212, no crane/derrick is permitted to be loaded beyond the specifications of the load rating chart, unless authorized by the crane manufacturer. The operator must not be required to operate the crane/derrick in a manner that would violate this requirement.
- (62) Load weight. The operator must verify that the load is within the rated capacity of the crane/derrick by at least one of the following methods:
- (a) The weight of the load must be determined from a reliable source recognized by the industry (such as the load's manufacturer), or by a reliable 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
 - (b) 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 the load exceeds seventy-five percent of the maximum rated capacity at the longest radius that will be used during the lift operation, the operator must not proceed with the lift until it is verified that the weight of the load is in accordance with (a) of this subsection.
- (63) Tag lines or restraint lines must be used when rotation or swinging of the load is hazardous or if the load needs guidance. Tag lines are not required when all of the following criteria are met:
- The suspended load can be expected to remain still when in a static (nonmoving) condition or does not swing or rotate in a hazardous manner;
 - The movement of the crane or boom cannot be expected to cause the load to swing or rotate in an uncontrolled manner that may create a hazard;
 - The operator is in control of the movement of the load and a hazardous condition is not created.
- (64) All brakes must be adjusted in accordance with manufacturer procedures to prevent unintended movement.
- (65) Safety devices and/or operational aids must not be used as a substitute for the exercise of professional judgment by the operator.
- (66) 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 crane/derrick.

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- (67) Whenever there is a concern as to safety, the operator has the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.
- (68) Tag-out.
- (a) Tagging out of service. Where the employer has taken the crane/derrick out of service, a tag must be placed in the cab or at the operator station 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.
- (b) Response to do not operate/tag-out signs.
- (i) If there is a warning (tag-out or maintenance/do not operate) sign on the crane/derrick or starting control, the operator must not activate the switch or start the crane/derrick 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 around the machine.
- (B) The crane/derrick 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 (b)(i)(A) and (B) of this subsection have been met.
- Note: For additional lockout/tagout procedures for electrical circuits, see WAC 296-155-429.*
- (69) If crane/derrick adjustments or repairs are necessary:
- (a) 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
- (b) The employer must notify all affected employees, at the beginning of each shift, of the necessary adjustments or repairs and all alternative measures.
- (70) All cranes and derricks mounted on barges or other floating structures must meet the requirements as outlined in ASME B30.8-2004 for construction, installation, inspection, maintenance and operation.
- (71) 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.
- (72) Remote control cranes/derricks. Before an operator leaves the crane/derrick to operate remotely, the operator must ensure that the crane/derrick will be used in accordance with the manufacturer's recommendations. Provisions must be made to prevent simultaneous activation of controls when more than one control station (remote control) is provided.
- (73) Remote-operated cranes/derricks must function so that if the control signal for any crane/derrick motion becomes ineffective, the crane/derrick motion must stop.

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- (74) Remote-operated cranes/derricks must be equipped with an “emergency stop” system, located at the operator's remote station to provide the means to remove power from the crane in the event of a malfunction.
- (75) A preventative maintenance program must be established based on the recommendation of the crane/derrick manufacturer. If manufacturer's recommendations are not available, then those of a qualified person must be followed. Dated records must be kept available.
- (76) Working with a diver. The employer must meet the following additional requirements when working with a diver in the water:
- (a) 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 removed from the water. When used for more than one diver, it must not be used for any other purpose until all divers are all out of the water.
 - (b) The operator must remain at the controls of the crane/derrick at all times.
 - (c) In addition to the requirements in WAC 296-155-53406, Signals, either:
 - (i) A clear line of sight must be maintained between the operator and dive tender; or
 - (ii) The signals between the operator and dive tender must be transmitted electronically.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53400, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53400, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53401 Duties of assigned personnel.

- (1) While the organizational structure of various construction activities may differ, the following duties are described here for purposes of assignment. All assignments listed below must be assigned in the worksite organization. (A single individual may perform one or more of these assignments concurrently.)
- Crane owner: Has custodial control of a crane by virtue of lease or ownership.
 - Crane user: Arranges the crane's presence on a worksite and controls its use there.
 - Site supervisor: Exercises supervisory control over the worksite on which a crane is being used and over the work that is being performed on that site.
 - Lift director: Directly oversees the work being performed by a crane and the associated rigging crew.
 - Crane operator: Directly controls the crane's functions.
- (2) Duties of the crane owner and crane user. In some situations the owner and the user may be the same entity and therefore would have the same duties assigned. In other cases, the user may lease or rent a crane from the owner without supervisory, operational, maintenance, support personnel, or services from the owner. In these situations, subsection (3)(c) and (d) of this section apply.
- (3) The crane owner's duties would include the following:
- (a) Providing a crane that meets the requirements of Part L of this chapter as well as specific job requirements defined by the user.
 - (b) Providing a crane and all necessary components, specified by the manufacturer, that meets the user's requested configuration and capacity.
 - (c) Providing all applicable load/capacity chart(s) and diagrams.

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- (d) Providing additional technical information pertaining to the crane, necessary for crane operation, when requested by the crane user.
 - (e) Providing field assembly, disassembly, operation, maintenance information, and warning decals and placards installed as prescribed by the crane manufacturer.
 - (f) Ensuring that inspection, testing, and maintenance is performed in accordance with Part L of this chapter and informing the crane user of these requirements.
 - (g) Using personnel that meet the requirements for a competent and/or qualified person as defined in WAC 296-155-52902 for the purposes of inspections, maintenance, repair, transport, assembly, and disassembly.
- (4) The crane user's duties would include the following:
- (a) Complying with the requirements of Part L of this chapter, manufacturer's requirements, and those regulations applicable at the worksite.
 - (b) Using supervisors for crane activities that meet the requirements for a qualified person as defined in WAC 296-155-52902.
 - (c) Ensuring that the crane is in proper operating condition prior to initial use at the worksite by:
 - (i) Verifying that the crane owner has provided documentation that the crane meets the requirements of Part L of this chapter.
 - (ii) Verifying that inspections have been performed as prescribed in WAC 296-155-53405.
 - (d) Verifying that the crane has the necessary lifting capacity to perform the proposed lifting operations in the planned configuration.
 - (e) Using crane operators that meet the requirements of WAC 296-155-53300 and are qualified to perform the tasks that will be required with the crane to which they are assigned to operate.
 - (f) Ensuring the assigned operator(s) has been notified of adjustments or repairs that have not been completed, prior to commencing crane operations.
 - (g) Using personnel that meet the requirements for a competent and/or qualified person as defined in WAC 296-155-52902 for the purposes of inspections, maintenance, repair, transport, assembly, and disassembly.
 - (h) Ensuring that all personnel involved in maintenance, repair, transport, assembly, disassembly, and inspection are aware of their assigned duties, and the associated hazards.
 - (i) Ensuring that the inspection, testing, and maintenance as required by this part are followed and any other related requirements specified by the crane owner.
- (5) The site supervisor's duties would include the following:
- (a) Ensuring that the crane meets the requirements of Part L of this chapter prior to initial site usage.
 - (b) Determining if additional regulations are applicable to crane operations.

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- (c) Ensuring that a qualified person is designated as the lift director.
- (d) Ensuring that crane operations are coordinated with other job site activities that will be affected by or will affect lift operations.
- (e) Ensuring that the area for the crane is adequately prepared. The preparation includes, but is not limited to, the following:
 - (i) Access roads for the crane and associated equipment;
 - (ii) Sufficient room to assemble and disassemble the crane;
 - (iii) An operating area that is suitable for the crane with respect to levelness, surface conditions, support capability, proximity to power lines, excavations, slopes, underground utilities, subsurface construction, and obstructions to crane operation;
 - (iv) Traffic control as necessary to restrict unauthorized access to the crane's working area.
- (f) Ensuring that work involving the assembly and disassembly of a crane is supervised by an assembly/disassembly director. See WAC 296-155-53402.
- (g) Ensuring that crane operators meet the requirements of WAC 296-155-53300.
- (h) Ensuring that conditions which may adversely affect crane operations are addressed. Such conditions include, but are not limited to, the following:
 - (i) Poor soil conditions;
 - (ii) Wind velocity or gusting winds;
 - (iii) Heavy rain;
 - (iv) Fog;
 - (v) Extreme cold;
 - (vi) Artificial lighting.
- (i) Allowing crane operation near electric power lines only when the requirements of WAC 296-155-53408 have been met.
- (j) Permitting special lifting operations only when equipment and procedures required by this part, the crane manufacturer, or a qualified person, are employed. Such operations include, but are not limited to, the following:
 - (i) Multiple crane lifts;
 - (ii) Multiple load line lifts;
 - (iii) Lifting personnel;
 - (iv) Pick and carry operations;

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- (v) Mobile/articulating cranes operating on barges.
- (k) Ensuring that work performed by the rigging crew is supervised by a qualified rigger. See WAC 296-155-53406.
- (l) Ensuring that crane maintenance is performed by a qualified person. See WAC 296-155-53404.
- (6) The lift director's duties would include the following:
 - (a) Being present at the job site and overseeing the lifting operations;
 - (b) Stopping crane operations if alerted to an unsafe condition affecting those operations;
 - (c) Ensuring that the preparation of the area needed to support crane operations has been completed before crane operations commence;
 - (d) Ensuring necessary traffic controls are in place to restrict unauthorized access to the crane's work area;
 - (e) Ensuring that personnel involved in crane operations understand their assigned duties, and the associated hazards;
 - (f) Addressing safety concerns raised by the operator or other personnel and deciding if it is necessary to overrule those concerns and directs crane operations to continue. In all cases, the manufacturer's criteria for safe operation and the requirements of this chapter and any other applicable safety and health standards must be adhered to;
 - (g) Assigning qualified signal person(s) and conveying that information to the crane operator;
 - (h) Ensuring that signal persons assigned meet the qualification requirements located in WAC 296-155-53302;
 - (i) Allowing crane operation near electric power lines only when the requirements of WAC 296-155-53408 and any additional requirements determined by the site supervisor have been met;
 - (j) Ensuring precautions are implemented when hazards associated with special lifting operations are present. Such operations include, but are not limited to, the following:
 - (i) Multiple crane lifts;
 - (ii) Multiple load line lifts;
 - (iii) Lifting personnel;
 - (iv) Pick and carry operations;
 - (v) Mobile/articulating cranes operating on barges.
 - (k) Ensuring that the applicable requirements of WAC 296-155-547 through 296-155-55405 are met when lifting personnel;

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- (l) Informing the crane operator of the weight of loads to be lifted, as well as the lifting, moving, and placing locations for these loads;
 - (m) Obtaining the crane operator's verification that this weight does not exceed the crane's rated capacity;
 - (n) Ensuring that a crane's load rigging is performed by a qualified rigger as defined in WAC 296-155-53306;
 - (o) Ensuring that the load is properly rigged and balanced before it is lifted more than a few inches.
- (7) Whenever the crane operator has doubt or concerns as to the safety of crane operations, the operator must stop the crane's functions in a controlled manner. Lift operations can only resume after safety concerns have been resolved or the continuation of crane operations is directed by the lift director as outlined in subsection (6) of this section. The crane operator's duties would include the following:
- (a) Reviewing the requirements for the crane with the lift director before operations;
 - (b) Knowing what types of site conditions could adversely affect the operation of the crane and consulting with the lift director concerning the possible presence of those conditions;
 - (c) Understanding and applying the information contained in the crane manufacturer's operating manual;
 - (d) Understanding the crane functions and limitations as well as its particular operating characteristics;
 - (e) Using the crane's load/capacity chart(s) and diagrams and applying all notes and warnings related to the charts to confirm the correct crane configuration to suit the load, site, and lift conditions;
 - (f) Refusing to operate the crane when any portion of the load or crane would enter the prohibited zone of energized power lines except as defined in WAC 296-155-53408;
 - (g) Performing a daily inspection as specified in WAC 296-155-53405;
 - (h) Promptly reporting the need for any adjustments or repairs to the appropriate person;
 - (i) Following applicable lockout/tagout procedures. See WAC 296-155-53400(67);
 - (j) Not operating the crane when physically or mentally unfit;
 - (k) Ensuring that all controls are in the off or neutral position and that all personnel are in the clear before energizing the crane or starting the engine;
 - (l) Not engaging in any practice that will divert their attention while actually operating the crane controls;
 - (m) Testing the crane function controls that will be used and operating the crane only if those function controls respond properly;
 - (n) Operating the crane's functions, under normal operating conditions, in a smooth and controlled manner;

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- (o) Knowing and following the procedures specified by the manufacturer or approved by a qualified person, for assembly, disassembly, setting up, and reeving the crane;
- (p) Knowing how to travel the crane;
- (q) Observing each outrigger during extension, setting, and retraction or using another worker to observe each outrigger during extension, setting, or retraction;
- (r) Ensuring that the load and rigging weight(s) have been provided;
- (s) Calculating or determining the net capacity for all configurations that will be used and verifying, using the load/capacity chart(s), that the crane has sufficient net capacity for the proposed lift;
- (t) Considering all factors known that might affect the crane capacity and informing the lift director of the need to make appropriate adjustments;
- (u) Knowing the standard and special signals as specified in WAC 296-155-53406 and responding to such signals from the person who is directing the lift or a qualified signal person;
- (v) If power fails during operations:
 - (i) Setting all brakes and locking devices.
 - (ii) Moving all clutches or other power controls to the off or neutral position.
 - (iii) Landing any load suspended below the hook under brake control if practical.
- (w) Before leaving the crane unattended:
 - (i) Landing any load suspended below the hook, unless the requirements of WAC 296-155-53400(52) are met.
 - (ii) Disengaging the master clutch.
 - (iii) Setting travel, swing, boom brakes, and other locking devices.
 - (iv) Putting controls in the off or neutral position.
 - (v) Stopping the engine. An exception to this may exist when crane operation is frequently interrupted during a shift and the operator must leave the crane. Under these circumstances, the engine may remain running and (w)(i) and (iv) of this subsection must apply. The operator must be situated where any entry to the crane can be observed.
 - (vi) Considering the recommendations of the manufacturer for securing the crane, when a local weather storm warning exists.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53401, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53402 Assembly/Disassembly.

- (1) When assembling and disassembling crane/derrick (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 subsection (17) of this section.

Note: The employer must follow manufacturer procedures when an employer uses synthetic slings during assembly or disassembly of cranes/derricks, see subsection (19) of this section.

- (2) Supervision - Competent/qualified person.
 - (a) 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 (assembly/disassembly director).
 - (b) 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 part, that person is considered the assembly/disassembly director.
- (3) Knowledge of procedures. The assembly/disassembly director must understand the applicable assembly/disassembly procedures.
- (4) Review of procedures. The assembly/disassembly director must review the applicable assembly/disassembly procedures immediately prior to the commencement of assembly/disassembly unless the assembly/disassembly director has applied them to the same type and configuration of crane/derrick (including accessories, if any).
- (5) Preassembly inspection.
 - (a) Prior to assembling crane/derrick components or attachments the assembly/disassembly director must inspect these components and attachments to ensure that they meet the manufacturer's recommendations. This inspection must include a visual inspection to ensure that the components and attachments are of sound physical condition and functional within the manufacturer's recommendations.
 - (b) Documentation of this inspection must remain at the job site while the crane/derrick is in use.
- (6) Crew instructions.
 - (a) Before commencing assembly/disassembly operations, the assembly/disassembly director must ensure that the crew members understand the following:
 - (i) Their tasks;
 - (ii) The hazards associated with their tasks;
 - (iii) The hazardous positions/locations that they need to avoid.

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Note: The employer must follow manufacturer procedures when an employer uses synthetic slings during assembly or disassembly of cranes/derricks, see subsection (19) of this section.

- (b) During assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations, the requirements in (a)(i) through (iii) of this subsection must be met.
- (7) Protecting assembly/disassembly crew members out of operator view.
 - (a) Before a crew member goes to a location that is out of view of the operator and is either: In, on, under, or near the crane/derrick (or load) where the crew member could be injured by movement of the crane/derrick (or load), the crew member must inform the operator that they are going to that location.
 - (b) Where the operator knows that a crew member went to a location covered by (a) of this subsection, the operator must not move any part of the crane/derrick (or load) until the operator is informed in accordance with a prearranged system of communication that the crew member is in a safe position.
- (8) Working under the boom, jib or other components.
 - (a) When pins (or similar devices) are being removed, employees must not be under the boom, jib, or other components, except where the requirements in (b) of this subsection are met.
 - (b) 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 assembly/disassembly director must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom. (See WAC 296-155-56430, Assembly/disassembly--Working under the boom, jib or other components--Sample procedures for minimizing the risk of unintended dangerous boom movement.)
- (9) Capacity limits. During all phases of assembly/disassembly, rated capacity limits for loads imposed on the crane/derrick, components (including rigging), lifting lugs and crane/derrick accessories must not be exceeded.
- (10) Addressing specific hazards. The assembly/disassembly director supervising the assembly/disassembly operation must address the hazards associated with the operation, which include:
 - (a) Site and ground bearing conditions. Site and ground conditions must be adequate for safe assembly/disassembly operations and to support the crane/derrick during assembly/disassembly (see WAC 296-155-53400 (34) through (38) for ground condition requirements).
 - (b) Blocking material. The size, amount, condition and method of stacking blocking must be sufficient to sustain the loads and maintain stability.
 - (c) 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 crane/derrick; and
 - (ii) Prevent dangerous movement and collapse.

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- (d) 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 WAC 296-155-53400(61) before assembly/disassembly begins.
- (e) 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.
- (f) Center of gravity.
 - (i) The center of gravity of the load must be identified if it 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 WAC 296-155-56430, Assembly/disassembly--Working under the boom, jib or other components--Sample procedures for minimizing the risk of unintended dangerous boom movement.)
- (g) 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.
- (h) 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).
- (i) Struck by counterweights. The potential for unexpected movement from inadequately supported counterweights and from hoisting counterweights.
- (j) 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.
- (k) Loss of backward stability. Backward stability before swinging the upperworks, travel, and when attaching or removing crane/derrick components.

WAC 296-155-53402 (Cont.)

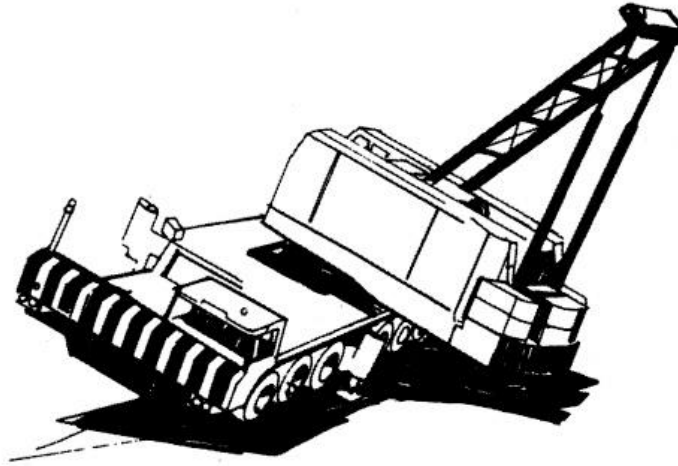


Figure 2-Lack of backward stability results in superstructure toppling.

- (l) Wind speed and weather. The effect of wind speed and weather on the crane/derrick.
- (11) 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 crane/derrick involved must determine this limitation in writing, which must not be exceeded.
- (12) Weight of components. The weight of each of the components must be readily available.
- (13) Components and configuration.
 - (a) The selection of components and configuration of the crane/derrick that affect the capacity or safe operation of this equipment must be in accordance with:
 - (i) Manufacturer's instructions, prohibitions, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of crane/derrick involved must approve, in writing, the selection and configuration of components; or
 - (ii) Approved modifications that meet the requirements of WAC 296-155-53400 (58) and (59) (crane/derrick modifications).
 - (b) Post-assembly inspection. Upon completion of assembly, the crane/derrick must be inspected by the assembly/disassembly director to ensure compliance with (a) of this subsection and as follows:
 - (i) Upon completion of assembly, the crane/derrick must be inspected by a qualified person to assure that it is configured in accordance with manufacturer's criteria. For tower cranes, this inspection must be done by an accredited crane certifier.
 - (ii) Where manufacturer's criteria is unavailable, a qualified person must determine if a registered professional engineer (RPE) familiar with the type of crane/derrick involved is needed to develop criteria for the 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.

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- (c) Crane/derrick must not be used until an inspection demonstrates that it is configured in accordance with the applicable criteria.
- (d) Documentation of this inspection must remain at the job site while the crane/derrick is in use.
- (14) 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.
- (15) Pile driving. Cranes used for pile driving must not have a jib attached during pile driving operations.
- (16) The following are additional requirements for dismantling of booms and jibs, including dismantling for changing the length of booms and jibs (applies to both the use of manufacturer procedures and employer procedures):
 - (a) None of the pins in the pendants are to be removed (partly or completely) when the pendants are in tension. See, for example, Figure 3.

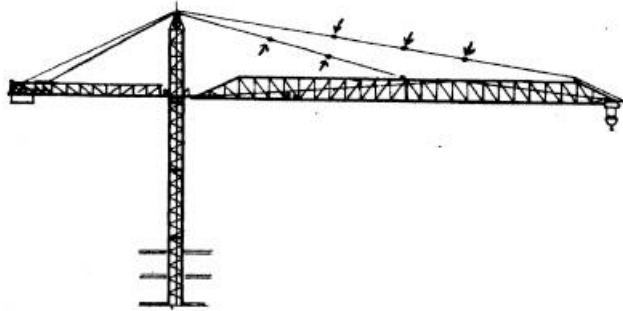


Figure 3-Pins (indicated by arrows) are not to be removed while pendants remain in tension.

- (b) None of the pins (top and 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. See, for example, Figures 4 and 5.

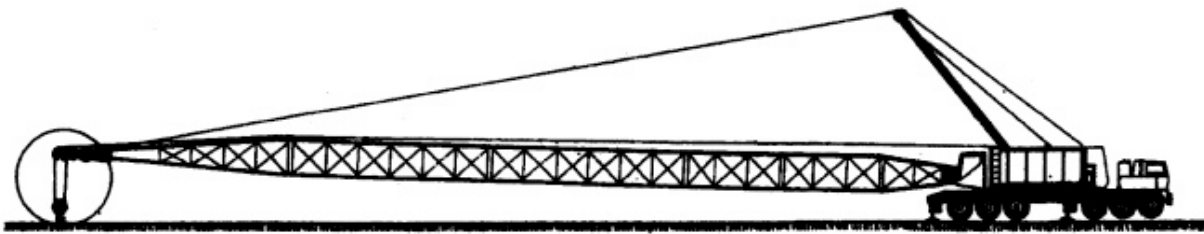


Figure 4-Pendant is in tension while connected to uppermost boom section, and no pins are to be removed.

WAC 296-155-53402 (Cont.)

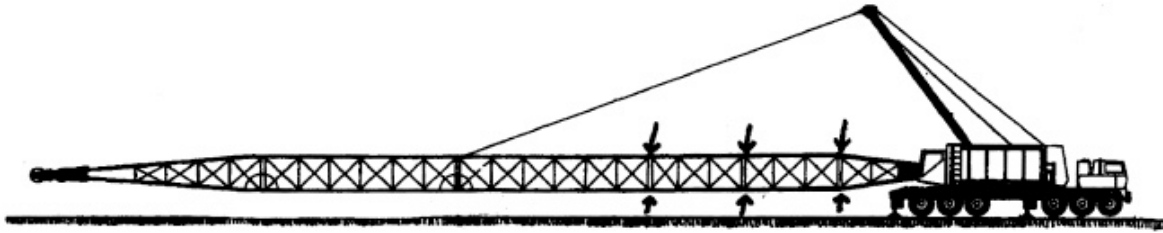


Figure 5-Pendant is in tension, and pins between pendant attachment point and crane body (indicated by arrows) are not to be removed. Note that, because the cantilevered portion of the boom is not supported, only the bottom pins ahead of the pendant may be removed. See Figure 8.

- (c) None of the pins (top and 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). See, for example, Figure 6.

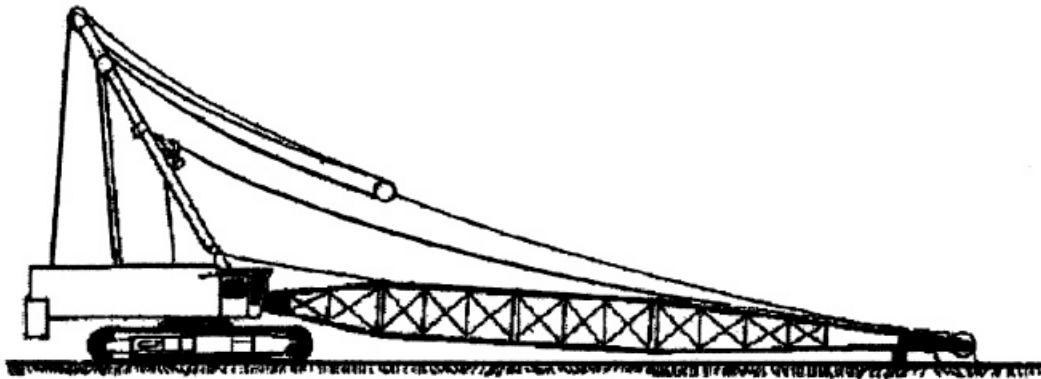


Figure 6-Uppermost boom section is resting on ground, and no pins between uppermost boom section and crane body are to be removed.

- (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. See, for example, Figures 7 and 8.

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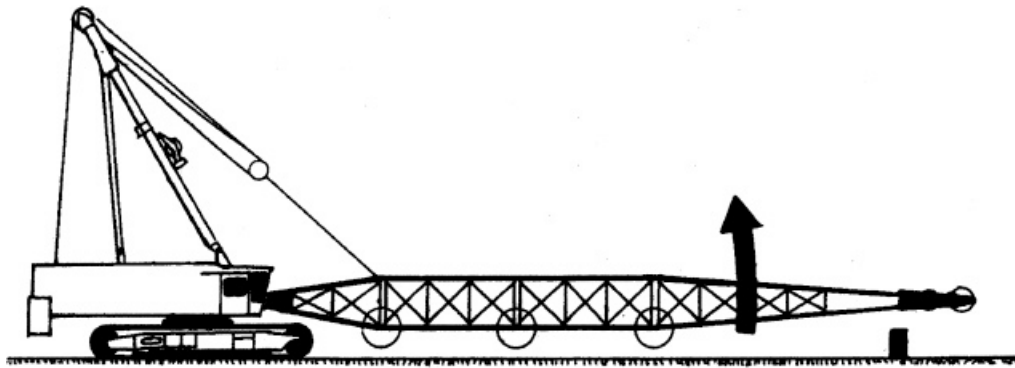


Figure 7-Cantilevered portion of boom is not supported, and top pins therefore are not to be removed. Bottom pins (circled) may be removed.

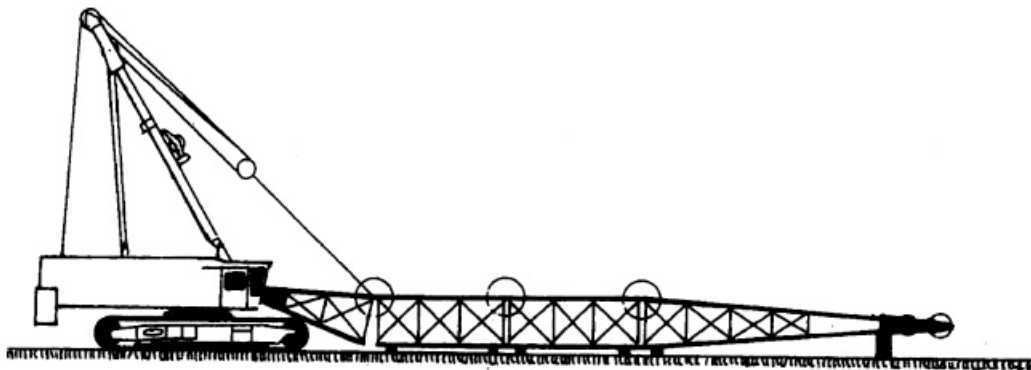


Figure 8-Cantilevered portion of boom is supported, and top pins (circled) may therefore be removed.

- (17) When using employer procedures instead of manufacturer procedures for assembling or disassembling, the employer must ensure that the procedures are designed to:
 - (a) Prevent unintended dangerous movement, and to prevent collapse, of any parts of the crane/derrick.
 - (b) Provide adequate support and stability of all parts of the crane/derrick during the assembly/disassembly process.
 - (c) Position employees involved in the assembly/disassembly operation so that their exposure to movement or collapse is minimized.
 - (d) Qualified person. Employer procedures must be developed by a qualified person.
- (18) 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, the following requirements must be met:
 - (a) The outriggers or stabilizers must be either fully extended or, if manufacturer procedures permit, deployed as specified in the load chart.

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- (b) The outriggers must be set to remove the crane weight from the wheels, except for locomotive cranes (see (f) of this subsection for use of outriggers on locomotive cranes). This provision does not apply to stabilizers.
 - (c) When outrigger floats are used, they must be attached to the outriggers. When stabilizer floats are used they must be attached to the stabilizers.
 - (d) Each outrigger or stabilizer must be visible to the operator or to a signal person during extension and setting.
 - (e) Outrigger and stabilizer blocking must:
 - (i) Meet the requirements in subsection (10)(b) and (c) 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.
 - (f) 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.
- (19) Rigging. In addition to the following requirements in WAC 296-155-556, 296-155-558, 296-155-560 and 296-155-562 and other requirements in this and other standards applicable to rigging, when rigging is used for assembly/disassembly, the employer must ensure that:
- (a) The rigging work is done by a qualified rigger. See WAC 296-155-53306.
 - (b) 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. See WAC 296-155-55815(6), 296-155-55820(6) and 296-155-55825(6).

Note: Requirements for the protection of wire rope slings are contained in WAC 296-155-55805.

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

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53402, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53402, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53403 Fall Protection.

- (1) Application.
 - (a) Subsections (2), (3)(b), (5) and (6) of this section apply to all cranes/derricks covered by this part except tower cranes.
 - (b) Subsections (3)(a), (4), (7), (10) and (11) of this section apply to all cranes/derricks covered by this part.
 - (c) Subsections (3)(c) and (9) of this section apply only to tower cranes.

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- (2) Boom walkways.
 - (a) Cranes/derricks manufactured after the effective date of this section 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 six or more feet.
 - (b) Boom walkway criteria. The walkways must be at least twelve inches wide.
- (3) Steps, handholds, ladders, grabrails, guardrails and railings.
 - (a) All steps, handholds, ladders and guardrails/railings/grabrails must be maintained in good condition.
 - (b) Cranes/derricks manufactured after the effective date of this section 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) or ISO 11660-2:1994(E) 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).
 - (c) Tower cranes manufactured after the effective date of this section 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) and ISO 11660-3:2008(E) or SAE J185 (May 2003) 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).
- (4) Personal fall arrest and fall restraint systems must conform to the criteria in WAC 296-155-24510. Body harnesses must be used in personal fall arrest and fall restraint systems.
- (5) For nonassembly/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 six feet above a lower level as follows:
 - (a) When moving point-to-point:
 - (i) On nonlattice booms (whether horizontal or not horizontal).
 - (ii) On lattice booms that are not horizontal.
 - (iii) On horizontal lattice booms where the fall distance is ten feet or more.

WAC 296-155-53403 (Cont.)

- (b) While at a work station on any part of the crane (including the boom, of any type).

Note: If the equipment is running and the employee is at or near the draw-works, precautions should be taken to ensure the fall protection gear will not become entangled.

- (6) 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 ten feet above a lower level.

Note: If the equipment is running and the employee is at or near the draw-works, precautions should be taken to ensure the fall protection gear will not become entangled.

- (7) Anchorage criteria.

- (a) Anchorages used for attachment of personal fall arrest equipment must be independent of any anchorage being used to support or suspend platforms and capable of supporting at least five thousand pounds (22.2 kN) per employee attached, or must be designed, installed, and used as follows:

- (i) As part of a complete personal fall arrest system which maintains a safety factor of at least two; and
- (ii) Under the supervision of a qualified person.

- (b) Positioning devices must be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or three thousand pounds (13.3 kN), whichever is greater.

- (c) 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 (a) of this subsection would not be met.
- (ii) Positioning device systems must be anchored to any apparently substantial part of the crane unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in (b) of this subsection would not be met.
- (iii) Attachable anchor devices (portable anchor devices that are attached to the crane) must meet the anchorage criteria in (a) of this subsection for personal fall arrest systems and (b) of this subsection for positioning device systems.

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

- (9) Tower cranes.

- (a) 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 six feet above a lower level.

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Note: If the equipment is running and the employee is at or near the draw-works, precautions should be taken to ensure the fall protection gear will not become entangled.

- (b) 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 ten feet above a lower level.
- (10) 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:
 - (a) 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 subsection (7)(a) of this section.
 - (b) The crane operator must be at the worksite and informed that the crane is being used for this purpose.
 - (c) 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).
- (11) Training. The employer must train each employee who may be exposed to fall hazards while on, or hoisted by, cranes/derricks covered by this section on all of the following:
 - (a) The requirements in this part that address fall protection.
 - (b) The applicable requirements in Parts C-1 and K of this chapter.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53403, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53403, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53404 Wire Rope.

- (1) Selection and installation criteria.
 - (a) Original crane/derrick 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 crane/derrick 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:
 - (i) Option (1). Wire rope must comply with Section 5-1.7.1 of ASME B30.5-2007 except that section's paragraph (c) must not apply.
 - (ii) Option (2). Wire rope must be designed to have, in relation to the crane's/derrick's rated capacity, a sufficient minimum breaking force and design factor so that compliance with the applicable inspection provisions in this section will be an effective means of preventing sudden rope failure.

WAC 296-155-53404 (Cont.)

- (c) Wire rope must be compatible with the safe functioning of the crane/derrick.
- (d) Boom hoist reeving.
 - (i) Fiber core ropes must not be used for boom hoist or luffing attachment reeving, except for derricks.
 - (ii) Rotation resistant ropes must be used for boom hoist reeving only where the requirements of (e) of this subsection are met.
- (e) Rotation resistant ropes.
 - (i) Definitions.
 - (A) 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 fifteen 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.
 - (B) Type II rotation resistant wire rope (Type II). Type II rotation resistant rope is stranded rope constructed to have resistance to rotation. It has at least ten 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.
 - (C) 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.
 - (ii) Requirements.
 - (A) Types II and III with an operation design factor of less than five must not be used for duty cycle or repetitive lifts.
 - (B) Rotation resistant ropes (including Types I, II and III) must have an operating design factor of no less than 3.5.
 - (C) Type I must have an operating design factor of no less than five, except where the wire rope manufacturer and the crane/derrick manufacturer approves the design factor, in writing.
 - (D) Types II and III must have an operating design factor of no less than five, except where the requirements of (e)(iii) of this subsection are met.

WAC 296-155-53404 (Cont.)

- (iii) When Types II and III with an operation design factor of less than five are used (for nonduty cycle, nonrepetitive lifts), the following requirements must be met for each lifting operation:
 - (A) A qualified person must inspect the rope in accordance with subsection (2)(a) of this section. 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.
 - (B) Operations must be conducted in such a manner and at such speeds as to minimize dynamic effects.
 - (C) Each lift made under these provisions 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.
- (iv) Additional requirements for rotation resistant ropes for boom hoist reeving.
 - (A) Rotation resistant ropes must not be used for boom hoist reeving, except where the requirements of (e)(iv)(B) of this subsection are met.
 - (B) 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:
 - (I) The drum must provide a first layer rope pitch diameter of not less than eighteen times the nominal diameter of the rope used.
 - (II) The requirements in WAC 296-155-53400(44) (irrespective of the date of manufacture of the crane/derrick), and WAC 296-155-53400(45).
 - (III) The requirements of ANSI/ASME B30.5-2007, Section 5-1.3.2(a), (a)(2) through (a)(4), (b) and (d), except that the minimum pitch diameter for sheaves used in multiple rope reeving is eighteen times the nominal diameter of the rope used instead of the value of sixteen specified in Section 5-1.3.2(d).
 - (IV) All sheaves used in the boom hoist reeving system must have a rope pitch diameter of not less than eighteen times the nominal diameter of the rope used.
 - (V) The operating design factor for the boom hoist reeving system must be not less than five.
 - (VI) 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 crane's/derrick's rated capacity.

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- (VII) 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.
- (2) Inspection of wire ropes.
 - (a) Shift inspection.
 - (i) A competent person must begin a visual inspection prior to each shift the crane/derrick is used, which must be completed before or during that shift. The inspection must consist of observation of accessible wire ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies, including those listed in (a)(ii) of this subsection. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.
 - (A) Category I. Apparent deficiencies in this category include the following:
 - (I) Distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands.
 - (II) Corrosion.
 - (III) Electric arc damage (from a source other than power lines) or heat damage.
 - (IV) Improperly applied end connections.
 - (V) Corroded, cracked, bent, or worn end connections (such as from severe service).
 - (B) Category II. Apparent deficiencies in this category are:
 - (I) Visibly broken wires 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;
 - (II) Visibly broken wires in rotation resistant ropes: Two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in thirty rope diameters;

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- (III) Visibly broken wires 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 at an end connection; and
 - (IV) A diameter reduction of more than five percent from nominal diameter.
 - (C) Category III. Apparent deficiencies in this category include the following:
 - (I) In rotation resistant wire rope, core protrusion or other distortion indicating core failure.
 - (II) Prior electrical contact with a power line.
 - (III) A broken strand.
- (ii) Critical review items. The competent person must give particular attention to all of the following:
 - (A) Rotation resistant wire rope in use.
 - (B) Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.
 - (C) Wire rope at flange points, crossover points and repetitive pickup points on drums.
 - (D) Wire rope at or near terminal ends.
 - (E) Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.
- (iii) Removal from service.
 - (A) If a deficiency in Category I 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:
 - (I) The wire rope is replaced; or
 - (II) If the deficiency is localized, the problem is corrected by removing the damaged section of the wire rope; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this subsection, 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.

WAC 296-155-53404 (Cont.)

- (B) If a deficiency in Category II is identified, operations involving use of the wire rope in question must be prohibited until:
 - (I) 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;
 - (II) The wire rope is replaced.
 - (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 subsection, 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. If a deficiency in category III is identified, operations involving use of the wire rope in question must be prohibited until:
 - (I) The wire rope is replaced; or
 - (II) 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 subsection, 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.
 - (D) Where a wire rope is required to be removed from service under this section, either the crane/derrick (as a whole) or the hoist with that wire rope must be tagged-out, in accordance with WAC 296-155-53400(67), until the wire rope is repaired or replaced.
- (b) Monthly inspection.
- (i) Each month an inspection must be conducted in accordance with (a) of this subsection (shift inspection).
 - (ii) The inspection must include any deficiencies that the qualified person who conducts the annual inspection determines under (c)(iii) of this subsection must be monitored.
 - (iii) Wire ropes on a crane/derrick must not be used until an inspection under this subsection demonstrates that no corrective action under (a)(iii) of this subsection is required.
 - (iv) This inspection must be documented and be kept and made available upon request. Electronic records are acceptable.
- (c) Annual/comprehensive, for cranes and derricks not covered by WAC 296-155-531 through 296-155-53214.
- (i) At least every twelve months, wire ropes in use on the crane/derrick must be inspected by a qualified person in accordance with (a) of this subsection (shift inspection).

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- (ii) In addition, at least every twelve months, the wire ropes in use on the crane/derrick must be inspected by a qualified person, as follows:
 - (A) The inspection must be for deficiencies of the types listed in (a)(i)(B) of this subsection.
 - (B) 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:
 - (I) Critical review items listed in (a)(ii) of this subsection.
 - (II) Those sections that are normally hidden during shift and monthly inspections.
 - (III) Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.
 - (IV) Wire rope subject to reverse bends.
 - (V) Wire rope passing over sheaves.
 - (VI) Wire rope at or near terminal ends.
 - (C) Exception: In the event an inspection under (c)(ii) of this subsection is not feasible due to existing set-up and configuration of the crane/derrick (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting). The inspection must consist of observation of the working range plus three additional wraps (running and standing) prior to use.
- (iii) If a deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard.
 - (A) If the deficiency is determined to constitute a safety hazard, operations involving the use of the wire rope in question is prohibited until:
 - (I) The wire rope is replaced; or
 - (II) 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 subsection, 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.
 - (B) 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.
- (iv) This inspection must be documented and be kept and made available upon request. Electronic records are acceptable.

WAC 296-155-53404 (Cont.)

- (d) Rope lubricants that are of the type that hinder inspection must not be used.
- (3) All documents produced under this section must be available, during the applicable document retention period, to all persons who conduct inspections under this section.
[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53404, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53404, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53405 Inspections.

- (1) Cranes that have had modifications or additions as defined in WAC 296-155-53214 must be inspected by an accredited crane certifier after such modifications/additions have been completed, prior to initial use.
- (2) Repaired/adjusted equipment.
 - (a) Cranes that have had significant repairs as defined in WAC 296-155-53214 must be inspected by an accredited crane certifier after such repairs have been completed, prior to initial use.
 - (b) Cranes that have had a repair or adjustment not defined in WAC 296-155-53214, 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 (b)(ii)(A) of this subsection.
 - (iii) The inspection must include functional testing of the repaired/adjusted parts and other components that may be affected by the repair/adjustment.
 - (c) Equipment must not be used until an inspection under this section demonstrates that the repair/adjustment meets the requirements of (b)(i) of this subsection (or, where applicable, in (b)(ii) of this subsection).
- (3) A competent person must begin a visual inspection prior to each shift the crane 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 crane 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:

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- (a) Control mechanisms for maladjustments interfering with proper operation;
 - (b) Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter;
 - (c) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation;
 - (d) Hydraulic system for proper fluid level;
 - (e) Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat;
 - (f) Wire rope reeving for compliance with the manufacturer's specifications;
 - (g) Wire rope, in accordance with WAC 296-155-53404;
 - (h) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation;
 - (i) Tires (when in use) for proper inflation and condition;
 - (j) Ground conditions around the equipment for proper support, including ground settling under and around outriggers/stabilizers and supporting foundations, groundwater accumulation, or similar conditions. This subsection 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 C.F.R., Part 213;
 - (k) The crane for level position within the tolerances specified by the crane manufacturer's recommendations, both before each shift and after each move and setup;
 - (l) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view;
 - (m) Rails, rail stops, rail clamps and supporting surfaces when the crane has rail traveling. This subsection 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 C.F.R., Part 213;
 - (n) Safety devices and operational aids for proper operation;
 - (o) Derricks must have guys inspected for proper tension.
- (4) The employer must keep monthly inspection records (see items listed in subsection (3) of this section). These inspection records must be kept for at least three months. This report must contain the following information:
- (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.

WAC 296-155-53405 (Cont.)

- (5) If any deficiency is found during the inspection, 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 and approved by a qualified person.
- (6) If any deficiency in safety devices/operational aids is identified, the action specified in WAC 296-155-53410 and 296-155-53412 must be taken prior to using the equipment.
- (7) If any deficiency is identified, an immediate determination must be made by a qualified person as to whether the deficiency constitutes a safety hazard.
 - (a) If a qualified person determines that a deficiency is a safety hazard, the crane must be taken out of service until it has been corrected, evaluated, and approved by a qualified person, except when temporary alternative measures are implemented as allowed in WAC 296-155-53412 and for tower cranes see WAC 296-155-54100(61).
 - (b) If a 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.
- (8) 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 crane and a qualified person must:
 - (a) Inspect the crane for structural damage to determine if the crane can continue to be used safely.
 - (b) In light of the use/conditions determine whether any items/conditions listed in subsection (7) of this section need to be inspected; if so, the qualified person must inspect those items/conditions.
 - (c) If a deficiency is found, the employer must follow the requirements in subsection (7)(a) of this section.
- (9) Cranes not in regular use. Cranes that have been idle for three months or more must be inspected by a qualified person in accordance with the requirements of subsection (3) of this section before initial use.
- (10) 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.
- (11) All documents produced under this section must be available, during the applicable document retention period, to all persons who conduct inspections under this section.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53405, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53406 Signals.

- (1) A qualified signal person that meets the requirements in WAC 296-155-53302 must be provided in each of the following situations:
 - (a) The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the crane/derrick operator.

WAC 296-155-53406 (Cont.)

- (b) When the crane is traveling, the view in the direction of travel is obstructed.
- (c) Due to site specific safety concerns, either the crane/derrick operator or the person handling the load determines that it is necessary.
- (2) Types of signals. Signals to crane/derrick operators must be by hand, voice, audible, or other means at least as effective.
- (3) Hand signals.
 - (a) When using hand signals, the standard method as established in the applicable ASME B30 standards must be used. 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, nonstandard hand signals may be used in accordance with (b) of this subsection.

Note: See WAC 296-155-56400 for the hand signal chart.

- (b) Nonstandard hand signals. When using nonstandard hand signals, the signal person, operator, and lift director must contact each other prior to the operation and agree on the nonstandard hand signals that will be used.
- (4) Signals other than hand, voice or audible signals may be used where the employer demonstrates that the signals provided are at least equally effective communications as voice, audible, or standard method hand signals.
- (5) Use and suitability.
 - (a) Prior to beginning operations, the operator, signal person, and lift director, must contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these employees need not meet again to discuss voice signals unless another employee 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.) and direction; distance and/or speed; function stop.
 - (c) The operator, signal person and lift director, must be able to effectively communicate in the language used.
 - (d) The signals used (hand, voice, audible, or other effective means), 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.
 - (e) Signals must be discernible or audible at all times. The crane operator must not respond unless signals are clearly understood.
- (6) 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.
- (7) 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.

WAC 296-155-53406 (Cont.)

- (8) Only one person gives signals to a crane/derrick at a time, except in circumstances covered by subsection (9) of this section.
- (9) Anyone who becomes aware of a safety problem must alert the operator or signal person by giving the stop or emergency stop signal. The operator must obey a stop (or emergency stop) signal, irrespective of who gives it.
- (10) All directions given to the operator by the signal person must be given from the operator's direction perspective.
- (11) Communication with multiple cranes/derricks. Where a signal person(s) is in communication with more than one crane/derrick, a system for identifying the crane/derrick for which each signal is intended must be used, as follows:
 - (a) For each signal, prior to giving the function/direction, the signal person must identify the crane/derrick for which the signal is intended; or
 - (b) An equally effective method of identifying which crane/derrick the signal is intended for must be used.
- (12) Hand signal chart. Hand signal charts must be either posted on the crane/derrick or conspicuously posted in the vicinity of the hoisting operations.
- (13) 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:
 - (i) Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.
 - (ii) 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 made by a hands-free system.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53406, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53406, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53408 Power line safety

- (1) Assembly and disassembly of crane/derrick.
 - (a) Before assembling or disassembling crane/derrick, the employer must determine if any part of the crane/derrick, load line or load (including rigging and lifting accessories) could get, in the direction or area of assembly, closer than twenty feet of a power line that is up to 350 kV or closer than fifty feet of a power line that exceeds 350 kV during the assembly/disassembly process. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3), as follows:

WAC 296-155-53408 (Cont.)

- (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) - Clearance. Ensure that no part of the crane/derrick, load line or load (including rigging and lifting accessories), gets closer than twenty feet of a power line that is up to 350 kV or closer than fifty feet of a power line that exceeds 350 kV by implementing the measures specified in (b) of this subsection.
- (iii) Option (3) - Table 4 clearance.
 - (A) Determine the line's voltage and the minimum approach distance permitted under Table 4 of this section.
 - (B) Determine if any part of the crane/derrick, load line or load (including rigging and lifting accessories), could get closer than the minimum approach distance of the power line permitted under Table 4 of this section. If so, then the employer must follow the requirements in (b) of this subsection to ensure that no part of the crane/derrick, 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), all of the following requirements must be met:
 - (i) Conduct a planning meeting with the assembly/disassembly 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.
 - (ii) If tag lines are used, they must be nonconductive.
 - (iii) 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:
 - (A) Use a dedicated spotter who is in continuous contact with the crane/derrick operator, plus an elevated warning line, barricade, or line of signs, in view of the spotter, equipped with flags or similar high-visibility markings. 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: A clearly visible line painted on the ground; a clearly visible line on 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, in accordance with WAC 296-155-53406(13) (radio, telephone, or other electronic transmission of signals).

WAC 296-155-53408 (Cont.)

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

Note: To be considered a dedicated spotter, the requirements of WAC 296-155-53302 (Signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and the equipment, the 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.

- (B) A proximity alarm set to give the operator sufficient warning to prevent encroachment.
 - (C) 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.
 - (D) A device that automatically limits range of movement, set to prevent encroachment.
- (c) Assembly/disassembly below power lines is 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 4 clearance is 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 4 of 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) is used, the utility owner/operator of power lines must provide the requested voltage information prior to commencement of work or 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 crane/derrick.
- (2) Operation of crane/derrick.
 - (a) Hazard assessments and precautions inside the work zone. Before beginning crane/derrick operations, the employer must:
 - (i) Identify the work zone.
 - (A) Define a work zone by 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 crane/derrick past those boundaries; or

WAC 296-155-53408 (Cont.)

- (B) Define the work zone as the area three hundred sixty degrees around the crane/derrick, up to its maximum working radius.
- (ii) Determine if any part of the crane/derrick, load line or load (including rigging and lifting accessories), if operated up to its maximum working radius in the work zone, could get closer than twenty feet of a power line that is up to 350 kV or closer than fifty feet of a power line that exceeds 350 kV. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) as follows:
 - (A) Option (1) - Deenergize and ground. Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.
 - (B) Option (2) - Twenty-foot clearance. Ensure that no part of the crane/derrick, load line, or load (including rigging and lifting accessories), gets closer than twenty feet to the power line by implementing the measures specified in (b) of this subsection.
 - (C) Option (3) - Table 4 clearance.
 - (I) Determine the line's voltage and the minimum approach distance permitted under Table 4 of this section.
 - (II) Determine if any part of the crane/derrick, load line or load (including rigging and lifting accessories), while operating up to its maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Table 4 of this section. If so, then the employer must follow the requirements in (b) of this subsection to ensure that no part of the crane/derrick, 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), all of the following requirements must be met:
 - (i) Conduct a planning meeting with the operator and the other workers who will be in the area of the crane/derrick or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.
 - (ii) If tag lines are used, they must be nonconductive.
 - (iii) 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 twenty feet from a power line that is up to 350 kV or fifty feet from a power line that exceeds 350 kV (if using Option (2)) or at the minimum approach distance under Table 4 of this section (if using Option (3)). If the operator is unable to see the elevated warning line, a dedicated spotter must be used as described in (iv)(B) of this subsection in addition to implementing one of the measures described in (b)(i), (iii) through (v) of this subsection.
 - (iv) Implement at least one of the following measures:
 - (A) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

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- (B) Use a dedicated spotter who is in continuous contact with the crane/derrick operator, plus an elevated warning line, barricade, or line of signs, in view of the spotter, equipped with flags or similar high-visibility markings. 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: A clearly visible line painted on the ground; a clearly visible line on 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.
 - (V) Give timely information to the operator so that the required clearance distance can be maintained.

Note: To be considered a dedicated spotter, the requirements of WAC 296-155-53302 (Signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and the equipment, the 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.

- (C) 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.
- (D) A device that automatically limits range of movement, set to prevent encroachment.
- (E) An insulating link/device, as defined in WAC 296-155-52902, installed at a point between the end of the load line (or below) and the load.
- (v) The requirements of (b)(iv) of this subsection do not apply to work covered by chapter 296-45 WAC.
- (c) Voltage information. Where Option (3) is used, the utility owner/operator of power lines must provide the requested voltage information prior to commencement of work or within two working days of the employer's request.
- (d) Operations below power lines.
 - (i) No part of the crane/derrick, 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 (d)(ii) of this subsection apply.

WAC 296-155-53408 (Cont.)

- (ii) Exceptions (d)(i) of this subsection is inapplicable where the employer demonstrates that one of the following applies:
 - (A) The work is covered by chapter 296-45 WAC.
 - (B) For cranes/derricks with nonextensible booms: The uppermost part of the crane/derrick, with the boom at true vertical, would be more than twenty feet below the plane of a power line that is up to 350 kV, fifty feet below the plane of a power line that exceeds 350 kV or more than the Table 4 minimum clearance distance below the plane of the power line.
 - (C) For cranes with articulating or extensible booms: The uppermost part of the crane, with the boom in the fully extended position, at true vertical, would be more than twenty feet below the plane of a power line that is up to 350 kV, fifty feet below the plane of a power line that exceeds 350 kV or more than the Table 4 minimum clearance distance below the plane of the power line.
 - (D) The employer demonstrates that compliance with (d)(i) of this subsection is infeasible and meets the requirements of subsection (4) of this section.
- (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) Training.
 - (i) The employer must train each operator and crew member assigned to work with the crane/derrick on all the following:
 - (A) The procedures to be followed in the event of electrical contact with a power line. Such training must include:
 - (I) Information regarding the danger of electrocution from the operator simultaneously touching the crane/derrick and the ground.
 - (II) 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.
 - (III) The safest means of evacuating from the crane/derrick that may be energized.
 - (IV) The danger of the potentially energized zone around the crane/derrick (step potential).
 - (V) The need for crew in the area to avoid approaching or touching the crane/derrick and the load.
 - (VI) Safe clearance distance from power lines.
 - (B) 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.

WAC 296-155-53408 (Cont.)

- (C) 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 power line is insulated.
 - (D) The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.
 - (E) The procedures to be followed to properly ground equipment and the limitations of grounding.
 - (ii) 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.
 - (iii) Training under this section must be administered in accordance with WAC 296-155-53409(2).
 - (g) Devices originally designed by the manufacturer for use as: A safety device (see WAC 296-155-53410), operational aid (see WAC 296-155-53412), 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.
- (3) Prior to working near a transmitter/communication tower where an electrical charge can be induced in the crane/derrick or materials being handled, the transmitter must be deenergized or the following precautions must be taken:
- (a) The crane/derrick must be provided with an electrical ground directly to the crane/derrick frame;
 - (b) Ground jumper cables must be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews must be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load;
 - (c) Combustible and flammable materials must be removed from the immediate area prior to operations; and
 - (d) If tag lines are used, they must be nonconductive.
- (4) Operation of the crane/derrick inside the Table 4 zone. Operations in which any part of the crane/derrick, load line or load (including rigging and lifting accessories) is either closer than the minimum approach distance under Table 4 of an energized power line or the power line voltage is undetermined and the crane/derrick load line or load is within twenty feet from the power line is prohibited, except where the employer demonstrates that all of the following requirements are met:
- (a) Notify the crane safety program within the department of labor and industries.
 - (b) The employer determines that it is infeasible to do the work without breaching the minimum approach distance under Table 4 of this section.
 - (c) 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.

WAC 296-155-53408 (Cont.)

- (d) Minimum clearance distance.
 - (i) 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 crane/derrick, 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.
 - (ii) Subsection (4)(d)(i) of this section does not apply to work covered by chapter 296-45 WAC; instead, for such work, the minimum clearance distances specified in chapter 296-45 WAC, Table 1 apply. Employers covered by chapter 296-45 WAC are permitted to work closer than the distances in chapter 296-45 WAC, Table 1, where both the requirements of this rule and WAC 296-45-375(10) are met.
- (e) 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:
 - (i) 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.
 - (ii) A dedicated spotter who is in continuous contact with the 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 on 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.

Note: To be considered a dedicated spotter, the requirements of WAC 296-155-53302 (Signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and the equipment, the 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.

WAC 296-155-53408 (Cont.)

- (iii) 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 chapter 296-45 WAC.
- (iv) Insulating link/device.
 - (A) An insulating link/device installed at a point between the end of the load line (or below) and the load.
 - (B) For work covered by chapter 296-45 WAC, the requirement in (e)(iv)(A) of this subsection applies only when working inside the clearance distances of Table 1 in chapter 296-45 WAC.
 - (C) For work covered by chapter 296-45 WAC, electrical workers, involving operations where use of an insulating link/device is infeasible, the requirements of WAC 296-45-375 (10)(c)(ii) or (iii) may be substituted for the requirement in (e)(iv)(A) of this subsection.
- (v) Until one year after the effective date of this part, the following procedure may be substituted for the requirement in (e)(iv)(A) of this subsection: 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 section.
- (vi) Until three years after the effective date of this part the following procedure may be substituted for the requirement in (e)(iv)(A) of this subsection:
 - (A) The employer must use a link/device manufactured on or before one year after the effective date of this part 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 (e)(vi)(A) of this subsection. Insulating gloves rated for the voltage involved are adequate additional means of protection for the purposes of this section.
- (vii) Use nonconductive rigging if the rigging may be within the Table 4 distance during the operation.
- (viii) If the crane/derrick is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the crane/derrick, load line or load (including rigging and lifting accessories) from breaching the minimum approach distance established under (d) of this subsection.

WAC 296-155-53408 (Cont.)

- (ix) If a tag line is used, it must be of the nonconductive type.
- (x) Barricades forming a perimeter at least ten feet away from the crane/derrick to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least ten feet away, the barricade must be as far from the crane/derrick as feasible.
- (xi) 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.
- (xii) Only personnel essential to the operation are permitted to be in the area of the crane and load.
- (xiii) The crane/derrick must be properly grounded.
- (xiv) 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.
- (f) The procedures developed to comply with (e) of this subsection are documented and immediately available on-site.
- (g) The crane/derrick user and utility owner/operator (or registered professional engineer) meet with the operator and the other workers who will be in the area of the crane/derrick or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in (d) of this subsection and prevent electrocution.
- (h) The procedures developed to comply with (e) of this subsection are implemented.
- (i) 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 section must direct the implementation of the procedures and must have the authority to stop work at any time to ensure safety.
- (j) If a problem occurs implementing the procedures being used to comply with (e) of this subsection, or indicating that those procedures are inadequate to prevent electrocution, the employer must safely stop operations and either develop new procedures to comply with (e) of this subsection 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: Safety devices (see WAC 296-155-53410), operational aids (see WAC 296-155-53412), 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.
- (l) The employer must train each operator and crew member assigned to work with the equipment in accordance with subsection (2)(f) of this section.

WAC 296-155-53408 (Cont.)

- (5) Cranes while traveling.
- (a) This section establishes procedures and criteria that must be met for cranes traveling under a power line on the construction site with no load. Equipment traveling on a construction site with a load is governed by subsections (2), (4), (6), and (7) of this section, whichever is appropriate, and WAC 296-155-53400(35).
 - (b) The employer must ensure that:
 - (i) The boom/mast and boom/mast support system are lowered sufficiently to meet the requirements of this section.
 - (ii) The clearances specified in Table 5 of this section are maintained.
 - (iii) The effects of speed and terrain on crane movement (including movement of the boom/mast) are considered so that those effects do not cause the minimum clearance distances specified in Table 5 of this section to be breached.
 - (iv) Dedicated spotter. If any part of the crane while traveling will get closer than twenty feet of 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:
 - (A) Be positioned to effectively gauge the clearance distance.
 - (B) Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - (C) Give timely information to the operator so that the required clearance distance can be maintained.
- Note: To be considered a dedicated spotter, the requirements of WAC 296-155-53302 (Signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and the equipment, the 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.*
- (v) Additional precautions for traveling in poor visibility. When traveling at night, or in conditions of poor visibility, in addition to the measures specified in (b)(i) through (iv) of this subsection, the employer must ensure that:
 - (A) The power lines are illuminated or another means of identifying the location of the lines must be used.
 - (B) A safe path of travel is identified and used.
- (6) The requirements of subsections (1) and (2) of this section apply to power lines over 350 kV, and below 1000 kV except that wherever the distance “twenty feet” is specified, the distance “fifty feet” must be substituted.
- (7) For power lines over 1000 kV, the minimum clearance distance must be established by the utility owner/operator or a registered professional engineer who is a qualified person with respect to power transmission and distribution.

WAC 296-155-53408 (Cont.)

Table 4--Minimum Clearance Distances	
Voltage (nominal, kV)	Minimum clearance distance (feet)
Up to 50	10
Over 50 to 200	15
Over 200 to 345	20
Over 345 to 500	25
Over 500 TO 750	35
Over 750 to 1,000	45
Over 1000	(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.

Table 5--Minimum Clearance Distances While Traveling With No Load and Boom/Mast Lowered	
Voltage (nominal, kV)	While traveling--minimum clearance distance (feet)
Up to 0.75	4 (while traveling/boom lowered).
Over .75 to 50	6 (while traveling/boom lowered).
Over 50 to 345	10 (while traveling/boom lowered).
Over 345 to 750	16 (while traveling/boom lowered).
Over 750 to 1,000	20 (while traveling/boom lowered).
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)

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53408, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53408, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53409 Training.

- (1) The employer must provide training as follows:
 - (a) Overhead power lines. The employer must ensure that each employee is trained in accordance with WAC 296-155-53408 (2)(g) and 296-155-53408 (4)(k) in the topics listed in WAC 296-155-53408 (2)(f).
 - (b) Qualified signal persons. The employer must ensure that each employee is trained who will be assigned to work as a signal person in accordance with the requirements of WAC 296-155-53302(3).
 - (c) Qualified rigger. The employer must ensure that each employee is trained who will be assigned to work as a rigger in accordance with the requirements of WAC 296-155-53306(3).
 - (d) Operators.
 - (i) Trainee/apprentice operator. The employer must ensure that each trainee/apprentice operator is trained in the areas addressed in WAC 296-155-53300 and 296-155-56420.

WAC 296-155-53409 (Cont.)

- (ii) Operator. Operators who have met the requirements in WAC 296-155-53300 and 296-155-56420 will be considered trained.
 - (iii) For operators using equipment covered under this part that are exempt in WAC 296-155-52900(3)(b), the employer must ensure that each operator is trained on the safe operation of the equipment the operator will be using.
 - (e) The employer must train each operator of the equipment covered by this part 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 WAC 296-155-53400 (68) and (69).
 - (ii) Where available, the manufacturer's emergency procedures for halting unintended equipment movement.
 - (f) Competent persons and qualified persons. The employer must ensure that each competent person and each qualified person is trained regarding the requirements of this part applicable to their respective roles.
 - (g) Crush/pinch points. The employer must ensure that each employee is trained who works with the equipment to keep clear of holes, and crush/pinch points and the hazards addressed in WAC 296-155-53400(42) (work area control).
 - (h) Tag-out. The employer must ensure that each operator and each additional employee authorized to start/energize equipment or operate equipment controls (such as maintenance and repair employees) is trained, in the tag-out and start-up procedures in WAC 296-155-53400 (16) and (67).
- (2) Training administration.
- (a) The employer must evaluate each employee required to be trained under this part to confirm that the employee understands the information provided in the training.
 - (b) The employer must ensure that refresher training is provided 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.
 - (c) Whenever the employer is required to provide training under this part, the employer must provide the training at no cost to the employee.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-53409, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53409, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53410 Safety Devices.

- (1) Safety devices. The following safety devices are required on all cranes/derricks, except tower cranes and self-erecting tower cranes, covered by this part, unless otherwise specified. For requirements relating to operational aids and safety devices for tower cranes, see WAC 296-155-53900 (60) and (61), for self-erecting tower cranes see WAC 296-155-54100 (42) and (43).

WAC 296-155-53410 (Cont.)

- (a) Crane level indicator.
 - (i) The crane must have a level indicator that is either built into the crane or is available on the crane.
 - (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 articulating cranes, portal cranes, derricks, floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.
- (b) Boom stops, except for derricks and hydraulic booms.
- (c) Jib stops (if a jib is attached), except for derricks.
- (d) Cranes with foot pedal brakes must have locks, except for portal cranes and floating cranes.
- (e) Hydraulic outrigger jacks and hydraulic stabilizer jacks must have an integral holding device/check valve.
- (f) Cranes on rails must have rail clamps and rail stops, except for portal cranes.
- (g) Horn.
 - (i) The crane/derrick, as defined in ASME B30.5, must have a built-in horn or a removable horn that is 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.
- (2) 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. 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. Alternative measures are not permitted to be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53410, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53412 Operational Aids.

- (1) The devices listed in this section (listed operational aids) are required on all cranes/derricks, except tower cranes and self-erecting tower cranes, covered by this part, unless otherwise specified. For requirements relating to operational aids and safety devices for tower cranes, see WAC 296-155-53900 (60) and (61), for self-erecting tower cranes see WAC 296-155-54100 (42) and (43).

Note:

- *The requirements in subsection (3)(e), (f) and (g) of this section do not apply to articulating cranes.*
- *The requirements in subsection (3)(d), (e) and (h) of this section only apply to those digger derricks manufactured after the effective date of this section.*

WAC 296-155-53412 (Cont.)

- (2) 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. More protective alternative measures specified by the crane/derrick manufacturer, if any, must be followed.
- (3) When operational aids are inoperative or malfunctioning, the crane and/or device manufacturer's recommendations for continued operation or shutdown of the crane must be followed until the problems are corrected. Without such recommendations and any prohibitions from the manufacturer against further operation, the following requirements apply:

Note: 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 WAC 296-155-53400 (58) and (59) (crane/derrick modifications).

- (a) Recalibration or repair of the operational aid must be accomplished as soon as is reasonably possible, as determined by a qualified person.
- (b) Boom hoist limiting device (except for derricks with base mounted drums).
 - (i) For cranes manufactured after December 16, 1969, a boom hoist limiting device is required. Temporary alternative measures: One or more of the following methods must be used:
 - (A) Use a boom angle indicator.
 - (B) Clearly mark the boom hoist rope (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 rope (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 crane 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 (b)(i)(A) through (C) of this subsection must be used.
- (c) Luffing jib limiting device. Cranes with a luffing jib must have a luffing jib limiting device. Temporary alternative measures are the same as in (b)(i) of this subsection, except to limit the movement of the luffing jib rather than the boom hoist.
- (d) Anti two-blocking device. (This does not apply to dedicated pile drivers.)
 - (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.
 - (A) Temporary alternative measures: Clearly mark the hoist rope (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

WAC 296-155-53412 (Cont.)

- (B) Use a spotter when extending the boom.
- (ii) Lattice boom cranes.
 - (A) Lattice boom cranes manufactured after February 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(s) 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 the effective date of this standard 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.

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

- (C) Temporary alternative measures: Clearly mark the hoist rope (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 hoist rope (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 hoist rope (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) Boom angle or radius indicator (except for derricks with base mounted drum hoists). The crane 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.
- (f) Jib angle indicator if the crane 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.
- (g) Boom length indicator if the crane 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:

WAC 296-155-53412 (Cont.)

- (i) Mark the boom with measured marks to calculate boom length; or
 - (ii) Calculate boom length from boom angle and radius measurements; or
 - (iii) Measure the boom with a measuring device.
- (h) Load weighing and similar devices (this also applies to dedicated pile drivers manufactured more than one year after the effective date of this section). Cranes (other than derricks and articulating cranes) manufactured after March 29, 2003, with a rated capacity over six thousand 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.
 - (i) Temporary alternative measures: The weight of the load must be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (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.
 - (ii) Articulating cranes manufactured after the effective date of this section 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.
- (i) Reserved.
- (j) The following devices are required on cranes manufactured after the effective date of this section:
 - (i) Outrigger/stabilizer position (horizontal beam extension) sensor/monitor if the crane 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 crane/derrick has a hoist drum is 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.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53412, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53414 Cranes/derricks with a rated hoisting/lifting capacity of 2,000 pounds or less.

For cranes/derricks with a maximum manufacturer-rated hoisting/lifting capacity of two thousand pounds or less:

- (1) The following sections apply: WAC 296-155-52900, Scope; WAC 296-155-52902, Definitions; WAC 296-155-53400 (34), (36) through (38), (45), (46), (59) and (67), General requirements; WAC 296-155-53404, Wire rope; WAC 296-155-53406, Signals; WAC 296-155-53408, Power line safety; WAC 296-155-53700(7), Mobile cranes--General; WAC 296-155-53715(5), Mobile cranes--Operations; WAC 296-155-539, Tower cranes; WAC 296-155-542, Overhead/bridge and gantry cranes; WAC 296-155-543, Derricks.

WAC 296-155-53414 (Cont.)

Note to subsection (1) of this section: Under subsection (2)(a) of this section, WAC 296-155-53402, (Assembly/disassembly) also apply.

- (2) Assembly/disassembly.
 - (a) WAC 296-155-53402 (Assembly/disassembly) applies.
 - (b) Components and configuration. The employer must ensure that:
 - (i) The selection of components and the configuration of the crane/derrick which affects the capacity or safe operation of the crane/derrick 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 crane/derrick involved must approve, in writing, the selection and configuration of components; or
 - (B) Approved modifications that meet the requirements of WAC 296-155-53400 (58) and (59).
 - (ii) Post-assembly inspection. Upon completion of assembly, the crane/derrick is inspected to ensure that it is in compliance with subsection (2)(b)(i) of this section.
 - (c) Manufacturer prohibitions. The employer must comply with applicable manufacturer prohibitions.
- (3) Operation - Procedures.
 - (a) The employer must comply with all manufacturer procedures applicable to the operational functions of the crane/derrick, including its use with attachments.
 - (b) Unavailable operation procedures. The employer must:
 - (i) Where the manufacturer procedures are unavailable, the employer must develop and ensure compliance with all procedures necessary for the safe operation of the crane/derrick 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 crane/derrick are developed and signed by a registered professional engineer.
 - (c) Accessibility. The employer must ensure that:
 - (i) The load chart must be available to the operator at the control station.
 - (ii) Procedures applicable to the operation of the crane/derrick, recommended operating speeds, special hazard warnings, instructions and operator's manual, are readily available for use by the operator.

WAC 296-155-53414 (Cont.)

- (iii) Where rated capacities are available at the control station only in electronic form and failure occurs that 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.
- (4) Safety devices and operational aids.
 - (a) The employer must ensure that safety devices and operational aids that are part of the original equipment are maintained in accordance with manufacturer procedures.
 - (b) Anti two-blocking. The employer must ensure that cranes covered by this section manufactured after the effective date of this standard must have either an anti two-block device that meets the requirements of WAC 296-155-53412 (3)(d), 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).
- (5) Operator qualifications. The employer must train each operator, ensure that, prior to operating the crane/derrick, the operator is trained on the safe operation of the type of crane/derrick the operator will be using.
- (6) Signal person qualifications. The employer must train each signal person, in the proper use of signals applicable to the use of the crane/derrick.
- (7) Keeping clear of the load. WAC 296-155-53400(43) applies, except for WAC 296-155-53400 (43)(c)(iii) (qualified rigger).
- (8) Inspections. The employer must ensure that the crane/derrick is inspected in accordance with manufacturer procedures.
- (9) Hoisting personnel. The employer must ensure that equipment covered by this section is not used to hoist personnel.
- (10) Design. The employer must ensure that the crane/derrick is designed by a qualified engineer.
[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53414, filed 12/20/11, effective 02/01/12.]

WAC 296-155-537 Mobile cranes.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-537, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53700 Mobile cranes - general.

- (1) All crawler or truck cranes (greater than two thousand pounds capacity) in use must meet the applicable requirements for design, construction, testing, inspection, maintenance, and operation as prescribed in the ASME B30.5-2007, Safety Standard for Mobile and Locomotive Cranes. It is not the intent of this rule to require retrofitting of existing cranes. However, when an item is being modified, its performance needs to be reviewed by a qualified person and compared to the applicable sections of this rule. For modification requirements see WAC 296-155-53400 (58) and (59). For cranes manufactured prior to the effective date of this rule the design, construction and testing criteria must meet at a minimum, ASME B30.5-1989.

WAC 296-155-53700 (Cont.)

- (2) Mobile cranes must have boom stops to provide resistance from backward overturning. Such as:
- A fixed or telescoping bumper;
 - A shock absorbing bumper;
 - Hydraulic boom elevation cylinder(s).
- (3) Restraints must be provided that will keep the jibs from backward overturning.
- (4) Boom angle or radius indicators readable from the operator's station must be provided.
- (5) A means must be provided that automatically stops the hoisting of the boom when the boom reaches a predetermined high angle. This can be either:
- A boom hoist disconnect;
 - A shutoff;
 - or
 - Hydraulic relief.
- (6) A boom length indicator that is readable from the operator's station must be provided for telescopic booms, unless the load rating is independent of the boom length.
- (7) Where the ground is soft or uneven, timber, planking, or other suitable material must be used to provide firm foundation and distribute the load.
- (8) All welding procedures and welding operator qualifications must be in accordance with ANSI/AWS D14.3 when welding is to be performed on load-sustaining members.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53700, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53715 Mobile cranes--Operations.

- (1) Where applicable, if the load hoist mechanism is not equipped with an automatic brake and the load must remain suspended for any considerable length of time, the operator must hold the drum from rotating in the lowering direction by activating a manually operated brake. The boom hoist brakes must be set, and on rope boom support cranes, a braking mechanism and a ratchet and pawl or other locking device must be engaged to prevent inadvertent lowering of the boom.
- (2) On wheel-mounted cranes, loads must not be lifted over the front area, except as permitted by the crane manufacturer.
- (3) Rolling outriggers. Mobile cranes using rolling outriggers must use load charts from the crane manufacturer or an RPE that specifically address this configuration. If the crane manufacturer does not address the use of rolling outriggers while some of the crane's weight is on its wheels, then the user must use the "on rubber" chart.
- (4) While in transit, the following additional precautions must be exercised:
- (a) The boom should be carried in line with the direction of motion.
 - (b) The superstructure must be secured against rotation (or the boom placed in a boom rack mounted on the carrier), except when negotiating turns when there is an operator in the cab or the boom is supported on a dolly.

WAC 296-155-53715 (Cont.)

- (5) A crane with or without a load must be traveled in the configuration recommended by the crane manufacturer. In the event a configuration is not specified, then travel must not be attempted with the boom so high that it may bounce back over the cab.
- (6) When rotating the crane, sudden starts and stops must be avoided. Rotational speed must be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line must be used when rotation of the load is hazardous.
- (7) Cranes must not be operated without the ballast or counterweight being in place as specified by the crane manufacturer. Under specific conditions, such as during crane assembly or unusual boom configurations, the crane manufacturer's recommendations for the amount of ballast or counterweight must be adhered to.
- (8) The crane must be leveled per the crane manufacturer's recommendation; in the event that these recommendations are not available an RPE's recommendation must be followed.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53715, filed 12/20/11, effective 02/01/12.]

WAC 296-155-538 Articulating boom cranes.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-538, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53800 Articulating boom cranes--General.

- (1) All articulating boom cranes in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ASME B30.22-2010, Safety Standard for Articulating Boom Cranes. It is not the intent of this rule to require retrofitting of existing cranes. However, when an item is being modified, its performance needs to be reviewed by a qualified person and compared to the applicable sections of this rule. For modification requirements see WAC 296-155-53400 (58) and (59). For cranes manufactured prior to the effective date of this rule the design and construction criteria must meet at a minimum, ASME B30.22-1987.
- (2) All articulating boom cranes with a winch must have a two-blocking damage prevention feature.
- (3) All welding and welding operator qualifications for load sustaining members must be in accordance with ANSI/AWS D14.3.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53800, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53815 Articulating boom cranes--Operations.

- (1) The operator must not engage in any practice that diverts their attention while actually engaged in operating the crane.
- (2) Stabilizers/outriggers must be visible to the operator or to a signal person during extension or setting.
- (3) When the crane is equipped with stabilizers/outriggers, they must be extended and set per manufacturer's recommendations. When applicable, cribbing under the stabilizers/outriggers must meet the following requirements:
 - (a) Strong enough to prevent crushing;
 - (b) Of such thickness, width, and length as to completely support the pad.

WAC 296-155-53815 (Cont.)

- (4) Crane supports for individual stabilizer/outrigger pads must be level to the manufacturer's specifications or those of a qualified person. Supports may be timbers, cribbing, or other structural members to distribute the load so as not to exceed the allowable bearing capacity of the underlying material.
- (5) In transit the boom must be carried in stowed position, as recommended by the manufacturer.
- (6) The crane must not travel with a load on the hook unless allowed by the manufacturer.
- (7) Articulating boom cranes must not be used with suspended work platforms (baskets).
- (8) The use of attached work platforms to the boom must be approved by the crane manufacturer.

Note: Requirements for personnel lifting are located in WAC 296-155-547.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53815, filed 12/20/11, effective 02/01/12.]

WAC 296-155-539 Tower cranes.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-539, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53900 Tower cranes--General.

- (1) This section contains supplemental requirements for tower cranes; all sections of this part apply to tower cranes unless specified otherwise. In addition, the requirements in WAC 296-155-53402 apply unless otherwise specified, except that the term "assembly/disassembly" is replaced by "erecting, climbing and dismantling," and the term "disassembly" is replaced by "dismantling."
- (2) All tower cranes in use must meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed by the manufacturer. If the manufacturer's recommendations are not available, follow the requirements in ASME B30.3-2009. It is not the intent of this rule to require retrofitting of existing cranes. However, when an item is being modified, its performance needs to be reviewed by a qualified person and compared to the applicable sections of this rule. For modification requirements see WAC 296-155-53400 (58) and (59). For cranes manufactured prior to the effective date of this rule the design and construction criteria must meet at a minimum, ASME B30.3-1990.
- (3) The manufacturer's recommendations must be followed when installing, erecting, and dismantling tower cranes. If the manufacturer's recommendations are not available, follow the requirements in ASME B30.3-2009.
- (4) When cranes are erected/dismantled, written instructions by the manufacturer or qualified person and a list of the weights of each subassembly to be erected/dismantled must be at the site.
- (5) A qualified person must supervise the erection, jumping and dismantling of the crane.
- (6) Procedures must be established before beginning crane erection/dismantling work to implement the instructions and adapt them to the particular needs of the site.
- (7) Tower cranes and tower crane assembly parts/components must be inspected by an accredited certifier, prior to assembly, following erection of the tower crane, after each climbing operation, or reconfiguring the boom, jib, or counterjib, before placing the crane in service. (See WAC 296-155-53206.) Only inspected and preapproved components must be used in the assembly of a tower crane.

WAC 296-155-53900 (Cont.)

- (8) Tower masts must be erected plumb to a tolerance of 1:500 (approximately one inch in forty feet) unless the manufacturer specifies otherwise and verified by a qualified person.
- (9) Cranes that are required to weathervane when out-of-service must be installed with clearance for the boom (jib) and the superstructure to swing through a full three hundred sixty degree arc. Clearances recommended by the crane manufacturer must be maintained between other weathervaning cranes and fixed objects.
- (10) When the crane is out of operation, the jib or boom must be pointed downwind and the slewing brake must be released so as to permit the jib or boom to weathervane, provided the jib or boom has a clear three hundred sixty degree rotation.
- (11) When the crane is out of operation and a three hundred sixty degree rotation is not feasible, the employer must follow the manufacturer's or RPE's written procedures for restraining the jib or boom from rotation.
- (12) 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.
- (13) Prior to erecting a tower crane on a nonstandard tower crane base/structural support, the employer must ensure that the engineering configuration of this base/structural support has been reviewed and acknowledged as acceptable by an independent registered professional structural engineer (RPSE), licensed under chapter 18.43 RCW.
- (14) An RPSE must certify that the crane foundation, structural supports and underlying soil provide adequate support for the tower crane with its applied torsional and overturning moments and the horizontal and vertical forces.
- (15) The controlling entity that installed the tower crane foundations and structural supports must provide a written statement/documentation to the A/D director stating that they were installed in accordance with their design and requirements the RPE, and the engineer of record if applicable.
- (16) The engineer of record must be consulted to verify that the host structure is capable of safely resisting the applied crane forces, if this engineer is not available an RSPE must perform this verification. When inside climbing cranes are used, the integrity of the host structure must be reviewed and approved by an RPSE, for the effects of the crane, load, and wind forces at each level of the structure.
- (17) Prior to installing a tower crane that will be attached to an existing building, new construction, or structure, an RPSE must certify that the structural attachment to the building is designed to withstand the torsional and overturning moments and the horizontal and vertical forces created by the crane to be installed.
- (18) The assembly/disassembly director must address backward stability before slewing, traveling or freestanding tower cranes on ballasted bases.
- (19) The top of the support/foundation must be accessible and free of debris, materials and standing water. No materials can be stored on the support unless approved by a qualified person. Tower crane's foundation and fasteners must remain accessible and visible for inspection at all times.
- (20) Tower cranes must not be climbed in concrete structures until the concrete at the levels at which horizontal and vertical supports are to be placed has reached sufficient strength to resist the crane reactions. It may be necessary to test concrete cylinders or cores or to use on-site testing techniques for this purpose.

WAC 296-155-53900 (Cont.)

- (21) Climbing jack systems used for raising a tower crane must be equipped with over-pressure relief valves, direct-reading pressure gauges, and pilot-operated hydraulic check valves installed in a manner which will prevent the jack from retracting should a hydraulic line or fitting rupture or fail.
- (22) Before climbing or erecting/dismantling, cranes must be balanced in accordance with the manufacturer's or a qualified person's instructions. If no such limit has been set, wind velocity must not exceed the limit set by the manufacturer, or twenty miles per hour as indicated by a wind velocity device mounted near the top of the crane. The crane operator must be present during climbing or erecting/dismantling operations.
- (23) Climbing operations must not be commenced until all crane support provisions at the new support level are in place as per the manufacturer's recommendations or as specified by an RPSE.
- (24) Crane superstructures and counterjibs (counterweight jib) must be arranged to receive counterweights, made in accordance with the manufacturer's specifications for the specified jib or boom length, and to hold them in position. Means must be provided to guard against shifting or dislodgement during crane operation. Manufacturer's specified counterweight weights are not to be exceeded.
- (25) Moveable counterweights, if provided, must either move automatically or must be equipped with a position indicator with read out at the operator's station(s).
- (26) When counterweight position is controlled by wire ropes, means must be provided to prevent uncontrolled movement in the event of wire rope or wire rope termination failure.
- (27) When counterweight position is controlled by wire ropes and/or linkages between the counterweight and the boom, provision must be made to avert structural damage if the boom is moved beyond its normal limits.
- (28) For cranes utilizing ballast, bases must include provisions to support and position the ballast. Means must be provided to guard against shifting or dislodgement of ballast during crane operation.
- (29) All electrical equipment must be properly grounded and protection must be provided against lightning per the manufacturer's recommendation or if not available, a registered professional electrical engineer.
- (30) Each electrically powered crane must have a main disconnect switch at or near the initial base of the crane. This switch must have provisions for locking in the "off" position.
- (31) Electrical equipment must be so located or guarded that live parts are not exposed to inadvertent contact by personnel and equipment under normal operating conditions.
- (32) Electrical equipment must be protected from dirt, grease, oil, and moisture. Fixtures, wiring, and connections exposed to the weather must be of weather resistant type.
- (33) Wiring must conform to the provisions of ANSI/NFPA 70 for temporary wiring. Motors, controls, switches, and other electrical equipment must meet the applicable requirements of ANSI/NFPA 70. Hoists, slewing, trolley, and travel controllers must conform to ISO 7752-1, 2010.
- (34) Provisions must be made to guard against reversing of each motor due to reversed phase connections.
- (35) Electrical circuits between the fixed and rotating portions of the crane must pass through a slip ring assembly that will permit continuous rotation of the upper crane structure in either direction, unless other means are provided to prevent damage to the electrical conductors.
- (36) Individual overload protection must be provided for each motor.

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- (37) Crane trucks must be fitted with sweeps extending below the top of the rail, unless the construction of the rail foundation prohibits such extension, and placed in front of the leading wheels in either direction. Truck wheels/bogies must be guarded.
- (38) A means must be provided to limit the drop of truck frames in case of wheel or axle breakage to a distance that will not cause a crane to overturn.
- (39) Multiple tower crane job sites. On job sites where more than one tower crane is installed, the cranes must be located such that no crane may come in contact with the structure of another crane. Crane's jibs or booms are permitted to pass over one another.
- (40) Tower cranes, in service, must be positioned whereby they can slew three hundred sixty degrees without either the counterjib or jib/boom striking any building, structure, or other object, unless:
 - (a) Suitable anticollision devices are installed which will prohibit contact with such objects or;
 - (b) Direct voice communications are established between any operator of the tower crane(s) involved and a signal person so stationed where the boom and/or counterweight movement, and the object with which it may contact can be observed so that the operator(s) can be warned of imminent danger.
 - (i) A secondary means of positive communications must be established as a back-up for possible direct voice communication failure.
 - (ii) Radio communication systems without tone coded squelch are prohibited. Citizens band radios must not be used as a means of communications for tower cranes.
- (41) Limit switches must be installed and must be kept properly adjusted. They must be protected or isolated in a manner which will prevent unauthorized tampering. Limit switches must provide the following functions:
 - (a) Limit the travel of the trolley to prevent it from hitting the outer end of the jib.
 - (b) Limit the upward travel of the load block to prevent two-blocking.
 - (c) Lower over travel limiting devices must be provided for all load hoists where the hook area is not visible to the operator.
 - (d) In the absence of the crane manufacturer's specifications, limit the load being lifted in a manner whereby no more than one hundred ten percent of the maximum rated load can be lifted or moved.
 - (e) Cranes mounted on rail tracks must be equipped with limit switches limiting the travel of the crane on the track and stops or buffers at each end of the tracks.
- (42) All tower cranes manufactured after July 27, 2010, must be equipped with a safety device (also referred to as a limit device) that provides deceleration before the top position of the crane hook is reached.
- (43) The load must be free when lifted; it must not be caught on nor attached to other objects. Side loading of jibs must be limited to freely suspended loads. Cranes must not be used for dragging loads.
- (44) When the operator may be exposed to the hazard of falling objects, the tower crane cab and/or remote control station must have adequate overhead protection.

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- (45) A safe means must be provided for access to the tower, operator's cab and machinery platform.
- (46) When necessary for inspection or maintenance purposes, ladders, walkways with railing or other devices must be provided.
- (47) All crane brakes must automatically set in event of power failure. Slewing brakes must also function in this manner or be capable of being set manually.
- (48) Each tower crane must be provided with a slewing brake capable of holding in both directions preventing the superstructure from rotating during operation and must be capable of being set in the holding position and remaining so without further action on the part of the operator.
- (49) The trolley must be provided with an operating brake capable of stopping the trolley in either direction. The system must include a means for holding the trolley without further action on the part of the operator, and must engage automatically if power or pressure to the brake is lost.
- (50) In addition to the operating brake, the trolley must be equipped with an automatic braking device capable of stopping trolley in either direction in the event of trolley drive rope breakage, if such ropes are used.
- (51) The body or frame of the trolley must be fitted with a means to restrain the trolley from becoming detached from its guide rail(s) in the event of trolley wheel or axle breakage or side loading.
- (52) The jib point sheave, if provided, must have at least one broad stripe of bright, contrasting color painted on each side so it can be determined whether or not the sheave is turning.
- (53) Employees required to perform duties on the boom/jib of tower cranes must be protected against falling in accordance with Part C-1 of this chapter.
- (54) An audible signal must automatically sound whenever the crane travels in order to warn persons in the vicinity.
- (55) A wind velocity indicating device must be mounted at or near the top of the crane. A velocity readout must be provided at the operator's station in the cab, and a visible or audible alarm must be triggered in the cab and at remote control stations when a preset wind velocity has been exceeded.
- (56) When the wind velocity indicating device is not functioning, crane operations may continue if another crane on the site is equipped with a functioning wind velocity indicator or if a qualified person determines that ambient wind velocity is within permitted limits.
- (57) Indicating devices must be provided to:
 - (a) Display the magnitude of the load on the hook;
 - (b) Display the boom angle or operating radius, as appropriate. On hammerhead booms (jibs), radius indication may be by means of flags or markers along the length of the boom (jib) so as to be visible to the operator;
 - (c) Display ambient wind velocity.

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- (58) Limiting devices must be provided to:
- (a) Decelerate the trolley travel at both ends of the jib prior to the final limit activation;
 - (b) Decelerate the luffing boom travel at upper and lower ends prior to final limit activation;
 - (c) Limit trolley travel at both ends of the jib;
 - (d) Stop boom luffing at lower and upper limits of boom movement;
 - (e) Decelerate the hoist up hook travel prior to final limit activation;
 - (f) Stop load block upper motion before two-blocking occurs;
 - (g) Stop load block downward motion to prevent the last two wraps of wire rope from spooling off the hoist drum;
 - (h) Limit crane travel at both ends of the runway tracks;
 - (i) Limit lifted load;
 - (j) Limit operating radius in accordance with lifted load, i.e., limit movement; and
 - (k) Limit pressures in hydraulic or pneumatic circuits.
- (59) Load limiting devices and acceleration/deceleration limiters must be locked or sealed when provided with a method to inhibit tampering and unauthorized adjustment.
- (60) Safety devices.
- (a) 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) Slewing brake;

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- (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.
- (b) Proper operation required. Operations must not begin unless the devices listed in this subsection are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. The crane must be taken out of service, and operations must not resume until the device is again working properly. Alternative measures are not permitted to be used.
- (61) Operational aids.
 - (a) The devices listed in this subsection (operational aids) are required on all tower cranes covered by this part, unless otherwise specified.
 - (b) Crane 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.
 - (c) When operational aids are inoperative or malfunctioning, the crane and/or device manufacturer's recommendations for operation or shutdown of the crane must be followed until the problems are corrected. Without such recommendations and any prohibitions from the manufacturer against further operation, the following requirements apply:

Note: 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 WAC 296-155-53400 (58) and (59).

- (i) Recalibration or repair of the operational aid must be accomplished as soon as is reasonably possible, as determined by a qualified person.
 - (ii) 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 ten feet of the outer or inner trolley end stops.
 - (iii) Boom hoist limiting device. The range of the boom must be limited at the minimum and maximum radius. Temporary alternative measures: Clearly mark the hoist rope (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.

WAC 296-155-53900 (Cont.)

- (iv) 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 hoist rope (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.

Note: This temporary alternative measure cannot be used if lifting personnel in a suspended platform.

- (v) Hoist drum lower limiting device. Tower cranes manufactured after the effective date of this section must be equipped with a device that prevents the last two wraps of hoist cable from being spooled off the drum. Temporary alternative measures: Mark the hoist rope (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 two 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.
- (vi) 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 reliable source (such as the load's manufacturer), by a reliable calculation method (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.
- (vii) 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).
- (viii) 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 ten 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.
- (ix) 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 type is not functioning.
- (x) Boom angle or hook radius indicator.
 - (A) Luffing boom tower cranes must have a boom angle indicator readable from the operator's station.

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- (B) Hammerhead tower cranes manufactured after the effective date of this section must have a hook radius indicator readable from the operator's station. Temporary alternative measures: Hook radii or boom angle must be determined by measuring the hook radii or boom angle with a measuring device.
- (xi) Trolley travel deceleration device. The trolley speed must be automatically reduced prior to the trolley reaching the end limit in both directions. Temporary alternative measures: 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.
- (xii) Boom hoist deceleration device. The boom speed must be automatically reduced prior to the boom reaching the minimum or maximum radius limit. Temporary alternative measures: 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 boom maximum or minimum end limits.
- (xiii) Load hoist deceleration device. The load speed must be automatically reduced prior to the hoist reaching the upper limit. Temporary alternative measures: 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 hoist speed when approaching the upper limit.
- (xiv) Wind speed indicator. A device must be provided to display the wind speed and must be mounted at or near the top of the crane structure. 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.
- (xv) Load indicating device. Cranes manufactured after the effective date of this section, 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 reliable source (such as the load's manufacturer), by a reliable calculation method (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.
- (62) Advertising signs or similar panels must not be installed on the crane or tower unless size, design, and positioning satisfy the manufacturer's recommendations, in the absence of the manufacturer's recommendations, an RPE's written approval must be obtained.
- (63) For night operations, lighting must be adequate to illuminate the working areas while not interfering with the operator's vision.
- (64) All welding procedures and welding operator qualifications for use in repair or alteration of load sustaining members must be in accordance with ANSI/AWS D14.3 or ANSI/AWS D1.1. Where special steels or other materials are used, the manufacturer or a qualified person must provide welding procedure instructions. The type of metal used for load sustaining members must be identified by the manufacturer. In the absence of the manufacturer an RPSE must be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53900, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53905 Tower cranes--Additional inspection criteria.

- (1) In addition to the requirements in WAC 296-155-53405, the following additional items must be included:
 - (a) 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.
 - (b) 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.
- (2) Annual. In addition to the items that must be inspected under WAC 296-155-53405(5), all turntable and tower bolts must be inspected for proper condition and torque.
[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53905, filed 12/20/11, effective 02/01/12.]

WAC 296-155-53915 Tower cranes--Operations.

- (1) The operator must not engage in any practice that diverts their attention while actually engaged in operating the crane.
- (2) The operator must do the following before leaving the crane unattended:
 - (a) Set down the load, rigging gear, bucket, lifting magnet, or other devices.
 - (b) Position trolley in accordance with the manufacturer's recommendations unless the site specific application drawing requires a different position.
 - (c) Leave the superstructure free to weathervane unless provisions for nonweathervaning have been specified by the manufacturer or by a qualified person.
 - (d) Disconnect power to operating controls or disengage the master clutch, as applicable.
 - (e) Place all controls in the "off" or "neutral" position.
 - (f) Secure the crane against accidental travel.
 - (g) Stop the internal combustion engine, when provided.

Exemption: If crane operation is frequently interrupted during a shift, the crane may remain running while the operator remains on the crane superstructure.

- (h) Restrain the crane from travel with rail clamps, or other means provided, when a wind alarm is given or on leaving the crane overnight.

Note: Additional information relating to cranes being unattended are located in WAC 296-155-53400(52) of this part.

- (3) If power fails during operation, the operator must:
 - (a) Set trolley, hoist, and travel brakes and locking devices, as applicable;
 - (b) Move all clutch or other power controls to the "off" or "neutral" position;
 - (c) If practical, the suspended load must be landed under brake control.

WAC 296-155-53915 (Cont.)

- (4) Cranes must not be climbed to a new operating level nor operated when wind speeds exceed the maximum velocity recommended by the manufacturer. Where the manufacturer does not specify this information, an RPE must determine the maximum allowable wind velocity. Climbing operations are not allowed until tie-ins at the new support level as specified by a qualified person are in place.
- (5) Prior to daily operation, operator aids must be checked to determine if they are working properly as required in WAC 296-155-53405 and 296-155-53905.
- (6) During adverse weather conditions which reduce visibility, operations must be performed according to the manufacturer's specifications, when not available in accordance with an RPE's written instructions.
- (7) The load must not be lowered below the point where less than two full wraps of rope remain on the drum.
- (8) When slewing the boom (jib), trolleying a load, or traveling the crane, sudden starts and stops must be avoided. Slew and travel speeds must be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line must be used when swinging of the load is hazardous.
- (9) Cranes must not be operated without the ballast or counterweight in place as specified by the manufacturer. Under specific conditions, such as during crane assembly or disassembly, the manufacturer's recommendations for the amount of partial ballast or counterweight must be adhered to. The maximum ballast or counterweight approved by the manufacturer or an RPE for use on a given crane must not be exceeded.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-53915, filed 12/20/11, effective 02/01/12.]

WAC 296-155-541 Self-erecting tower cranes.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-541, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54100 Self-erecting tower cranes--General.

- (1) All self-erecting tower cranes in use must meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed by the manufacturer. For modification requirements see WAC 296-155-53400 (58) and (59).
- (2) In addition to the requirements in WAC 296-155-53402(6), 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) When cranes are erected, reconfigured, or dismantled, written instructions by the manufacturer must be followed. If circumstances do not permit the normal manufacturer's written instructions from being followed, alternative written instructions from the manufacturer or an RPE must be followed.
- (4) Erection, reconfiguration, and dismantling must be performed under the supervision of a qualified person.
- (5) The area in which a crane is to be set up must be carefully assessed to ensure that it is suitable before the crane is taken to site and put into service. The area chosen must be of a sufficient size to enable the crane to be maneuvered into position, set up, operated and dismantled, with sufficient clearances between the crane and surrounding structures, as detailed by application drawings and in the manufacturer's operation and instruction manual.

WAC 296-155-54100 (Cont.)

- (6) When setting up a crane, care must be taken to ensure that the crane will not contact or approach overhead hazards such as power lines, communications cables or overhead structures.
- (7) The assembly/disassembly director must address backward stability before slewing self-erecting tower cranes.
- (8) Crane supports for individual outrigger pads must be level to the manufacturer's specifications or those of a qualified person. Supports may be timbers, cribbing, or other structural members to distribute the load so as not to exceed the allowable bearing capacity of the underlying material.
- (9) All load bearing foundations, supports, and rail tracks must be constructed or installed to support the crane loads and to transmit them to the soil or other support medium. In addition to supporting vertical load, foundations and supports, rail supports excepted, must be designed to provide a moment resisting overturning equal to a minimum of one hundred fifty percent of the maximum crane overturning moment. This requirement may be met by means of structural anchors or ballast weights.
- (10) In addition to the requirements in WAC 296-155-53400 (36) and (37), a qualified person must ensure that the underlying soil is adequate support for the crane with its maximum forces recommended by the manufacturer.
- (11) Cranes required to weathervane when out-of-service must be installed with clearance for jib and superstructure to slew a full three hundred sixty degree arc unobstructed without encroaching any power line "Danger-Swing/Crush Zone." Clearances recommended by the crane manufacturer must be maintained between weathervaning cranes, fixed objects and other cranes.
- (12) When the crane is out of operation and a three hundred sixty degree rotation is not provided, follow the manufacturer's or RPE's written procedures.
- (13) Advertising signs or similar panels must not be installed on the crane or tower unless size, design, and positioning satisfy the manufacturer's recommendations. In the absence of the manufacturer's recommendations, an RPE's written approval must be obtained.
- (14) Prior to installing a self-erecting tower crane on a building or structure the engineer of record must be consulted to verify that the host structure is capable of safely resisting the applied crane forces, if this engineer is not available an RSPE must perform this verification.
- (15) When cranes are erected and after each reconfiguration, before placing the crane in service, all functional motions, motion limiting devices, brakes, and indicating devices must be tested for operation.
 - (a) The order in which tests of a newly erected or reconfigured crane are to be performed is as follows:
 - (i) Functional motion tests without load. Each test must include:
 - (A) Load hoisting and lowering;
 - (B) Jib elevating and lowering, or traversing the trolley;
 - (C) Slew motion;
 - (D) Brakes and clutches;

WAC 296-155-54100 (Cont.)

- (E) Operational aids and motion limiting devices;
 - (F) Remote control, if provided.
 - (ii) Functional load tests at rated load. Each test must include:
 - (A) Load hoisting and lowering;
 - (B) Jib elevating and lowering, or traversing the trolley;
 - (C) Slew motion;
 - (D) Brakes and clutches;
 - (E) Operational aids and load limiting devices;
 - (F) Remote control, if provided.
 - (b) During the test, the crane supports must be checked. Any observed displacement is reason to suspend testing until an evaluation is made by a qualified person.
- (16) Conditions that adversely affect the crane at the time of erection, reconfiguration, or dismantling must be a limiting factor that could require suspending the operation. These conditions include but are not limited to:
 - (a) Support conditions;
 - (b) Wind velocity or gusting winds;
 - (c) Heavy rain;
 - (d) Fog;
 - (e) Extreme cold or heat;
 - (f) Ice;
 - (g) Artificial lighting.
- (17) For night operations, lighting must be adequate to illuminate the working areas while not interfering with the operator's vision.
- (18) For cranes utilizing ballast, bases must include provisions to support and position the ballast. Means must be provided to guard against shifting or dislodgement during crane operation.
- (19) Superstructures must be arranged to receive counterweights, made in accordance with the crane manufacturer's specifications, and to hold them in position. Means must be provided to guard against shifting or dislodgement during crane operation.
- (20) Counterweights must be securely fastened in place and must be at the location and within the weight tolerance as recommended by the manufacturer.

WAC 296-155-54100 (Cont.)

- (21) Limiting devices must be provided to:
 - (a) Decelerate the trolley and hoist hook prior to activating the motion stop limit;
 - (b) Limit trolley travel at both ends of the jib;
 - (c) Limit jib telescoping at inner and outer position;
 - (d) Stop load block upward motion before two-blocking occurs;
 - (e) Stop load block downward motion to prevent the last two wraps of wire rope from spooling off the hoist drum;
 - (f) Limit crane travel at both ends of the runway tracks;
 - (g) Limit lifted load;
 - (h) Limit operating radius in accordance with lifted load, i.e., limit moment; and
 - (i) Limit pressures in hydraulic or pneumatic circuits, i.e., pressure relief valves.
- (22) Load limiting devices and acceleration/deceleration limiters must be locked or sealed when provided with a method to inhibit tampering and unauthorized adjustment.
- (23) All crane brakes must automatically set in event of power failure. Slew brakes must also function in this manner or be capable of being set manually.
- (24) Each crane must be provided with a slewing brake capable of holding in both directions preventing the superstructure from rotating during operation and must be capable of being set in the holding position and remaining so without further action on the part of the operator.
- (25) The trolley must be provided with an operating brake capable of stopping the trolley in either direction. The system must include a means for holding the trolley without further action on the part of the operator, and must engage automatically if power or pressure to the brake is lost.
- (26) In addition to the operating brake, the trolley must be equipped with an automatic braking device capable of stopping the movement of the load trolley in the event of trolley drive rope breakage, if such ropes are used.
- (27) The body or frame of the trolley must be fitted with a means to restrain the trolley from becoming detached from its guide rail(s) in the event of trolley wheel or axle breakage or side loading.
- (28) All electrical equipment must be properly grounded and protection must be provided against lightning per the manufacturer's recommendations or if not available, a registered professional electrical engineer.
- (29) Each electrically powered crane must have an over-current protected main disconnect switch mounted at or near the initial base of the crane. This switch must have provisions for locking in the off position.
- (30) Electrical equipment must be so located or guarded that live parts are not exposed to inadvertent contact by personnel and equipment under normal operating conditions.

WAC 296-155-54100 (Cont.)

- (31) Electrical equipment must be protected from dirt, grease, oil, and moisture. Fixtures, wiring, and connections exposed to the weather must be of weather resistant type.
- (32) Wiring must conform to the provisions of ANSI/NFPA 70 for temporary wiring. Motors, controls, switches, and other electrical equipment must meet the applicable requirements of ANSI/NFPA 70. Hoists, slewing, trolley, and travel controllers must conform to ISO 7752-1, 2010.
- (33) Provision must be made to guard against any crane function operating in the opposite intended direction due to reversed phase connections.
- (34) Electrical circuits between the fixed and rotating portions of the crane must pass through a slip ring assembly that will permit continuous rotation of the upper crane structure in either direction unless other means are provided to prevent damage to the electrical conductors.
- (35) Individual overload protection must be provided for each motor.
- (36) For traveling cranes, both ends of all tracks must be provided with stops or buffers adjusted for simultaneous contact with both sides of the travel base. Stops attached to rails must be mounted not less than three feet (1 m) inboard of the last rail support. Cranes must be equipped with means to prevent running into the buffers or stops while under power.
- (37) An audible signal device must be provided with the control located within reach of the operator.
- (38) An audible signal must automatically sound whenever the crane travels in order to warn persons in the vicinity.
- (39) Bogies must be fitted with sweeps extending below the top of the rail, unless the construction of the rail foundation prohibits such extension, and placed in front of the leading wheels in either direction. Bogie wheels must be guarded.
- (40) A means must be provided to limit the drop of bogie frames in case of wheel or axle breakage to a distance that will not cause the crane to overturn.
- (41) A wind velocity indicating device must be mounted at or near the top of the crane. A velocity readout must be provided at the operator's station or in the cab. 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.
- (42) Safety devices.
 - (a) The following safety devices are required on all self-erecting tower cranes unless otherwise specified:
 - (i) Boom stops on luffing boom type self-erecting tower cranes;
 - (ii) Jib stops on luffing boom type self-erecting 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;

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- (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) Slewing 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.
 - (b) Proper operation required. Operations must not begin unless the devices listed in this subsection are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. The crane must be taken out of service, and operations must not resume until the device is again working properly. Alternative measures are not permitted to be used.
- (43) Operational aids.
- (a) The devices listed in this subsection (operational aids) are required on all self-erecting tower cranes covered by this part, unless otherwise specified.
 - (b) Crane 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 self-erecting tower crane manufacturer, if any, must be followed.
 - (c) When operational aids are inoperative or malfunctioning, the crane and/or device manufacturer's recommendations for operation or shutdown of the crane must be followed until the problems are corrected. Without such recommendations and any prohibitions from the manufacturer against further operation, the following requirements apply:

Note: 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 WAC 296-155-53400 (58) and (59).

- (i) Recalibration or repair of the operational aid must be accomplished as soon as is reasonably possible, as determined by a qualified person.
- (ii) 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:

WAC 296-155-54100 (Cont.)

- (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 ten feet of the outer or inner trolley end stops.
- (iii) Boom hoist limiting device. The range of the boom must be limited at the minimum and maximum radius. Temporary alternative measures: Clearly mark the hoist rope (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.
- (iv) Anti two-blocking device. The self-erecting 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 hoist rope (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.

Note: This temporary alternative measure cannot be used if lifting personnel in a suspended platform.

- (v) Hoist drum lower limiting device. Self-erecting tower cranes manufactured after the effective date of this section must be equipped with a device that prevents the last two wraps of hoist cable from being spooled off the drum. Temporary alternative measures: Mark the hoist rope (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 two 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.
- (vi) Load moment limiting device. The self-erecting 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 reliable source (such as the load's manufacturer), by a reliable calculation method (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.
- (vii) 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).

WAC 296-155-54100 (Cont.)

- (viii) 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 ten 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.
- (ix) 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 type is not functioning.
- (x) Boom angle or hook radius indicator.
 - (A) Luffing boom self-erecting tower cranes must have a boom angle indicator readable from the operator's station.
 - (B) Self-erecting hammerhead cranes manufactured after the effective date of this section must have a hook radius indicator readable from the operator's station. Temporary alternative measures: Hook radii or boom angle must be determined by measuring the hook radii or boom angle with a measuring device.
- (xi) Trolley travel deceleration device. The trolley speed must be automatically reduced prior to the trolley reaching the end limit in both directions. Temporary alternative measures: 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.
- (xii) Boom hoist deceleration device. The boom speed must be automatically reduced prior to the boom reaching the minimum or maximum radius limit. Temporary alternative measures: 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 boom maximum or minimum end limits.
- (xiii) Load hoist deceleration device. The load speed must be automatically reduced prior to the hoist reaching the upper limit. Temporary alternative measures: 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 hoist speed when approaching the upper limit.
- (xiv) Wind speed indicator. A device must be provided to display the wind speed and must be mounted at or near the top of the crane structure. Temporary alternative measures: Use of wind speed information from a properly functioning indicating device on another crane on the same site, or a qualified person estimates the wind speed.

WAC 296-155-54100 (Cont.)

- (xv) Load indicating device. Cranes manufactured after the effective date of this section, 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 reliable source (such as the load's manufacturer), by a reliable calculation method (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.
- (44) All welding procedures and welding operator qualifications for use in repair or alteration of load sustaining members must be in accordance with ANSI/AWS D14.3 or ANSI/AWS D1.1. Where special steels or other materials are used, the manufacturer or a qualified person must provide welding procedure instructions. The type of metal used for load sustaining members must be identified by the manufacturer. In the absence of the manufacturer an RPSE must be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54100, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54115 Self-erecting tower cranes--Operations.

- (1) The operator must not engage in any practice that diverts their attention while actually engaged in operating the crane.
- (2) Before leaving the crane unattended the operator must:
 - (a) Set down the load, rigging gear, bucket, lifting magnet, or other devices;
 - (b) Land any load suspended below the hook;
 - (c) Put controls in the off or neutral position;
 - (d) Set brakes and other locking devices;
 - (e) Disengage the main control circuit;
 - (f) Stop the engine: An exception to this may exist when crane operation is frequently interrupted during a shift and the operator must leave the crane. Under these circumstances, the engine may remain running and (a) through (e) of this subsection must apply. The operator must be situated where any entry to the crane can be observed.
 - (g) Leave the superstructure free to weathervane unless provisions for nonweathervaning have been specified by the manufacturer or by a qualified person.

Note: Additional information relating to cranes being unattended are located in WAC 296-155-53400(52) of this part.

- (3) If power fails during operation, the operator must:
 - (a) Set all brakes and locking devices;
 - (b) Move all clutch or other power controls to the "off" or "neutral" position;

WAC 296-155-54115 (Cont.)

- (c) If practical, the suspended load must be landed under brake control, according to the manufacturer's procedures.
- (4) The operator must be familiar with the crane and its proper care. If adjustments or repairs are necessary, the operator must report the condition to the competent person. The next operator must be notified of the condition.
- (5) All controls must be tested by the operator at the start of a new shift, if possible. If any controls fail to operate properly, they must be adjusted or repaired before operations are initiated.
- (6) Cranes must not be operated when wind speeds exceed the maximum velocity recommended by the manufacturer. Where the manufacturer does not specify this information, an RPE must determine the maximum allowable velocity.
- (7) Prior to daily operation, operator aids must be checked to determine if they are working properly as required in WAC 296-155-53405(3).
- (8) During adverse weather conditions which reduce visibility, operations must be performed in accordance with the manufacturer's specifications, when not available follow RPE's recommendations for reduced function speeds and with signaling means appropriate to the situation.
- (9) No less than two full wraps of rope must remain on the load hoist drum(s) at any time during operation.
- (10) When slewing the boom (jib), trolleying a load, or traveling the crane, sudden starts and stops must be avoided. Slew and travel speeds must be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line must be used when uncontrolled rotation of the load is hazardous.
- (11) Cranes must not be operated without the ballast or counterweight in place as specified by the manufacturer. Under specific conditions, such as during crane assembly or disassembly, the manufacturer's recommendations for the amount of partial ballast or counterweight must be adhered to. The maximum ballast or counterweight approved by the manufacturer for use on a given crane must not be exceeded.
- (12) The load must be free when lifted; it must not be caught on nor attached to other objects. Side loading of jibs must be limited to freely suspended loads. Cranes must not be used for dragging loads.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54115, filed 12/20/11, effective 02/01/12.]

WAC 296-155-542 Overhead/bridge and gantry cranes.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-542, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54200 Overhead/bridge and gantry cranes--General.

- (1) Permanently installed overhead/bridge and gantry cranes which are located in a manufacturing facility or powerhouse must follow the requirements of WAC 296-24-235 (General safety and health standards), even when a construction activity is being performed. This requirement applies to overhead, bridge, gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.
- (2) Overhead and gantry cranes that are not permanently installed must follow the applicable requirements in chapter 296-155 WAC Part L.

WAC 296-155-54200 (Cont.)

- (3) Cranes included in this section must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in:
 - (a) ASME B30.2-2005, Safety Standard for Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist).
 - (b) ASME B30.11-2010, Safety Standards for Monorails and Underhung Cranes.
 - (c) ASME B30.17-2006, Safety Standards for Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist).
 - (d) It is not the intent of this rule to require retrofitting of existing cranes. However, when an item is being modified, its performance needs to be reviewed by a qualified person and compared to the applicable sections of this rule. For modification requirements see WAC 296-155-53400 (58) and (59). For cranes manufactured prior to the effective date of this rule the design and construction criteria must meet at a minimum, ASME B30.2.0-1990.
- (4) The rated load of the crane must be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist must have its rated load marked on it or its load block, and this marking must be clearly legible from the ground or floor.
- (5) The crane or surrounding structure must be marked to provide operating directions that match and are visible from the crane's operating controls, i.e., north/south, east/west or forward/back, left/right.
- (6) Overhead and gantry cranes with bridge trucks must be equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.
- (7) Except for floor-operated cranes, an effective warning device must be provided for each crane equipped with a power traveling mechanism.
- (8) A wind-indicating device must be provided for all outdoor overhead and gantry cranes. The device must be mounted on the crane runway structure and must give a visible and audible alarm to the crane operator at a predetermined wind velocity. A single wind-indicating device may serve as an alarm for more than one crane.
- (9) Electrical.
 - (a) Wiring and equipment must comply with Article 610 of ANSI/NFPA No. 70, National Electrical Code and chapter 296-155 WAC Part I.
 - (b) The control circuit voltage must not exceed 600 volts for AC or DC.
 - (c) The voltage at pendant pushbuttons must not exceed 150 volts for AC and 300 volts for DC.
 - (d) Where multiple conductor cable is used with a suspended pushbutton station, the station must be supported in a manner that will protect the electrical conductors against strain.
 - (e) Pendant control stations must be constructed to prevent electrical shock. The pushbutton enclosure must be at ground potential and marked for identification of functions.

WAC 296-155-54200 (Cont.)

- (10) All welding procedures and welding operator qualifications to be used on load sustaining members must be in accordance with ANSI/AWS D1.1, except as modified by ANSI/AWS D14.1.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-54200, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54200, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54215 Overhead/bridge and gantry cranes--Operations.

- (1) The operator must not engage in any practice that diverts their attention while actually engaged in operating the crane.
- (2) The operator must do the following before leaving a cab-operated crane or a cab-operated carrier unattended:
- (a) Remove any attached load and raise the hook to the highest allowable position.
 - (b) Place controllers or master switches in the “off” position and deenergize the main switch (crane disconnect) of the specific crane.

Note: Additional information relating to cranes being unattended is located in WAC 296-155-53400(52) of this part.

- (3) If power fails during operation, the operator must:
- (a) Move all clutch or other power controls to the “off” position;
 - (b) Prior to reuse of the crane operating motions must be checked for proper direction.
- (4) The operator must be familiar with the crane and its proper care. If adjustments or repairs are necessary, the operator must report the condition to the competent person. The next operator must be notified of the condition.
- (5) The load must not be lowered below the point where less than two full wraps of wire rope remain on the drum.
- (6) When two or more cranes are used to lift a load, one qualified person must be in charge of the operation. This person must analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.
- (7) The operator must not leave the position at the controls while the load is suspended over an area accessible to people.
- (8) For cab and remote operated cranes, when the load or hook approaches near or over personnel, a warning signal must be sounded.
- (9) Hoist limit switch.
- (a) At the beginning of each operator's shift, the upper limit switch of each hoist must be tested under no load.

WAC 296-155-54215 (Cont.)

- (b) The hoist limit switch which controls the upper limit of travel of the load block must never be used as an operating control.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54215, filed 12/20/11, effective 02/01/12.]

WAC 296-155-543 Derricks.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-543, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54300 Derricks--General.

- (1) This section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this part 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.
- (2) Derricks. All derricks in use must meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation as prescribed in American National Standard Institute B30.6-2010, Safety Standard for Derricks. It is not the intent of this rule to require retrofitting of existing derricks. However, when an item is being modified, its performance needs to be reviewed by a qualified person and compared to the applicable sections of this rule. For modification requirements see WAC 296-155-53400 (58) and (59). For derricks manufactured prior to the effective date of this rule the design and construction criteria must meet at a minimum, ASME B30.6-1990.
- (3) 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.
- (4) The manufacturer's recommendations must be followed when installing, erecting, operating, maintenance and dismantling derricks. If the manufacturer's recommendations are not available, follow the requirements in ASME B30.6-2010.
- (5) When derricks are erected/dismantled, written instructions by the manufacturer or qualified person and a list of the weights of each subassembly to be erected/dismantled must be at the site.
- (6) Procedures must be established before beginning derrick erection/dismantling work to implement the instructions and adapt them to the particular needs of the site.
- (7) A qualified person must supervise the erection and dismantling of the derrick.
- (8) Derricks and their crane assembly parts/components must be inspected by an accredited certifier, prior to assembly and following erection of the derrick before placing the crane in service (see WAC 296-155-53212). Only inspected and preapproved components are allowed to be used in the assembly of a derrick.
- (9) Prior to erecting a derrick on a nonstandard base/structural support, the employer must ensure that the engineering configuration of this base/structural support has been reviewed and acknowledged as acceptable by an independent registered professional structural engineer (RPSE), licensed under chapter 18.43 RCW.

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- (10) An RPSE must certify that the derrick foundation, structural supports and underlying soil provide adequate support for the derrick with its applied torsional and overturning moments and the horizontal and vertical forces.
- (11) Derricks must be attached to bases/structural supports in compliance with the manufacturer's or an RPSE's instructions.
- (12) Prior to installing a derrick that will be attached to an existing building, new construction, or structure, an RPSE must certify that the structural attachments to the building are designed to withstand the torsional and overturning moments and the horizontal and vertical forces created by the derrick to be installed.
- (13) The engineer of record must be consulted to verify that the host structure is capable of safely resisting the applied derrick forces, if this engineer is not available an RPSE must perform this verification.
- (14) Derrick superstructures and machine deck (counterweight jib/counter-jibs) must be arranged to receive counterweights, made in accordance with the manufacturer's specifications for the specified jib or boom length, and to hold them in position. Means must be provided to guard against shifting or dislodgement during derrick operation. Manufacturer's specified counterweight weights are not to be exceeded.
- (15) For derricks utilizing ballast, bases must include provisions to support and position the ballast. Means must be provided to guard against shifting or dislodgement of ballast during derrick operation.
- (16) All electrical equipment must be properly grounded and protection must be provided against lightning per the manufacturer's recommendations or if not available, a registered professional electrical engineer.
- (17) Each electrically powered derrick must have a main disconnect switch at or near the initial base of the derrick. This switch must have provisions for locking in the "off" position.
- (18) Electrical equipment must be so located or guarded that live parts are not exposed to inadvertent contact by personnel and equipment under normal operating conditions.
- (19) Electrical equipment must be protected from dirt, grease, oil, and moisture. Fixtures, wiring, and connections exposed to the weather must be of weather resistant type.
- (20) Wiring must conform to the provisions of ANSI/NFPA 70 for temporary wiring. Motors, controls, switches, and other electrical equipment must meet applicable requirements of ANSI/NFPA 70. Hoists, slewing, trolley, and travel controllers must conform to ISO 7752-1, 2010.
- (21) Provisions must be made to guard against reversing of each motor due to reversed phase connections.
- (22) Electrical circuits between the fixed and rotating portions of the derrick must pass through a slip ring assembly that will permit continuous rotation of the upper derrick structure in either direction, unless other means are provided to prevent damage to the electrical conductors.
- (23) Individual overload protection must be provided for each motor.
- (24) Employees required to perform duties on the boom/jib of derricks must be protected against falling in accordance with Part C-1 of this chapter.

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- (25) Advertising signs or similar panels must not be installed on the derrick unless size, design, and positioning satisfy the manufacturer's recommendations, in the absence of the manufacturer's recommendations, an RPE's written approval must be obtained.
- (26) For night operations, lighting must be adequate to illuminate the working radius while not interfering with the operator's vision.
- (27) All welding procedures and welding operator qualifications for use in repair or alteration of load sustaining members must be in accordance with ANSI/AWS D14.3 or ANSI/AWS D1.1. Where special steels or other materials are used, the manufacturer or a qualified person must provide welding procedure instructions. The type of metal used for load sustaining members must be identified by the manufacturer. In the absence of the manufacturer an RPSE must be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54300, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54305 Derricks--Construction.

- (1) Guy derricks.
 - (a) The minimum number of guys must be six, 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.
 - (b) 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:
 - (i) The number of guys.
 - (ii) The spacing around the mast.
 - (iii) The size, grade, and construction of rope to be used for each guy.
 - (c) For guy derricks manufactured after December 18, 1970, in addition to the information required in subsection (b) of this section, the employer must have the following guy information from the manufacturer or a qualified person, when not available from the manufacturer:
 - (i) The amount of initial sag or tension.
 - (ii) The amount of tension in guy line rope at anchor.
 - (d) The mast base must permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack.
 - (e) The mast cap must:
 - (i) Permit the mast to rotate freely.
 - (ii) Withstand tilting and cramping caused by the guy loads.

WAC 296-155-54305 (Cont.)

- (iii) Be secured to the mast to prevent disengagement during erection.
 - (iv) Be provided with means for attaching guy ropes.
- (2) Stiffleg derricks.
 - (a) 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.
 - (b) The stifflegs must be capable of withstanding the loads imposed at any point of operation within the load chart range.
 - (c) The mast base must:
 - (i) Permit the mast to rotate freely (when necessary).
 - (ii) Permit deflection of the mast without binding.
 - (d) The mast must be prevented from lifting out of its socket when the mast is in tension.
 - (e) The stiffleg connecting member at the top of the mast must:
 - (i) Permit the mast to rotate freely (when necessary).
 - (ii) Withstand the loads imposed by the action of the stifflegs.
 - (iii) Be secured so as to oppose separating forces.
- (3) Gin pole derricks.
 - (a) 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.

 - (b) The base of the gin pole must permit movement of the pole (when necessary).
 - (c) The gin pole must be anchored at the base against horizontal forces (when such forces are present).
- (4) Chicago boom derricks. The fittings for stepping the boom and for attaching the topping lift must be arranged to:
 - (a) Permit the derrick to swing at all permitted operating radii and mounting heights between fittings.
 - (b) Accommodate attachment to the upright member of the host structure.

WAC 296-155-54305 (Cont.)

- (c) Withstand the forces applied when configured and operated in accordance with the manufacturer's/builder's procedures and within its rated capacity.
 - (d) Prevent the boom or topping lift from lifting out under tensile forces.
- (5) Anchoring and guying.
 - (a) Load anchoring data developed by the manufacturer or a registered professional engineer must be used.
 - (b) Guy derricks.
 - (i) The mast base must be anchored per the manufacturer's recommendations. In the absence of the manufacturer's recommendations an RPSE must be used.
 - (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.
 - (c) Stiffleg derricks.
 - (i) The mast base and stifflegs must be anchored per the manufacturer's recommendations. In the absence of the manufacturer's recommendations an RPSE must be used.
 - (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.
 - (d) Gin pole derricks.
 - (i) Side guys must be located so that they do not usurp the topping-lifted load;
 - (ii) Side guys must be evenly played out or in depending on their position relative to the boom foot pivot.
- (6) Swingers and hoists.
 - (a) The boom, slewing mechanism, and hoists must be suitable for the derrick work intended and must be anchored to prevent displacement from the imposed loads.
 - (b) Base-mounted drum hoists. Base-mounted drum hoists must meet the requirements of ASME B30.7-2006, including the following:
 - (i) Load ratings must be the manufacturer's recommended single rope pull in pounds (kilograms), at a specified rate of speed, on a given size drum, and prescribed number of layers of rope.

WAC 296-155-54305 (Cont.)

- (ii) Markings. Hoists are to be marked with the following identification for each drum:
 - (A) Load rating;
 - (B) Drum size consisting of barrel diameter, barrel length, and flange diameter;
 - (C) Rope size(s);
 - (D) Rope speed in feet per minute (meters per second);
 - (E) Rated power supply.
- (iii) Attachments and anchorages for hoist bases must provide mounting of the hoist and must be capable of withstanding loads imposed by the hoist under operating conditions. The weight of the hoist and loads imposed by the load ropes must be provided for.
- (iv) Location of drum hoists. Drum hoists must be located in a manner that provides proper rope spooling on the drums.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54305, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54320 Derricks--Operations.

- (1) The operator must not engage in any practice that diverts their attention while actually engaged in operating the derrick.
- (2) The operator must do the following before leaving the derrick unattended:
 - (a) Set down any attached load.
 - (b) Disengage clutches.
 - (c) Put the handles of controls in the “off” position.
 - (d) Open main switch or stop the engine.
 - (e) Engage the manual locking devices in the absence of automatic holding equipment.

Note: Additional information relating to cranes being unattended are located in WAC 296-155-53400(52) of this part.

- (3) If power fails during operation, the derrick hoist operator must:
 - (a) If practical, the suspended load must be landed under brake control, according to the manufacturer’s procedures or an RPE;
 - (b) Set all brakes or locking devices;
 - (c) Move all clutch or other power controls to the “off” position.

WAC 296-155-54320 (Cont.)

- (4) The operator must be familiar with the derrick and its proper care. If adjustments or repairs are necessary, the operator must report the condition to the competent person, and must also notify the next operator.
- (5) The operator must test all controls at the start of a new shift. If any controls do not operate properly, they must be adjusted or repaired before operations are begun.
- (6) The load must not be lowered below the point where less than two full wraps of rope remain on the drum.
- (7) When slewing a derrick, sudden starts and stops must be avoided. Slewing speed must be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line must be used when slewing of the load is hazardous.
- (8) Use of winch heads.
 - (a) Ropes must not be handled on a winch head without the knowledge of the operator.
 - (b) While a winch head is being used, the operator must be within reach of the power unit control lever.
- (9) Securing the derrick.
 - (a) When the boom is being held in a fixed position, dogs, pawls, or other positive holding mechanisms on the boom hoist must be engaged.
 - (b) When taken out of service for thirty days or more, the derrick must be secured according to the manufacturer's recommendations. In the absence of the manufacturer's recommendations an RPE must be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54320, filed 12/20/11, effective 02/01/12.]

WAC 296-155-544 Additional requirements for other types of cranes/derricks.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-544, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54400 Floating cranes/derricks and land cranes/derricks on barges.

- (1) 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 part 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.
- (2) General requirements. The requirements in subsections (3) through (10) of this section apply to both floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.
- (3) Work area control.
 - (a) The requirements of WAC 296-155-53400(42) (work area control) apply, except for WAC 296-155-53400 (42)(b)(ii).

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- (b) 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.
- (4) Keeping clear of the load. WAC 296-155-53400(43) does not apply.
- (5) Additional safety devices. In addition to the safety devices listed in WAC 296-155-53410, the following safety devices are required:
 - (a) Barge, pontoon, vessel or other means of flotation list and trim indicator. The safety device must be located in the cab or, when there is no cab, at the operator's station.
 - (b) Positive equipment house lock.
 - (c) 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.
- (6) Operational aids.
 - (a) An anti two-block device is required only when hoisting personnel or hoisting over an occupied cofferdam or shaft.
 - (b) WAC 296-155-53412 (3)(h) (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.
- (7) Accessibility of procedures applicable to equipment operation. If the crane/derrick has a cab, the requirements of WAC 296-155-53400(6) apply. If the crane/derrick does not have a cab, the employer must ensure that:
 - (a) 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.
 - (b) 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.
- (8) Inspections. In addition to meeting the requirements of WAC 296-155-53405 for inspecting the crane/derrick, the barge, pontoons, vessel or other means of flotation used to support a floating crane/derrick or land crane/derrick must be inspected, to ensure that:

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- (a) 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.
- (b) 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 deck load 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.
- (c) 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.
- (d) 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 this subsection.
 - (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.

WAC 296-155-54400 (Cont.)

- (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 WAC 296-155-53400(68).
 - (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.
 - (e) 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.
 - (f) Documentation. The monthly and annual inspections required in (b) and (d) of this subsection are documented in accordance with WAC 296-155-53405, respectively, and that the four-year inspection required in this section is documented, except that the documentation for that inspection must be retained for a minimum of four years. All such documents must be made available, during the applicable document retention period, to all persons who conduct inspections in accordance with WAC 296-155-53405.
- (9) Working with a diver. The employer must meet the following additional requirements when working with a diver in the water:
- (a) 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.
 - (b) The operator must remain at the controls of the crane/derrick at all times.
 - (c) In addition to the requirements in WAC 296-155-53406 (Signals), either:
 - (i) A clear line of sight must be maintained between the operator and dive tender; or
 - (ii) The signals between the operator and dive tender must be transmitted electronically.

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- (d) The means used to secure the crane/derrick to the vessel/flotation device (see subsection (12)(e) of this section) must not allow any amount of shifting in any direction.
- (10) Barge, pontoons, vessel or other flotation manufacturer's specifications and limitations.
 - (a) 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.
 - (b) 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.
 - (c) When the manufacturer's specifications and limitations are unavailable, the employer must ensure that the specifications and limitations established by a marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to environmental, operational and in-transit loads for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.
- (11) 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:
 - (a) 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 forty miles per hour.
 - (b) The employer must ensure that the requirements for maximum allowable list and maximum allowable trim as specified in Table 6 of this section are met.

TABLE 6		
Equipment designed for marine use by permanent attachment (other than derricks):		
Rated Capacity	Maximum Allowable List	Maximum Allowable Trim
25 tons or less	5 degrees	5 degrees
Over 25 tons	7 degrees	7 degrees
Derricks designed for marine use by permanent attachment:		
Any rated capacity	10 degrees	10 degrees

- (c) The employer must ensure that the equipment is stable under the conditions specified in Tables 7 and 8 of this section. *(Note: Freeboard is the vertical distance between the water line and the main deck of the vessel.)*

WAC 296-155-54400 (Cont.)

Table 7		
Operated at	Wind speed	Minimum Freeboard
Rated capacity	60 mph.	2 ft.
Rated capacity plus 25%	60 mph.	2 ft.
High boom, no load	60 mph.	2 ft.

Table 8	
For backward stability of the boom:	
Operated at	Wind speed
High boom, no load, full back list (least stable condition)	90 mph

- (d) 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 (a) through (c) of this subsection. 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).
- (e) 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.
- (12) Land cranes/derricks. For land cranes/derricks used on barges, pontoons, vessels or other means of flotation, the employer must ensure that:
 - (a) 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 (c) and (d) of this subsection are met.

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- (b) The rated capacity modification required in (a) of this subsection 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.
- (c) 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 (d) of this subsection are met. In addition, the maximum allowable list and the maximum allowable trim does not exceed the least of the following: Five 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.
- (d) 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.
- (e) Physical attachment, corraling, 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 (e)(v) of this subsection.
 - (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) - Corraling. The crane/derrick is prevented from shifting by installing barricade restraints (i.e., a corraling system). Employers must ensure that corraling 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.

WAC 296-155-54400 (Cont.)

- (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.
- (f) Exception. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement specified by (e) of this subsection 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 corraling, 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 (f)(v) of this subsection are exceeded, the mobile auxiliary crane is attached physically or corralled in accordance with Option (1), Option (2) or Option (4) of (e) of this subsection.
- (g) 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.

WAC 296-155-54400 (Cont.)

- (iii) Have access to void compartments to allow for inspection and pumping.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54400, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54405 Dedicated pile drivers.

- (1) The provisions of Part L of this chapter apply to dedicated pile drivers, except as specified in this section.
- (2) WAC 296-155-53412 (3)(d) (Anti two-blocking device) does not apply.
- (3) WAC 296-155-53412 (3)(h) (Load weighing and similar devices) applies only to dedicated pile drivers manufactured after the effective date of this section.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54405, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54410 Sideboom cranes.

- (1) The provisions of this standard apply, except WAC 296-155-53400(34) (Ground conditions), WAC 296-155-53410 (Safety devices), WAC 296-155-53412 (Operational aids), WAC 296-155-531 through 296-155-53214 (crane certifier accreditation and crane certification) and WAC 296-155-53300 (Operator qualifications and certification).
- (2) Sideboom cranes manufactured prior to the effective date of this section must meet the requirements of SAE J743a-1964. Sideboom cranes mounted on wheel or crawler tractors manufactured after the effective date of this section must meet the requirements of ASME B30.14-2010.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-54410, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54410, filed 12/20/11, effective 02/01/12.]

WAC 296-155-547 Personnel lifting platforms (attached and suspended) Scope.

- (1) This rule applies to the lifting, lowering, and transporting of personnel using personnel platforms connected to cranes or derricks that are designed under ASME B30 series. Personnel platforms can be suspended from the crane or derrick by wire rope, or attached to the boom of the crane or derrick. Using articulating boom cranes with suspended platforms is not allowed. The use of attached work platforms to the articulating boom crane must be approved by the crane manufacturer. Cranes and derricks are designed and intended for material handling, and are not required to meet the same design standards as manlifts, aerial lifts, bucket trucks, and other conventional personnel-lifting equipment. The lifting or lowering of personnel using material handling cranes and derricks is prohibited unless all of the applicable requirements of WAC 296-155-547 through 296-155-55405 are met. Digger derricks must follow the requirements in ANSI/ASSE A10.31-2006 when hoisting personnel. Machines that are designed to both ASME B30 series and ANSI/SIA A92.2, Vehicle Mounted Elevating and Rotating Aerial Devices must follow the requirements in ANSI/SIA A92.2-2009 when hoisting personnel.
- (2) The use of cranes or derricks 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.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-547, filed 12/20/11, effective 02/01/12.]

WAC 296-155-548 Design and installation requirements for personnel lifting systems.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-548, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54800 Design of platforms and suspension systems.

- (1) Employers that manufacture personnel platforms and/or their suspension systems must be designed, constructed and tested according to ASME B30.23-2005, Personnel Lifting Systems. The design and manufacturer's specifications must be made by a registered professional engineer. Personnel platforms manufactured prior to the effective of this section must comply with ASME B30.23-1998.
- (2) Only the crane/derrick manufacturer may approve the design and installation procedures for platform mounting attachment points on lattice type boom cranes and lattice type boom extensions. The design and installation procedures, for platform mounting attachment points on other types of cranes/derricks must be approved by their manufacturer or an RPE. All approvals must be in writing.
- (3) Platform mounting attachments on the crane/derrick must be designed to protect against disengagement during lifting operation.
- (4) The system used to connect the personnel platform to the equipment must allow the platform to remain within ten degrees of level, regardless of boom angle.
- (5) The suspension system must be designed to minimize tipping of the platform due to movement of employees occupying the platform.
- (6) 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.
- (7) The personnel platform must be equipped with a guardrail system which meets the requirements of Part K of this chapter, 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 one-half inch (1.27 cm). Points to which personal fall arrest systems are attached must meet the anchorage requirements in Part K of this chapter.
- (8) A grab rail must be installed inside the entire perimeter of the personnel platform except for access gates/doors.
- (9) Access gates/doors. If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) must:
 - (a) Not swing outward. If due to the size of the personnel platform, such as a one-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.
 - (b) Be equipped with a device that prevents accidental opening.
- (10) Headroom must be sufficient to allow employees to stand upright in the platform.
- (11) 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 one-half inch openings), unless full protection is necessary.
- (12) All edges exposed to employee contact must be smooth enough to prevent injury.
- (13) An identification plate must be located on the platform. The location must protect against damage and allow easy viewing from both interior (while hoisted) and exterior (while not hoisted) of the platform.

WAC 296-155-54800 (Cont.)

- (14) The inspection plate must display the following information:
- (a) Manufacturer's name and address;
 - (b) Platform rating in terms of weight and personnel;
 - (c) Platform identification number;
 - (d) Suspension system description for suspended platforms, or the intended crane/derrick manufacturer and model for boom attached platforms;
 - (e) Weight of the empty platform and its suspension system;
 - (f) Date the platform was manufactured;
 - (g) Certification of compliance to the design, construction, and testing requirements of ASME B30.23-2005, Personnel Lifting Systems;
 - (h) Listing of any unique operational environments for which the platform has been designed.
- (15) For suspended platforms, the suspension system must be sized by the platform manufacturer, and its installed sling angle established, so as not to cause damage to the platform. Suspension systems must comply with the following:
- (a) 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 subsection (a) of this section. Such devices must be closed and locked when attached.
 - (b) When a rope bridle is used to suspend the personnel platform, each bridle leg must be connected to a master link or shackle (see (a) of this subsection) in a manner that ensures that the load is evenly divided among the bridle legs.
 - (c) Eyes in wire rope slings shall be fabricated with thimbles.

WAC 296-155-54800 (Cont.)

- (d) Wire rope sling suspension systems with pored socket end connections, if used, must be designed in accordance with the manufacturer's or qualified person's application instructions.
 - (e) All sling suspension systems must utilize a master link for attachment to the crane/derrick hook or bolt type shackle with cotter pin.
 - (f) Synthetic webbing or natural or synthetic fiber rope slings must not be used for suspension systems.
 - (g) Suspension system legs must be designed and sized according to ASME B30.23-2005.
 - (h) Wire rope sling suspension systems must have each leg of the system permanently marked with the rated load of the leg. The master link in the system must be permanently marked with the suspension system's rated load and identification as a personnel lifting platform suspension component.
 - (i) 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. A sling made from rotation resistant rope is prohibited.
 - (j) 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, and must not be used for any other purpose when not hoisting personnel.
- (16) Overhead protection, when provided for a platform, must allow for a clear view of the crane/derrick components directly overhead, from any position in the platform. Any openings designed in the overhead protection must not allow a sphere of greater than 0.5 in (13 mm) to pass through.
- (17) 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.
- (18) Bolted connections of load sustaining members or components of the platform must be in accordance with the AISC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
- (19) The incorporation of a weatherproof compartment suitable for storage of the operator's manual and assorted other documents, or a weatherproof placard displaying the operator's manual, and readable from the platform, when motion controls that are operational from the platform are installed must be provided.
- (20) Motion controls, if installed on the platform, must:
- (a) Be clearly identified as to their function;
 - (b) Be protected from inadvertent actuation;
 - (c) Be inside the platform and readily accessible to the operator;
 - (d) When possible be oriented and move in the approximate direction of the function that they control;
 - (e) Return to their neutral position and stop all motion when released.

WAC 296-155-54800 (Cont.)

- (21) Boom motion controls, if provided, must additionally:
- (a) Include a control that must be continuously activated for controls to be operational;
 - (b) Include an emergency stop control that does not require continuous actuation for a stop condition;
 - (c) Have motion controls, accessible at ground level, that can override platform controls.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54800, filed 12/20/11, effective 02/01/12.]

WAC 296-155-549 Personnel lifting hoisting equipment.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-549, filed 12/20/11, effective 02/01/12.]

WAC 296-155-54900 Crane or derrick requirements for personnel lifting.

- (1) Cranes and derricks must meet the requirements in this part and the applicable crane/derrick ASME B30 volume in addition to the following requirements in this section.
- (2) The following cranes/derricks must **not** be used to lift personnel:
 - (a) Articulating boom cranes, unless approved by the manufacturer;
 - (b) Cranes or derricks with pendant supported, jib type boom extensions without positive stops.
- (3) The crane or derrick being used to hoist the personnel platform must meet the following requirements:
 - (a) Live boom or live load capabilities allowing free fall are removed for the period of personnel lifting;
 - (b) An operational anti two-block device or upper travel limit switch is installed on the hoisting systems;
 - (c) On cranes and derricks with variable angle booms there is a boom angle indicator that is clearly visible to the operator;
 - (d) Equipped with a boom hoist limiting device;
 - (e) Cranes with a luffing jib must be equipped with:
 - (i) A jib angle indicator, readily visible to the operator.
 - (ii) A jib hoist limiting device.
 - (f) Cranes with telescoping booms must have a boom length indicator, readable from the operator's station;
 - (g) Articulating cranes must be equipped with a properly functioning automatic overload protection device. Using articulating boom cranes with suspended platforms is **not** allowed. The use of attached work platforms to the articulating boom crane must be approved by the crane manufacturer;

WAC 296-155-54900 (Cont.)

- (h) Has automatic brakes on the crane/derrick, so motions stop when the operating controls are released;
 - (i) Has a holding device, such as a load hold check valve, that will prevent uncontrolled movement of the crane/derrick if a system fails, on hydraulic or pneumatic systems;
 - (j) Has a way to prevent hydraulic or pneumatic outriggers or stabilizers, if these are a part of the crane/derrick, from retracting if the hydraulic or pneumatic line fails;
 - (k) 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;
 - (l) 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.
- (4) Direct attachment of a personnel platform to a luffing jib is prohibited.
- (5) The base of the crane must be level in accordance with manufacturer's recommendations and in no case greater than one percent of level. The crane must be located on firm footing and a qualified person must determine that the footing is sufficiently firm and stable. Outriggers or stabilizers must be extended, blocked and locked according to manufacturer's recommendations, if the crane is equipped with them, the amount of the extension must be the same for all outriggers or stabilizers.
- (6) The total weight of the lifted load, including rigging, platform, personnel, tools, and material must not exceed fifty percent of the crane's rated capacity for the radius and configuration, under the planned conditions of operations (except during testing as outlined in WAC 296-155-551).
- (7) 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.
- (8) The area must be inspected where the crane/derrick will be set up and look for:
- (a) Overhead obstructions;
 - (b) Electrical lines;
 - (c) Hazardous locations;
 - (d) Inadequate surface area;
 - (e) Inadequate support to withstand all force imposed, wind, weather, and unstable conditions; and
 - (f) Other potentially hazardous conditions.

WAC 296-155-54900 (Cont.)

- (9) Hooks on headache ball assemblies, lower load blocks, or other attachment assemblies must be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-54900, filed 12/20/11, effective 02/01/12.]

WAC 296-155-551 Inspections, maintenance and testing.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-551, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55100 Inspections on cranes and personnel platforms.

- (1) A qualified person must inspect personnel platforms before use and at each new job site to make sure the requirements of WAC 296-155-548 through 296-155-55305 are met.
- (2) A qualified person must inspect all items in Table 9 at least once each day, before use.
- (3) Any hazardous conditions must be corrected before using the platform.
- (4) As applicable, perform a frequent inspection on the crane/derrick in accordance with WAC 296-155-53405.
- (5) Dated inspection records for the crane and the personnel platform must be made and kept on file for the duration of the personnel lift operation.

Table 9	
Inspection Checklist for Personnel Lifting Platforms	
Items to check:	How Often:
Markings (all information legible): <ul style="list-style-type: none">• Platform.• Suspension system.	Once each day, before use.
Structure: <ul style="list-style-type: none">• Load supporting welds/bolts.• Load supporting members.• Barrier from toe board to intermediate rail.• Hand rail.• Fall protection device anchorage points• Gate locking mechanisms.• Platform flooring.• Suspension attachment points.	
Attachment mechanisms: <ul style="list-style-type: none">• Pins/ears/bolt-ups/eyes• Wire rope/chain/rigid leg• Master links	
Special purpose items: (Overhead protection, flotation, platform controls)	

- (6) The platform must not be used until safety deficiencies identified during the inspection have been evaluated, corrected, and approved by a qualified person.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55100, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55105 Adjustments and repairs on personnel platforms.

- (1) Any adjustments or repairs to the platform must be done by a qualified person.
- (2) Adjustments or repairs to the suspension system must be done by a qualified person.
- (3) Replacement parts and repairs must be equal to or exceed the original equipment specifications.
- (4) The manufacturer or a qualified person must approve any modifications, in writing, before they are made.
- (5) Records of any repairs to the structural components of the platform must be maintained and kept.
- (6) 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.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55105 filed 12/20/11, effective 02/01/12.]

WAC 296-155-55110 Proof load test platforms and rigging.

- (1) The platform and rigging must be proof load tested at each new location before lifting personnel. This may be done at the same time as the trial lift.
 - (a) Test as follows:
 - (i) Test to one hundred twenty-five percent of the platform's rated capacity.
 - (ii) 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.
 - (b) Do the following after proof load testing:
 - (i) A qualified person must inspect the platform and rigging to determine if the test has passed.
 - (ii) Any deficiencies that pose a safety hazard must be corrected prior to lifting personnel.
 - (iii) Another test must be performed after any deficiencies are corrected.
 - (c) Keep the most recent proof load testing records available at the job site.
 - (d) Personnel hoisting must not be conducted until a qualified person determines that the platform and rigging has successfully passed the proof load test.
- (2) The platform and rigging must be proof load tested after any structural repair or modification, before lifting personnel.
 - (a) Test suspended platforms in the following order:
 - (i) Test to one hundred fifty percent of the platform's rated capacity;
 - (ii) The loaded platform must be raised, then lower it at a speed of at least one hundred ft/min;

WAC 296-155-55110 (Cont.)

- (iii) Bring the platform to a stop by using the crane/derrick brakes;
 - (iv) The platform must hang for at least five minutes;
 - (v) A qualified person must inspect the platform and rigging;
 - (vi) Any deficiencies must be corrected;
 - (vii) Another test must be performed after any deficiencies are corrected.
- (b) Test attached platforms in the following order:
 - (i) Test to one hundred twenty-five percent of the platform's rated capacity;
 - (ii) Hold the platform suspended for five minutes with the test load evenly distributed on the platform;
 - (iii) A qualified person must inspect the platform and rigging;
 - (iv) Any deficiencies must be corrected;
 - (v) Another test must be performed after any deficiencies are corrected.

- (c) The most recent proof load testing records must be kept and available at the job site.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55110, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55110, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55115 Trial lift.

- (1) A trial lift must be performed with the personnel platform, on each shift before lifting personnel, to check the following:
 - (a) Crane/derrick setup and configuration is correct;
 - (b) Load capacities are adequate;
 - (c) No hazardous interferences exist;
 - (d) The operator's operational competence.
- (2) A trial lift with the unoccupied personnel platform loaded at least to the anticipated lift-weight 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.
- (3) The trial lift must be repeated before lifting personnel whenever:
 - (a) The crane or derrick is moved and set up in a different location or returned to a previously used location;

WAC 296-155-55115 (Cont.)

- (b) The crane or derrick is reconfigured;
 - (c) The operator is changed;
 - (d) The lift route has changed, unless the competent person determines that the new route presents no new factors affecting safety.
- (4) A competent person must determine that:
- (a) 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 WAC 296-155-53410 and 296-155-53412.
 - (b) Nothing interferes with the crane/derrick or the personnel platform in the course of the trial lift.
 - (c) The lift will not exceed fifty percent of the crane/derrick's rated capacity at any time during the lift.
 - (d) The load radius to be used during the lift has been accurately determined.
- (5) Immediately after the trial lift, a competent person must:
- (a) Conduct a visual inspection of the crane/derrick, base support or ground, and personnel platform, to determine whether the trial lift has exposed any defect or problem or produced any adverse effect.
 - (b) Confirm that, upon the completion of the trial lift process, the test weight has been removed.
- (6) Immediately prior to each lift:
- (a) 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.
 - (b) The following conditions must be determined by a competent person to exist before the lift of personnel proceeds:
 - (i) Hoist ropes must be free of deficiencies in accordance with WAC 296-155-53404.
 - (ii) Multiple part lines must not be twisted around each other.
 - (iii) The primary attachment must be centered over the platform.
 - (iv) 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.
- (7) 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.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55115, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55115, filed 12/20/11, effective 02/01/12.]

WAC 296-155-552 Employer responsibilities.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-552, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55200 Employer responsibilities for lifting personnel.

- (1) The employer must require that the provisions of this part are understood and applied at the operational levels and that the appropriate portions of this part are included in the prelift briefing information.
- (2) The employer must:
 - (a) Assign an employee to function as the lift supervisor, see WAC 296-155-55205;
 - (b) Prepare a personnel lift plan containing at least the information shown in WAC 296-155-56410. This plan must be retained as part of the job site records;
 - (c) Verify the need for a personnel lift;
 - (d) Verify the crane/derrick to be used for the personnel lift;
 - (e) Authorize the personnel lift operation;
 - (f) Require the personnel lift be accomplished in accordance with the provisions of this part;
 - (g) Hold the prelift meeting prior to the trial lift at each new work location;
 - (h) Verify qualified persons are assigned to perform the functions of the personnel lift supervisor, operator, signal persons, riggers and tagline handlers, as applicable;
 - (i) Accomplish other tasks that may be needed to enhance the safety of the personnel lift;
 - (j) Require that all personnel associated with the lift receive the briefings and safety indoctrinations specified in this part. This prelift meeting must be attended by the crane/derrick operator, signal person (if used for the lift), employees to be hoisted, personnel lift supervisor and the person responsible for the task to be performed.
- (3) The prelift meeting must cover, as a minimum:
 - (a) The requirements of the applicable portions of Part L in this chapter;
 - (b) Assignment and responsibilities of each person involved in the lift operation;
 - (c) The procedures to be followed;
 - (d) Guidance on general and specific safety precautions;
 - (e) Special signals for the operation;
 - (f) Unique considerations of the lift;
 - (g) Work to be accomplished during lift;
 - (h) If applicable, the responsibilities and assignments when lifting personnel near electrical power lines.

WAC 296-155-55200 (Cont.)

- (4) If individuals are changed during a series of personnel lifts, each new person must be appropriately briefed by the employer.
- (5) The employer must not allow or require any operator to lift personnel under the following conditions:
 - (a) The operator does not feel physically or mentally fit to perform the operation;
 - (b) The operator has been working for more than ten hours prior to the start of the lift, or the lift will not be completed before the operator has been working for twelve hours;
 - (c) The operator did not have at least eight hours off, immediately prior to the work shift containing the personnel lift operation.
- (6) The employer must verify there are no less hazardous alternatives to performing the work or providing access to the area. The personnel lift must not be authorized when less hazardous means are feasible.
- (7) The employer can only authorize personnel lifting over, under, or in the vicinity of power lines in accordance with the requirements of Figures 9, 10 and 11 and Table 10 in WAC 296-155-55305.
[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55200, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55205 Responsibilities of the personnel lift supervisor.

- (1) The personnel lift supervisor must:
 - (a) Supervise the personnel lift operation;
 - (b) Verify all crane/derrick and platform inspections have been accomplished as outlined in this part;
 - (c) Inspect the area for potential hazards, any hazards found during this inspection must be reported to the employer prior to performing the personnel lift. This inspection must include, but not limited to:
 - (i) Excessive load and/or radius;
 - (ii) Overhead obstructions and electrical transmission lines;
 - (iii) Hazardous locations;
 - (iv) Inadequate surface and support to withstand all forces imposed;
 - (v) Wind, weather, and unstable conditions;
 - (vi) Any potentially hazardous conditions.
 - (d) Verify the base of the crane is level in accordance with manufacturer's recommendations and in no case greater than one percent of level;
 - (e) For crane/derrick with a boom-attached platform, verify that the platform is attached as specified by the platform manufacturer and crane/derrick manufacturer or qualified person;

WAC 296-155-55205 (Cont.)

- (f) Not allow the total weight of the lifted load, including rigging, platform, personnel, tools, and material, to exceed fifty percent of the crane/derrick's rated load, under the planned conditions of operation (except during testing as outlined in WAC 296-155-55115).
 - (g) Not allow the platform's rating or the crane's/derrick's reduced rated load to be exceeded when loads are transferred to the hoisted platform.
 - (h) Verify a trial lift has been performed as outlined in WAC 296-155-55115.
 - (i) Verify that during the trial lift, the platform is loaded to at least the weight expected during the actual lift.
 - (j) Not allow the crane/derrick to travel with personnel in the personnel platform except when the crane/derrick runs on fixed rails or runways.
 - (k) Verify the platform is securely attached to the crane or derrick.
 - (l) Verify the load line is not attached to or wrapped around the platform.
 - (m) Verify boom-attached personnel platforms are attached according to manufacturer's specifications or a qualified person.
 - (n) Keep people from passing under the raised platform.
 - (o) Ensure there are no more people on the platform than are needed to do the job.
- (2) The personnel lift supervisor must ensure the crane/derrick and platform manufacturer's information is consulted for specific instruction on the crane/derrick operation. The crane/derrick and platform operation instructions in this part are intended as minimum criteria.
- (3) The personnel lift supervisor must ensure there are an appropriate number of signal persons, ground crew, and platform occupants to perform the personnel lift safely. In suspended and boom-attached platforms without boom motion controls, one occupant must be designated as the platform signal person. This person must be responsible for communicating with the operator and/or other designated signal persons.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55205, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55210 Crane or derrick operation requirements for personnel lifting.

- (1) Before lifting personnel the following must be met:
- (a) Operate crane/derrick with outriggers or stabilizers extended, blocked, and locked in accordance with the manufacturers' specifications;
 - (b) For crane/derrick that uses wire rope to hoist a personnel platform, verify that the crane/derrick has an anti two-block device or upper travel limit switch, installed and operational;
 - (c) Position the personnel platform so that it may be tied off to the structure to which the occupants are entering or leaving, if the platform cannot be landed during the entrance or exit of the occupants. If the platform has been tied off, the operator must not move the platform until it is verified that it is freely suspended;

WAC 296-155-55210 (Cont.)

- (d) Not knowingly allow the platform load to exceed the platform rating, except during proof testing;
- (e) Not travel the crane/derrick with personnel in the personnel platform except when they run on fixed rails or runways;
- (f) Perform all movements of the platform or crane/derrick in a slow, controlled, cautious manner to minimize sudden movement of the platform;
- (g) Engage the power-controlled lowering mechanism at all times the platform is occupied (no freefall);
- (h) In the case of suspended or boom-mounted platforms, without controls, the operator must remain at the crane/derrick controls at all times when the platform is occupied;
- (i) Reserved;
- (j) 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 crane/derrick and hazards associated with its operation. See WAC 296-155-53300, Operator qualifications and certification.
 - (ii) The crane/derrick operator must be at a set of crane controls that include boom and swing functions of the crane, and must be on-site and in view of the crane/derrick and platform.
 - (iii) The platform operating manual must be in the platform or on the crane/derrick.

Note: If lowering, retracting, and rotating primary power source becomes inoperative, the crane/derrick operator is allowed to leave the controls.

- (k) Set all brakes and locks on the crane/derrick after positioning of the personnel platform and before personnel perform any work;
- (l) Move the platform under controlled conditions and under the direction of a qualified signal person or platform occupant(s);
- (m) Not move platforms over, under, or in the vicinity of power lines unless the requirements of WAC 296-155-55305 are met;
- (n) Not lift any other loads, on any other load lines, while conducting a personnel lift. When the crane/derrick has a boom-attached platform without controls, it must not be used for other lifting service;
- (o) 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 five hundred pounds and does not exceed the rated capacity of the winch and platform, and does not exceed fifty percent of the crane's rated capacity at the radius and configuration used;

WAC 296-155-55210 (Cont.)

- (p) Not disable, or allow to be disabled, any crane/derrick safety device during a personnel lift;
- (q) Hoist the platform at a speed suitable for the safety of the operation but in no case in excess of ninety feet/minute (30 m/minute) or 1.5 feet/second (0.5 m/second).

(2) The operator must not move the platform without a discernible or audible signal from a signal person.
[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55210, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55210, filed 12/20/11, effective 02/01/12.]

WAC 296-155-553 Lifting personnel.

Lifting personnel on platforms with cranes or derricks must **only** be done if it is the only possible way to accomplish the work that needs to be done. See WAC 296-155-547.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-553, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55300 Personnel lifting requirements.

- (1) Conditions must provide clear visibility. When conditions such as darkness, fog, or snow prevent clear visibility, a personnel lift must not be performed.
- (2) Personnel platforms cannot be used in winds (sustained or gusts) in excess of twenty mph (32.2 km/hr) or in electric storms, snow, ice, sleet, or other adverse weather conditions which could affect the safety of personnel.
- (3) 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).
- (4) Personnel platforms must only be used for personnel, their tools, and sufficient material to do their work. They must not be used for solely transporting bulk materials.
- (5) 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.
- (6) A qualified person must evaluate the safety concerns of the operational environment and verify the platform and crane/derrick are suitable for use. Additionally, special work circumstances may require further precautions. Precautions such as, but not limited to, the following must be taken:
 - (a) When welding is to be accomplished from the personnel platform, suitable electrode holders must be provided to protect them from contact with any conducting components of the platform.
 - (b) Operators of cranes/derricks, installed on floating vessels, must be instructed not to lift personnel when the list or trim of the vessel exceeds five degrees. If a mobile crane/derrick is placed on floating vessels, operators must not lift personnel when the list or trim of the vessel exceeds one degree.
 - (c) Personnel fall protection devices with quick release features must be provided and required to be worn. The fall protection device must be appropriately attached while personnel are lifted over land and detached while personnel are lifted over water. See Part C-1 of this chapter for requirements for fall arrest system, including the attachment point (anchorage) used to comply with this subsection. When personnel lifts are conducted over water, U.S. Coast Guard approved (Type I, II, III, or V) personnel flotation devices must be provided and required to be worn.

WAC 296-155-55300 (Cont.)

- (d) A boat/skiff with appropriate rescue personnel must be readily available at all times during a personnel lift over water.
 - (e) Appropriate personnel protective equipment must be provided and required to be used around toxic, flammable, or hazardous substances or fumes.
 - (f) Any concentrated loading of the platform must be reviewed to preclude the overstressing of any component or impairing the platform stability.
 - (g) Where the rotation of the platform, while hoisted, can create a hazard, appropriate restraining methods must be provided and required to be used.
- (7) In order to safely perform the personnel lift, make sure the following are met:
- (a) The personnel platform is **not** loaded with more than its rated load capacity;
 - (b) Materials and tools being lifted by a platform are:
 - (i) Secured to prevent movement;
 - (ii) Evenly distributed on the platform.
 - (c) The personnel platform is hoisted slowly, with no sudden movements;
 - (d) Tag lines are used to control the motion of suspended platforms, unless using them creates a hazard;
 - (e) The platform is secured to the structure where the work will be performed before employees exit or enter the platform, unless securing to the structure is unsafe;
 - (f) No other load lines on the crane or derrick are used to lift anything while personnel are on a platform;
 - (g) Brakes and locking devices are engaged when the personnel platform is occupied and in a stationary working position;
 - (h) The lowering motion of the hoist line and/or the boom is power-controlled only. Free fall is **not** allowed;
- (8) The platform operation instructions in this rule are intended as minimum criteria. The platform manufacturer's information must be consulted for specific instruction on the platform's operation.
- (9) Traveling.
- (a) Rubber tired cranes are not allowed to travel while lifting personnel. Hoisting of employees while the crane is traveling is only allowed when:
 - (i) The crane travels on fixed rails; or
 - (ii) The crane has crawlers and is on a runway, and the employer demonstrates that there is no less hazardous way to perform the work.

WAC 296-155-55300 (Cont.)

- (b) Where employees are hoisted while the crane is traveling, the following criteria must be met:
 - (i) Crane travel must be restricted to a fixed track or runway.
 - (ii) 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 crane/derrick being used to lift and travel with the personnel platform. An existing surface may be used as long as it meets these criteria.
 - (iii) Travel must be limited to boom length.
 - (iv) The boom must be parallel to the direction of travel, except where it is safer to do otherwise.
 - (v) 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 WAC 296-155-55115 which tests the lift route.
- (10) Derricks are prohibited from traveling while personnel are hoisted.
- (11) Platform occupants must remain in continuous sight or in communication with the operator and in sight and communication of a signal person.
- (12) Platform occupants must use personnel protective equipment, such as hard hats, safety glasses, hearing protection, and gloves, in conditions where a hazard of injury exists.
- (13) Platform occupants must wear personnel fall protection devices with lanyards attached to a specific anchorage point(s), unless special work circumstance requirements dictate otherwise, such as working over water.
- (14) Platform occupants must 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.
- (15) Platform occupants must not stand, sit on, or work from the top rail, intermediate rail, toe board, or use any other device to enhance their vertical height working capability.
- (16) Platform occupants must not pull the platform out of plumb in relation to the crane/derrick.
- (17) Platform occupants must not enter or exit a suspended platform while it is raised unless the platform has an installed gate and is physically secured to the structure to which the occupants are entering or exiting unless the employer can demonstrate that securing to the structure would create a greater hazard.
- (18) Platform occupants must not operate a platform with motion controls without the platform operation manual available in the platform.
- (19) 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.
- (20) The platform must be inspected prior to each lift to verify all attachments and the platform are safe to use.

WAC 296-155-55300 (Cont.)

- (21) Verify the platform is evenly loaded, material secured, and the total platform weight does not exceed the platform rating or the reduced crane/derrick lift capacity.
- (22) Communication requirements.
 - (a) Hand signals to the operator must be in accordance with the applicable crane/derrick portion of this part.
 - (b) Signals must be discernable or audible to the operator.
 - (c) Hand signals must be posted conspicuously at the following locations:
 - (i) On the crane/derrick as required by this part.
 - (ii) Inside the personnel platform.
 - (iii) At any platform motion control locations.
 - (d) Some operations may require additions to or modifications of standard signals.
 - (i) Any special signals must be agreed upon and understood by the signal persons and crane/derrick operator.
 - (ii) Special signs must not conflict with the crane/derrick standard signals.
 - (e) No response must be made unless signals are clearly understood.
 - (f) If communications between operator and platform occupants are disrupted, all operations must be stopped until communication is reestablished.
 - (g) Communication systems to be used during the lift must be verified as functioning and effective prior to commencing the lift.

Note: If radios or other electronic means of communication are used, they should operate on a secure channel.
[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55300, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55300, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55305 Lifting personnel near electrical power lines.

- (1) It is recognized that lifting personnel where the crane/derrick or platform can become electrified from electric power lines is an extremely hazardous practice. It is required to perform the lift so there is no possibility of the crane/derrick, load line, or personnel platform becoming a conductive path. Cranes/derricks must not be used to lift personnel under electric power lines if any combination of boom, personnel platform, load line, and machine component will enter the prohibited zone. (See Table 10.) Lifting personnel near electric lines is not allowed unless there is no less hazardous way to do the job. The three situations to consider, and take steps to establish, when lifting personnel near electric power lines are:

WAC 296-155-55305 (Cont.)

Table 10	
Condition	Situation
A	Power lines are de-energized and grounded as shown in Figure 9. (This is the safest and preferred condition)
B	Power lines are energized with the crane/derrick outside the prohibited zone, but there is a potential for the crane/derrick or platform being energized as shown in Figure 10.
C	Power lines are energized with the crane/derrick inside the prohibited zone, and there is a possibility that the crane/derrick or platform can become energized as shown in Figure 11. (Lifting personnel in this condition is prohibited)

- (2) **Condition A.** This is the preferred condition under which a personnel lift can be performed. The hazard of injury or death due to electrocution has been removed. The following steps must be taken when lifting personnel in a Condition A situation:
- (a) The power company or owner of the power lines must deenergize the lines.
 - (b) The power lines must be visibly grounded to avoid the possibility of electrical feedback.
 - (c) A qualified representative of the owner of the power lines or a designated representative of the electric utility must be on the site to verify that steps (a) and (b) of this subsection have been completed and that the power lines are not energized.
 - (d) Durable signs must be installed at the operator's station and on the outside of the crane warning that electrocution or serious bodily injury may occur unless the minimum clearance of twenty feet is maintained between the crane/derrick and platform and power lines up to 350 kV or fifty feet of a power line that is over 350 kV. These signs must be posted at the crane/derrick operating station, on the outside of the crane/derrick, and inside the personnel platform.
 - (e) If proximity warning devices, insulated links, or boom cages are used, they must not be a substitute for any of the requirements of this section. If these devices are used, the crane/derrick operator, ground crew, and platform occupants must be instructed by management on the limitations of the devices, operating condition requirements of the devices, and the devices' testing requirements prescribed by the device manufacturer.
- (3) **Condition B.** The following steps must be taken when lifting personnel in a Condition B situation:
- (a) A meeting, on the job site, between the job site management and either a qualified representative of the owner of the power lines or the electric utility must take place. Procedures to safely complete the lift must be established.
 - (b) Hoisting personnel within twenty feet of a power line that is up to 350 kV, and hoisting personnel within fifty feet of a power line that is over 350 kV, is prohibited, except for work covered by chapter 296-45 WAC, safety standards for electrical workers and performed by qualified personnel.
 - (c) Power line movement, horizontal and vertical, due to wind must be added to the distances specified in (b) of this subsection. A qualified representative of the power line owner or a designated representative of the electric utility must be consulted for the movement distances.

WAC 296-155-55305 (Cont.)

- (d) The required clearances to the power lines must be continuously monitored by a dedicated and qualified signal person in constant communication with the crane/derrick operator.
 - (e) Personnel platform movement restraint, when required, must be done through electrically nonconductive tag lines.
 - (f) No person outside the personnel platform must be permitted to touch the crane/derrick, load line, or platform unless the signal person identified in (d) of this subsection indicates it is safe.
 - (g) Durable signs must be posted warning that electrocution or serious bodily injury may occur unless the minimum clearance specified in (b) of this subsection is maintained between the crane/derrick and platform and power lines. These signs must be posted at the crane/derrick operating station, on the outside of the crane/derrick, and inside the personnel platform.
 - (h) If proximity warning devices, insulated links, or boom cages are used, they must not be a substitute for any of the requirements of this section. If these devices are used, the crane/derrick operator, ground crew, and platform occupants must be instructed by management on the limitations of the devices, operating condition requirements of the devices, and the devices' testing requirements prescribed by the device manufacturer.
- (4) **Condition C.** Lifting personnel under Condition C is prohibited.

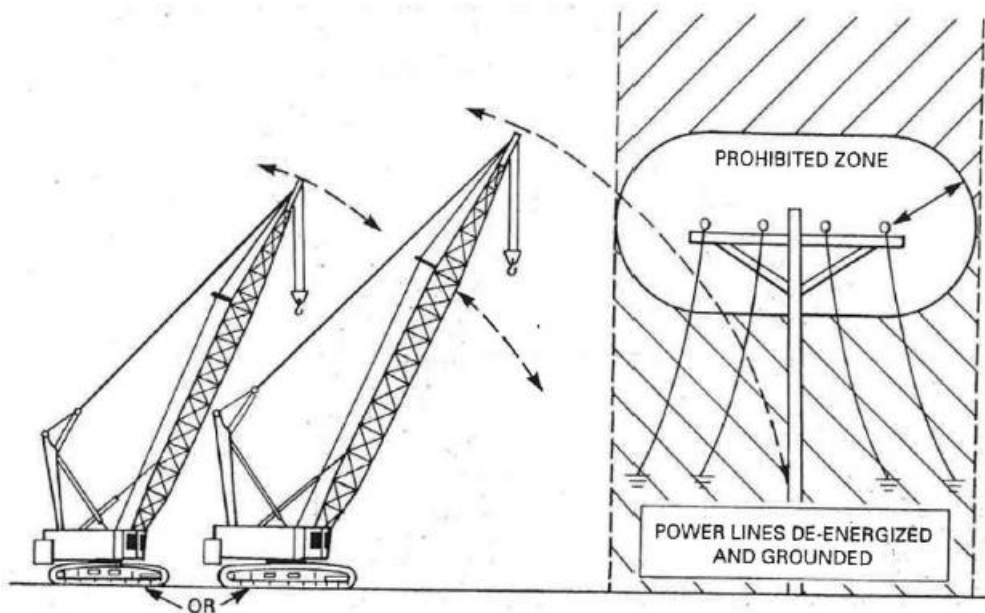


Figure 9-Condition A (see Table 10).

WAC 296-155-55305 (Cont.)

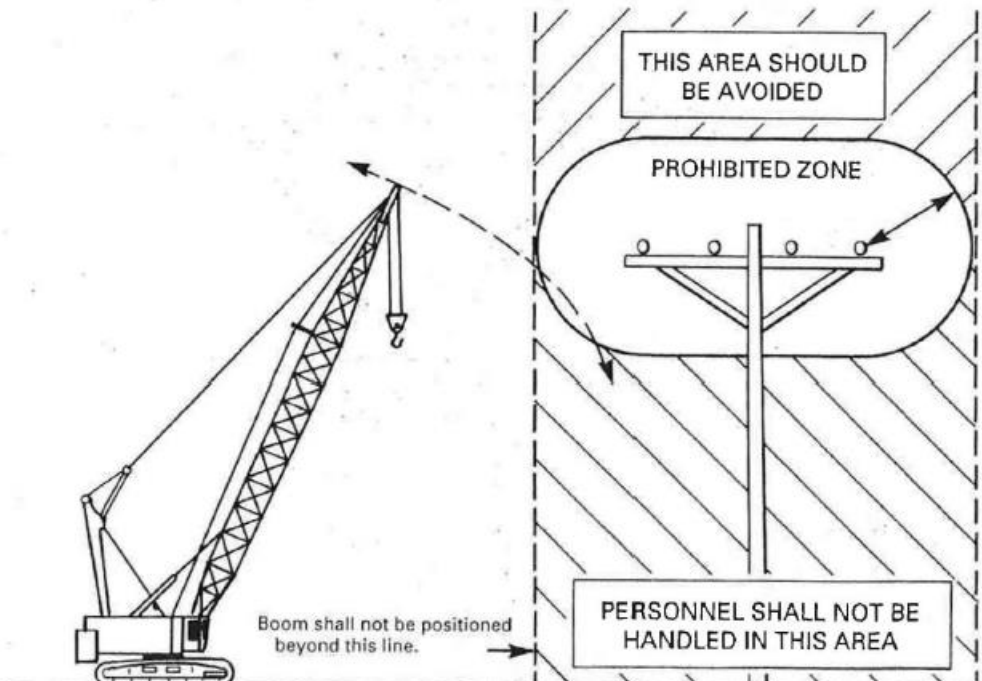


Figure 10-Condition B (see Table 10).

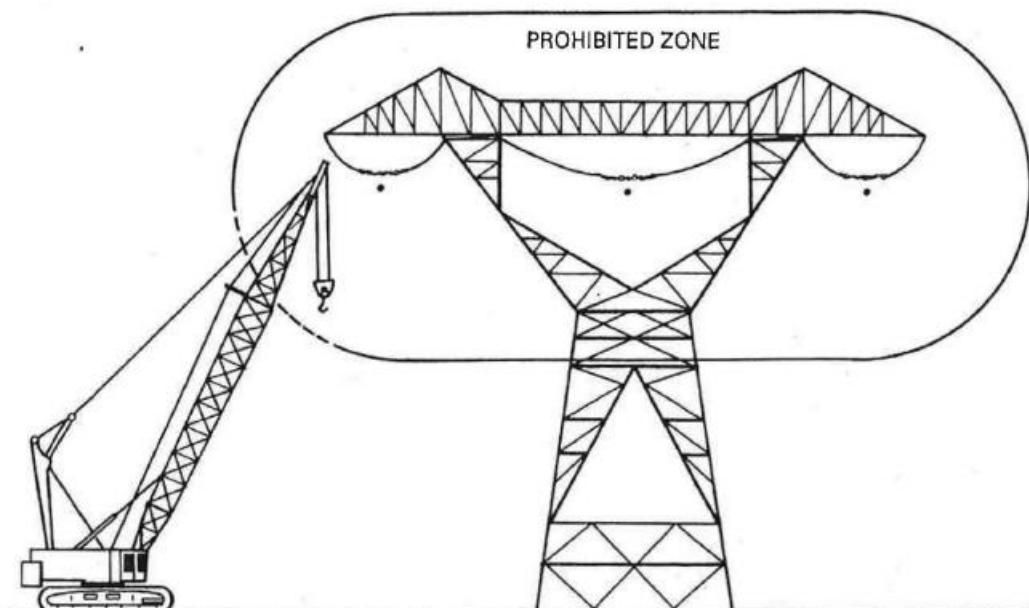


Figure 11-Condition C (see Table 10) This Condition is Prohibited.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55305, filed 12/20/11, effective 02/01/12.]

WAC 296-155-554 Boatswain's chairs.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-554, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55400 Use boatswain's chairs as a last resort.

- (1) Boatswain's chairs must only be used when it is not possible to accomplish the task in a less hazardous way.
- (2) Follow all applicable requirements in this part for the use of boatswain chairs.
- (3) The chair must be capable of supporting its own weight and at least five times the maximum intended load.
- (4) Boatswain's chair tackle must consist of correct size ball bearings or bushed blocks containing safety hooks and properly "eye-spliced" minimum five-eighths inch (1.6 cm) diameter first-grade manila rope, or other rope which will satisfy the criteria (e.g., strength and durability) of manila rope.
- (5) Boatswain's chair seat slings must be a minimum of five-eighths inch (1.6 cm) diameter fiber, synthetic, or other rope which will satisfy the criteria (e.g., strength, slip resistance, durability, etc.) of first-grade manila rope.
- (6) Boatswain's chair seat slings must be reeved through four corner holes in the seat; must cross each other on the underside of the seat; and must be rigged so as to prevent slippage which could cause an out-of-level condition.
- (7) Hooks on headache ball assemblies, lower load blocks, or other attachment assemblies must be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55400, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55405 Lifting personnel using a boatswain's chair.

- (1) The boatswain's chair must not be loaded in excess of its rated load capacity.
- (2) The boatswain's chair must only be used for employees, their tools, and the materials necessary to do their work. Do not use the chair to hoist materials or tools without hoisting employees.
- (3) Materials and tools must be secured during lift.
- (4) A signal person must be assigned any time the lift will take the employee out of the direct sight of the crane operator.
- (5) The employee being lifted must use personal fall protection equipment, including a full body harness with the lanyard attached independent of the chair. The lanyard must be secured to the lift line above the headache ball or to the crane hook itself.
- (6) Only one employee can be lifted at a time.
- (7) The operator must:
 - (a) Lift the chair in a slow, controlled manner with no sudden movements;
 - (b) Remain at the crane/derrick controls at all times when the chair is occupied.

WAC 296-155-55405 (Cont.)

- (8) All brakes and locking features must be engaged when the occupied chair is in a stationary working position.
- (9) Operations must be stopped if any safety device quits working properly during the use of the boatswain's chair.
- (10) The safety device must be repaired before resuming operations. Alternative measures are not permitted.
- (11) Any other lifting on the crane/derrick's load lines is prohibited while personnel are suspended in a chair.
[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55405, filed 12/20/11, effective 02/01/12.]

WAC 296-155-556 Rigging--General requirements.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-556, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-556, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55600 General requirements.

- (1) Employers must use at least one qualified rigger as follows:
 - (a) During hoisting activities for assembly and disassembly work (WAC 296-155-53402 (19)(a));
 - (b) Whenever employees are engaged in hooking, unhooking, or guiding a load, or in the initial connection of a load to a component or structure, and are within the fall zone (WAC 296-155-53400 (43)(c)).

Note: See qualified rigger requirements located in WAC 296-155-53306 of this part.

- (2) All slings in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.9-2010.
- (3) All rigging hardware in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.26-2010.
- (4) All rigging gear must be used in accordance with the manufacturer's recommendations or a qualified person.
- (5) All below-the-hook lifting devices in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.20-2010.
- (6) All hooks in use must meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in ASME B30.10-2009.
- (7) Repair of hooks must be approved by the manufacturer or qualified person and as follows:
 - (a) Cracks, nicks, and gouges may be repaired by a competent person, all other repairs are done by the manufacturer or a qualified person;
 - (b) Grind longitudinally, following the contour of the hook;
 - (c) Do not reduce the dimension of the hook more than ten percent from the original.

WAC 296-155-55600 (Cont.)

- (8) Hooks must not be modified by welding and/or drilling unless written approval by the manufacturer has been received.
- (9) Special custom design grabs, hooks, clamps, or other lifting accessories, for such units as modular panels, prefabricated structures and similar materials, must be marked to indicate the safe working loads and must be proof tested prior to use to one hundred and twenty-five percent of their rated load.
- (10) A qualified person must inspect the rigging equipment before each day or shift and:
 - (a) Consider the application the equipment will be used for, and determine if it is safe for use;
 - (b) Remove the equipment from service if using it will create a hazard or meets any of the removal criteria listed in this chapter.
- (11) The rated load of the rigging equipment must not be exceeded.
- (12) All rigging hardware must have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load.
- (13) All rigging hardware must be inspected in accordance with Table 11, each day before using. If a daily inspection is not feasible because the hardware is in a semipermanent or inaccessible location, a periodic inspection is allowed instead of daily.
- (14) Rigging hardware must be removed from service when it shows any conditions listed in Table 11, or any other hazardous condition.

WAC 296-155-55600 (Cont.)

Table 11
Rigging Hardware Inspection/Removal Criteria
For all hardware, inspect for the following:
Missing or illegible identification.
Indications of heat damage, including weld spatter or arc strikes.
Excessive pitting or corrosion.
Load bearing components that are: <ul style="list-style-type: none"> • Bent; • Twisted; • Distorted; • Stretched; • Elongated; • Cracked; • Broken.
Excessive nicks or gouges.
10% reduction of the original or catalog dimension at any point.
Excessive thread damage or wear, where applicable.
Evidence of unauthorized welding or modification.
Any other conditions that cause doubt as to the safety of continued use.
On Shackles , also inspect for incomplete pin engagement.
On swivels and swivel hoist rings , check for lack of ability to freely rotate or pivot.
On Compression hardware , also check for: <ul style="list-style-type: none"> Unauthorized replacement components; Insufficient number of wire rope clips; Improperly tightened wire rope clips; Damaged wire rope; Indications of wire rope slippage Improper assembly.
On Swivels , check for loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices.
On Blocks check for: <ul style="list-style-type: none"> • Loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices; • Misalignment or wobble in sheaves; • Excessive sheave groove corrugation or wear.

- (15) Any alteration or modification of rigging hardware must be in accordance with the hardware manufacturer or a qualified person and proof load tested to one hundred twenty-five percent. This test must be documented and available upon request.
- (16) Welding of rigging hardware is prohibited unless authorized by the manufacturer or an RPE.
- (17) Replacement parts must meet or exceed the original rigging hardware manufacturer's specifications.
- (18) Rigging hardware selection must have the characteristics suitable for the application and environment where it will be used.
- (19) Workers must keep all parts of their body from between the load and any rigging during the lift.

WAC 296-155-55600 (Cont.)

- (20) If handling intermodal shipping containers at a construction site, the employer must follow the requirements in chapter 296-56 WAC, longshore, stevedore and waterfront related operations, Part F, Specialized terminals and the guidelines found in International Organization for Standardization (ISO) 3874 - Series 1 Freight Containers, fifth edition - Handling and Securing.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55600, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55600, filed 12/20/11, effective 02/01/12.]

WAC 296-155-558 Slings.

[Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-558, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55800 Chain Slings.

- (1) Only use chain slings that are made from grade eighty or higher alloy steel chain.
- (2) The following requirements must be met if manufacturing your own chain slings:
 - (a) Have a design factor of four;
 - (b) Meet the rated load requirements in subsection (9) of this section.
- (3) Rate chain slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.
- (4) Makeshift fittings, such as hooks or links formed from bolts, rods, or other parts are prohibited.
- (5) All chain slings must have legible identification information attached to the sling which includes the following information:
 - (a) Name or trademark of the manufacturer;
 - (b) Grade;
 - (c) Nominal chain size;
 - (d) Number of legs;
 - (e) Rated loads for the vertical hitch and bridle hitch and the angle upon which it is based;
 - (f) Length (reach);
 - (g) Individual sling identification (e.g., serial numbers);
 - (h) Repairing agency, if the sling was ever repaired.
- (6) Inspections.
 - (a) A qualified person must inspect chain slings before their initial use, according to Table 12, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.

WAC 296-155-55800 (Cont.)

- (b) A qualified person must perform a visual inspection for damage, each day or shift the chain sling is used. Immediately remove from service any sling damaged beyond the criteria in Table 12.
- (c) A qualified person must perform periodic inspections on chain slings according to Table 12.
 - (i) Each link and component must be examined individually, taking care to expose and examine all surfaces including the inner link surfaces.
 - (ii) Remove slings from use:
 - If any of the conditions in Table 12 are found;
 - When they have been exposed to temperatures above one thousand degrees Fahrenheit.
- (d) A written record of the most recent periodic inspection must be kept, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

WAC 296-155-55800 (Cont.)

Table 12 Chain Sling Inspection/Removal Criteria	
Inspect alloy steel chain slings for the following conditions:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Cracks or breaks. • Excessive nicks, gouges, or wear beyond that allowed in Table 13, Minimum Allowable Thickness at Any Point on a Link. • Stretched chain links or components. • Bent, twisted or deformed chain links or components. • Evidence of heat damage. • Excessive pitting or corrosion. • Inability of chain or components to hinge (articulate) freely. • Weld spatter. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook; – Any distortion causing an increase in throat opening of five percent, not to exceed one-quarter inch, or as otherwise recommended by the manufacturer; – Wear exceeding ten percent of the original section dimension of the hook or its load pin, or as otherwise recommended by the manufacturer; – A self-locking mechanism that does not lock (if applicable); – Any latch that does not close the hook's throat (if applicable). • Other visible damage that raises doubt about the safety of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service, which means use within the rated load. • At least once a quarter for slings in severe service, which involves abnormal operating conditions. • As recommended by a qualified person for slings in special service, which is anything other than normal or severe.

Table 13 Minimum Allowable Thickness at Any Point on a Link			
Nominal Chain or Coupling Link Size		Minimum Allowable Thickness at Any Point on the Link	
Inches	Millimeters	Inches	Millimeters
$\frac{7}{32}$	5.5	0.189	4.80
$\frac{9}{32}$	7	0.239	6.07
$\frac{5}{16}$	8	0.273	6.93
$\frac{3}{8}$	10	0.342	8.69
$\frac{1}{2}$	13	0.443	11.26
$\frac{5}{8}$	16	0.546	13.87
$\frac{3}{4}$	20	0.687	17.45
$\frac{7}{8}$	22	0.750	19.05
1	26	0.887	22.53
1 $\frac{1}{4}$	32	1.091	27.71

WAC 296-155-55800 (Cont.)

- (7) Repair, alterations, or modifications.
- (a) Chain slings must be repaired as follows:
- (i) Slings must only be repaired by the manufacturer or a qualified person;
 - (ii) Chain used for sling repair must be alloy steel chain manufactured and tested in accordance with ASTM A 391/A 391M for Grade 80 chain and ASTM A 973/A 973M for Grade 100 chain;
 - (iii) Components for alloy steel chain slings must be manufactured and tested in accordance with ASTM A 952/A 952M;
 - (iv) The use of mechanical coupling links within the body of a chain sling to connect two pieces of chain is prohibited;
 - (v) Replace cracked, broken, or bent chain links or components instead of repairing them.
- (b) The sling must be marked to show the repairing agency.
- (c) Repaired slings must be proof tested according to the requirements in subsection (8) of this section. If only replacing components of the sling, and the components were individually proof tested, the sling does not have to be tested as a whole.

Note: For additional requirements relating to repair and modification see WAC 296-155-55600(9).

- (8) Proof test chain slings. Prior to initial use, all new and repaired chain and components of an alloy steel chain sling, either individually or as an assembly must be proof tested by the sling manufacturer or a qualified person. Follow the requirements in Table 14, Chain Sling Proof Load Requirements.

Table 14 Chain Sling Proof Load Requirements	
<ul style="list-style-type: none">• Master links for double leg bridle slings.• Single basket slings.• Master coupling links connected to two legs.	To at least four times the single leg vertical hitch rated load.
<ul style="list-style-type: none">• Master links for triple and quadruple leg bridle slings.• Double basket bridle sling.	To at least six times the single leg vertical hitch rated load.

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(9) Chain slings rated loads, the term “working load limit” is commonly used to describe rated load.

Note: Rated loads are based on the following factors:

- *Strength of sling materials;*
 - *Design factor;*
 - *Type of hitch;*
 - *Angle of loading.*
- (a) Chain slings must be used within the rated loads shown in Tables 1 through 4 of ASME B30.9-2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or one calculated by a qualified person.
- (b) The use of horizontal sling angles less than thirty degrees are prohibited, unless recommended by the sling manufacturer or a qualified person. See Figure 12, Multiple-Leg Bridle Sling Hitch.
- (c) Rated loads must be verified for slings used in a choker meet the values shown in the above referenced tables provided that the angle of choke is one hundred and twenty degrees or greater. See Figure 13, Single-Leg Choker Hitch.
- (d) Rated loads for angles of choke less than one hundred twenty degrees must be determined by the manufacturer or a qualified person.

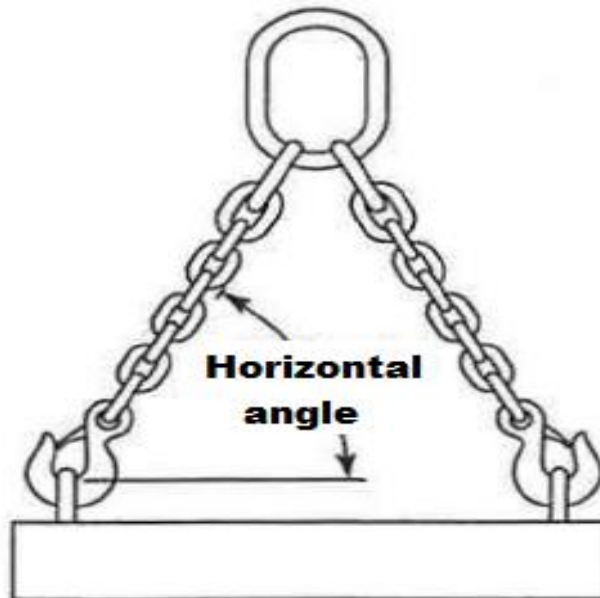


Figure 12-Multiple-Leg Bridle Sling Hitch.

WAC 296-155-55800 (Cont.)

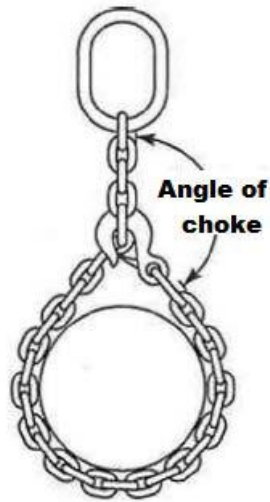
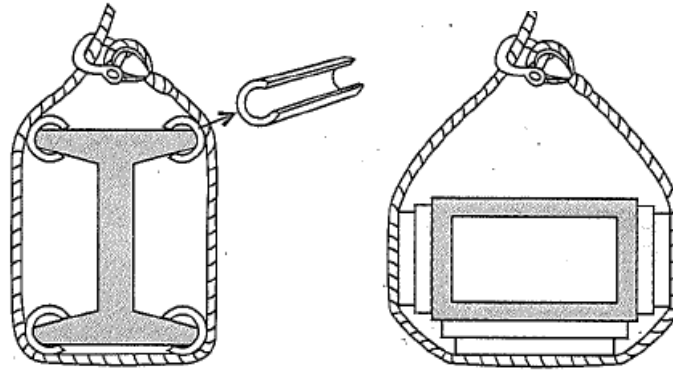


Figure 13-Single-Leg Choker Hitch.

- (10) Use of chain slings.
 - (a) Shorten or adjust slings using only methods approved by the manufacturer or a qualified person.
 - (b) Slings must not be shortened or lengthened by knotting or twisting.
 - (c) Twisting and kinking must be avoided.
 - (d) Hitch slings in a way that provides control of the load.
 - (e) Balance the load in slings used in a basket hitch to prevent it from slipping.
 - (f) Slings must be protected from sharp edges of the load. See Figure 14.
 - (g) The sling must be prevented from snagging anything during the lift, with or without load.

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Softeners can be made from split pipe, padding or blocking

Figure 14 Softeners.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55800, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55805 Wire rope slings.

- (1) Manufacturing wire rope slings.
 - (a) Wire rope slings must be made from new or unused regular lay wire rope. The wire rope must be manufactured and tested in accordance with ASTM A 1023-02 and ASTM A 586.
 - (b) The following fabrication methods must be used to make wire rope slings:
 - (i) Hand splicing;
 - (ii) Turnback eye;
 - (iii) Return loop;
 - (iv) Flemish eye mechanical splicing;
 - (v) Poured or swaged socketing.
 - (c) Wire rope slings must have a design factor of five.
 - (d) Wire rope slings must meet the requirements in Table 16.
 - (e) Using any of the following when making wire rope slings is prohibited:
 - (i) Rotation resistant wire rope;
 - (ii) Malleable cast iron clips;
 - (iii) Knots;

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- (iv) Wire rope clips, unless:
- The application of the sling prevents using prefabricated slings;
 - The specific application is designed by a qualified person.
- (f) Wire rope clips, if used, must be installed and maintained in accordance with the recommendations of the clip manufacturer or a qualified person, or in accordance with the provisions of ASME B30.26-2010.
- (g) Slings made with wire rope clips must not be used as a choker hitch.

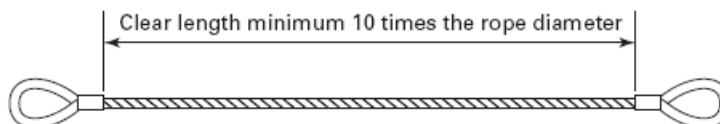
Note: If using wire rope clips under these conditions, follow the guidance given in Table 15.

Table 15 Number, Torque Values, and Turn Back Requirements for U-Bolt Wire Rope Clips				Table 15 Number, Torque Values and Turn Back Rqmts. for Double Saddle (Fist Grip) Wire Rope Clips			
Clip & Wire Rope Size (inches)	Min. No. of Clips	Amount of Rope Turn Back in Inches	* Torque in Ft. Lbs.	Clip & Wire Rope Size (inches)	Min. No. of Clips	Amount of Rope Turn Back in Inches	* Torque in Ft. Lbs.
1/8	2	3-1/4	4.5	3/16-1/4	2	4	30
3/16	2	3-3/4	7.5	5/16	2	5	30
1/4	2	4-3/4	15	3/8	2	5 1/4	45
5/16	2	5-1/4	30	7/16	2	6 1/2	65
3/8	2	6-1/2	45	1/2	3	11	65
7/16	2	7	65	9/16	3	12 3/4	130
1/2	3	11-1/2	65	5/8	3	13 1/2	130
9/16	3	12	95	3/4	4	16	225
5/8	3	12	95	7/8	4	26	225
3/4	4	18	130	1	5	37	225
7/8	4	19	225	1-1/8	5	41	360
1	5	26	225	1-1/4	6	55	360
1-1/8	6	34	225	1-3/8	6	62	500
1-1/4	7	44	360	1-1/2	7	78	500
1-3/8	7	44	360				
1-1/2	8	54	360				
1-5/8	8	58	430				
1-3/4	8	61	590				
2	8	71	750				
2-1/4	8	73	750				
2-1/2	9	84	750				
2-3/4	10	100	750				
3	10	106	1200				
3-1/2	12	149	1200				

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

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Table 16 Wire Rope Sling Configuration Requirements	
If you have:	Then you need:
<ul style="list-style-type: none"> Slings made of rope with 6 x 19 and 6 x 36 classification. Cable laid slings. 	A minimum clear length of rope 10 times the rope diameter between splices, sleeves, or end fittings (See Figure 15, Minimum Sling Length) unless approved by a qualified person.
<ul style="list-style-type: none"> Braided slings. 	A minimum clear length of rope forty times the component rope diameter between the loops or end fittings (See Figure 16, Minimum Braided Sling Length) unless approved by a qualified person.
<ul style="list-style-type: none"> Grommets and endless slings. 	A minimum circumferential length of ninety-six times the body diameter of the grommet or endless sling unless approved by a qualified person.
<ul style="list-style-type: none"> Other configurations. 	Specific limitation data provided by a qualified person. These slings must meet all other requirements of ASME B30.9, 2010.



**Figure 15 – Minimum Sling Length
For rope with 6x19 and 6x36 classification
or Cable Laid Slings.**

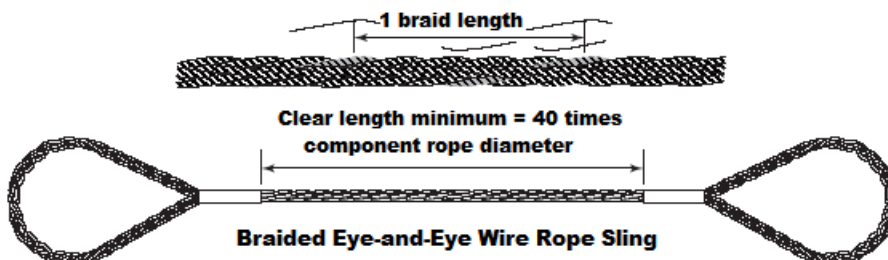





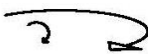


Figure 16-Minimum Braided Sling Length.

- (2) Wire rope sling fittings.
 - (a) Fittings must be used according to the fitting manufacturer's directions.
 - (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.
 - (c) Weld any end attachments, except covers to thimbles, before assembling the sling.

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- (3) Identification information. All wire rope slings must have legible identification information attached to the sling which includes the information below, see sample tag in Figure 17. For slings in use that are manufactured before the effective date of this rule, the information below must be added before use or at the time the periodic inspection is completed.
- (a) Name or trademark of the manufacturer.
 - (b) Diameter or size.
 - (c) Rated loads for the types of hitches used and the angle that the load is based on.
 - (d) Number of legs, if more than one.
 - (e) Repairing agency, if the sling is ever repaired.

Vert. 	Chock 	Vert. Basket 
2.2 Tons	1.6 Tons	4.4 Tons
Rated Capacity by Angle		
60° 	45° 	30° 
3.8 Tons	3.1 Tons	2.2 Tons

Note: Sample Tag for a ½" Single-Leg Sling 6x19 or 6x36 Classification, Extra Improved Plow Steel (EIPS) Grade Fiber Core (FC) Wire Rope with a Mechanical Splice (Ton = 2,000 lb).

Figure 17-Sample Wire Rope Sling ID Tag.

- (4) Inspection.
- (a) A qualified person must inspect wire rope slings before their initial use, according to Table 17, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
 - (b) A qualified person must perform a visual inspection for damage, each day or shift the wire rope sling is used:
 - (i) Include all fastenings and attachments;
 - (ii) Immediately remove any sling from service that is damaged beyond the criteria listed in Table 17; or

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- (iii) Remove fiber core wire rope slings that have been exposed to temperatures higher than one hundred eighty degrees Fahrenheit.
 - (c) A qualified person must perform periodic inspections on wire rope slings according to Table 17.
- (5) Repair, alterations, or modifications.
 - (a) Repair wire rope slings as follows:
 - (i) Make sure slings are only repaired by the sling manufacturer or a qualified person;
 - (ii) Mark the sling to show the repairing agency;
 - (iii) Do not repair wire rope used in slings, wire rope must be replaced. Only end attachments and fittings can be repaired on a wire rope sling.
 - (b) Modification or alterations to end attachments or fittings must be considered as repairs and must conform to all other provisions of this part.
 - (c) Proof load test repaired slings according to the requirements in subsection (6) of this section.
- (6) Proof load tests. Make sure the sling manufacturer or a qualified person proof load tests the following slings before initial use, according to Table 18:
 - (a) All repaired slings;
 - (b) All slings incorporating previously used or welded fittings;
 - (c) For single- or multiple-leg slings and endless slings, each leg must be proof loaded according to the requirements listed in Table 18 based on fabrication method. The proof load test must not exceed fifty percent of the component ropes' or structural strands' minimum breaking strength;

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Table 17 Wire Rope Sling Inspection and Removal Criteria	
Inspect wire rope slings for the following conditions:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Severe localized abrasion or scraping. • Kinking, crushing, birdcaging, or any other condition resulting in damage to the rope structure. • Evidence of heat damage. • Severe corrosion of the rope, end attachments, or fittings. • End attachments that are cracked, deformed, or worn to the extent that the strength of the sling is substantially affected. • Broken wires: <ul style="list-style-type: none"> – For strand-laid and single-part slings, ten randomly distributed broken wires in one rope lay, or five broken wires in one strand in one rope lay; – For cable-laid slings, twenty broken wires per lay; – For six-part braided slings, twenty broken wires per braid; – For eight-part braided slings, forty broken wires per braid. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook; – Any distortion causing an increase in throat opening five percent, not to exceed one-quarter inch, or as recommended by the manufacturer; – Wear exceeding ten percent, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer; – Self-locking mechanism that does not lock. • Other visible damage that raises doubt about the safety of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service. • At least once a quarter for slings in severe service. • As recommended by a qualified person for slings in special service.

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Table 18 Wire Rope Sling Proof Load Test Requirements	
Type of equipment:	Proof load test:
• Mechanical splice slings.	Each leg to at least two times the single leg vertical hitch rated load.
• Swaged socket and poured socket slings.	Each leg to at least two times, but not more than two and one-half, times the single-leg vertical hitch rated load.
<i>Note: For mechanical splice, swaged socket and poured socket slings follow the rope manufacturer's recommendations for proof load testing provided that it is within the above-specified proof load range, including subsection (c) of this subsection.</i>	
• Hand tucked slings, if proof load tested.	To at least one, but not more than one and one-quarter, times the single-leg vertical hitch rated load.

(d) The proof load test for components (fittings) attached to single legs must meet the requirements in (c) of this subsection.

(e) Proof load testing for master links must be in accordance with Table 19.

Table 19 Proof Load Test for Master Links on Wire Rope Slings	
• Master links for two-leg bridle slings.	To at least four times the single-leg vertical hitch rated load.
• Master links for three-leg bridle slings.	To at least six times the single-leg vertical hitch rated load.
• Master links for four-leg bridle slings.	To at least eight times the single-leg vertical hitch rated load.

(7) Rated load. The term “rated capacity” is commonly used to describe rated load.

Note: Rated loads are based on the following factors:

- *Strength of sling material;*
 - *Design factor;*
 - *Type of hitch;*
 - *Angle of loading (see Figure 18, Angle of Loading);*
 - *Diameter of curvature over which the sling is used (D/d) (see Figure 19, D/d ratio);*
 - *Fabrication efficiency.*
- (a) Wire rope slings must be used within the rated loads shown in Tables 7 through 15 in ASME B30.9-2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or have a qualified person calculate the rated load.
- (b) Prohibit the use of horizontal sling angles less than thirty degrees unless recommended by the sling manufacturer or a qualified person. See Figure 18.
- (c) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced tables, provided that the angle of choke is one hundred twenty degrees or greater. See Figure 20 and Table 20, Angle of Choke.

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- (d) Use either Figure 20 and Table 20, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than one hundred twenty degrees.
- (i) Inspect the entire length of the sling including splices, end attachments, and fittings.
- (ii) Remove slings from use if any of the conditions in Table 17 are found.
- (iii) Keep a record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

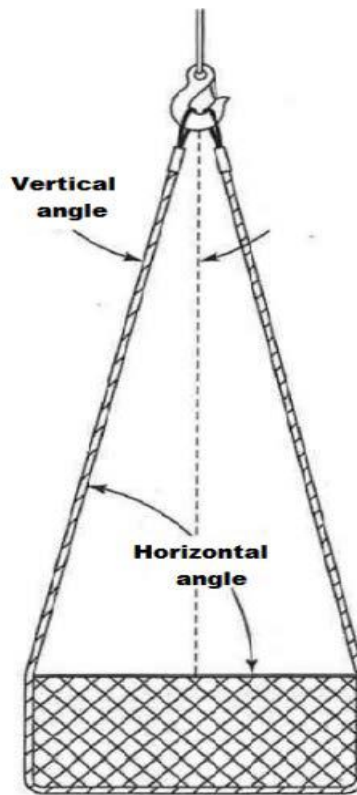


Figure 18-Angle of Loading.

WAC 296-155-55805 (Cont.)

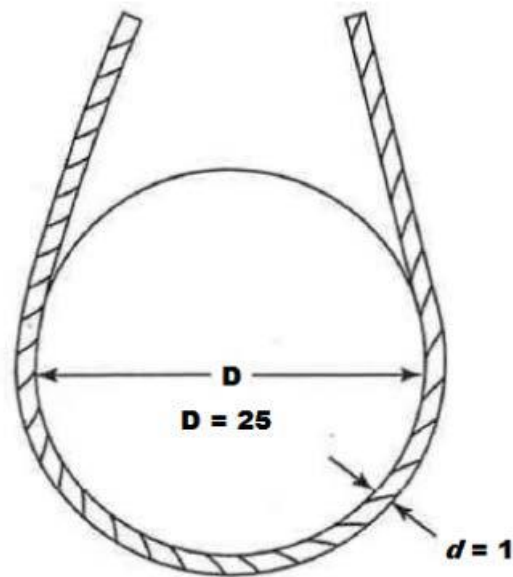


Figure 19-D/d Ratio.

Note: When D is 25 times the component rope diameter(d) the D/d ratio is expressed as 25/1.

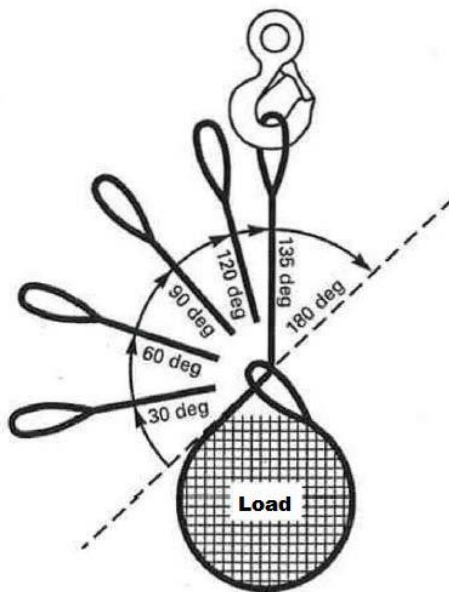


Figure 20-Angle of Choke.

WAC 296-155-55805 (Cont.)

Table 20 Angle of Choke	
Angle of Choke, deg.	Rated Capacity, %
Over 120	100
90 – 120	87
60 – 89	74
30 – 59	62
0 – 29	49

Note: Percent of sling rated capacity in a chocker hitch.

- (8) Use of wire rope slings.
- (a) Hitch the slings in a way that provides control of the load.
 - (b) Shorten or adjust slings using only the methods approved by the manufacturer or qualified person.
 - Do **not** shorten or lengthen by knotting, twisting, or by wire rope clips.
 - (c) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
 - (d) Protruding ends of strands in splices on slings and bridles must be covered or blunted.
 - (e) A sling must not be pulled from under a load when the load is resting on the sling.
 - (f) Prohibit all of the following:
 - (i) Intentional shock loading;
 - (ii) Avoid twisting and kinking.
 - (g) Decrease the rated load of the sling when D/d ratios (Figure 19) smaller than twenty-five to one. Consult the sling manufacturer for specific data or refer to the *Wire Rope Sling User's Manual* (wire rope technical board).
 - (h) Follow Table 21, Use of Wire Rope Slings or Clips, when using any of the identified wire rope slings or clips. See Figure 14.
 - (i) Slings in contact with edges, corners, or protrusions must be protected with a material of sufficient strength, thickness, and construction to prevent damage to the sling. See Figure 14.

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Table 21 Use of Wire Rope Slings or Clips	
If you are using:	Then:
Single leg slings used with multiple-leg slings.	Make sure the rating shown is not exceeded in any leg of the multiple-leg sling.
Hand tucked slings are used in a single leg vertical lift.	Do not allow the sling or load to rotate.
Slings made with wire rope clips.	Must not be used as a choker hitch.
U-bolt wire rope clips.	Use only U-bolt wire rope clips that are made of drop-forged steel.
	Follow Table 15 for the number and spacing of the clips.
	Apply the U-bolt so the "U" section is in contact with the dead end of the rope (See Figure 21, <i>Installation and Loading</i>).

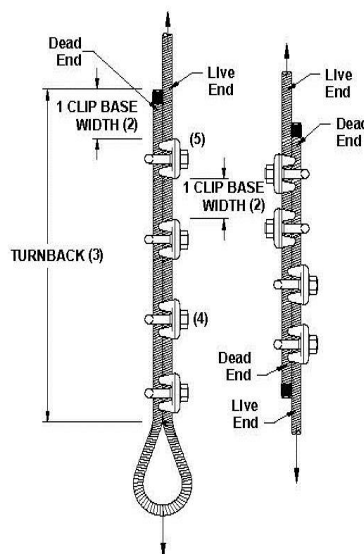


Figure 21-Installation and Loading.
Proper Installation Requires
Correct number of clips for wire rope size
Correct spacing of clips
Correct turnback length
Correct torque on nuts
Correct orientation of saddle live end

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55805, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55805, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55810 Metal mesh slings.

- (1) Identification information on metal mesh slings. Make sure all slings have legible identification information permanently attached to the sling which includes all of the following information:
 - (a) Name or trademark of the manufacturer;
 - (b) Rated loads for the types of hitches used, and the angle they're based on;
 - (c) Width and gauge;
 - (d) Number of legs, if more than one;
 - (e) Individual sling identification (e.g., serial numbers);
 - (f) Repairing agency, if the sling has ever been repaired.
- (2) Inspection.
 - (a) A qualified person must inspect metal mesh slings before their initial use, according to Table 22, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
 - (b) A qualified person must perform a visual inspection for damage, each day or shift the metal mesh sling is used. Immediately remove from service any sling damaged beyond the criteria in Table 22.
 - (c) A qualified person must perform periodic inspections on metal mesh slings according to Table 22.
 - (i) Inspect the entire length, including splices, end attachments, and fittings.
 - (ii) Remove slings from use if any of the conditions in Table 22 are found.
 - (iii) Keep a record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

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Table 22 Metal Mesh Sling Inspection Table	
Inspect metal mesh slings for conditions such as the following:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Broken welds along the sling edge. • Broken brazed joints along the sling edge. • Broken wire in any part of the mesh. • Reduction in wire diameter of: <ul style="list-style-type: none"> – Twenty-five percent due to abrasion; – Fifteen percent due to corrosion. • Lack of flexibility due to the distortion of the mesh. • Distortion of the choker fitting so the depth of the slot is increased by more than ten percent. • Distortion of either end fitting so the width of the eye opening is decreased by more than ten percent. • A fifteen percent reduction of the original cross-sectional area of any point around the hook opening of the end fitting. • Visible distortion of either end fitting out of its plane. • Cracked end fitting. • Slings in which the spirals are locked or without free articulation. • Fittings that are pitted, corroded, cracked, bent, twisted, gouged, or broken. • Other visible damage that raises doubt about the safety of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service. • At least once a quarter for slings in severe service. • As recommended by a qualified person for slings in special service.

- (3) Repair, alteration, or modifications. Repair metal mesh slings as follows:
- (a) Make sure slings are only repaired by the manufacturer or a qualified person;
 - (b) Straightening of spiral or cross rods, or forcing a spiral into position is prohibited (see Figure 22);
 - (c) Mark the sling to show the repairing agency;
 - (d) Replace cracked, broken, bent or damaged metal mesh or components instead of repairing them;
 - (e) Proof load test repaired slings according to subsection (4) of this section.

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- (4) Proof load testing.
- (a) Make sure the sling manufacturer or a qualified person proof load tests all new and repaired metal mesh slings before initial use;
 - (b) Use a proof load test that is a minimum of two times the vertical hitch rated load.
- (5) Rated load.

Note: Rated loads are based on the following factors:

- *Strength of sling material;*
 - *Design factor;*
 - *Type of hitch;*
 - *Angle of loading.*
- (a) Metal mesh slings must be used within the rated loads shown in Table 17 in ASME B30.9-2010. For angles that are not shown in these tables, use either the rated load for the next lower angle or one calculated by a qualified person.
 - (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if fittings are rated lower than the sling material itself, identify the sling with the lower rated capacity.
 - (c) The use of horizontal sling angles less than thirty degrees is prohibited, unless recommended by the sling manufacturer or a qualified person.
 - (d) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced table, provided that the angle of choke is one hundred twenty degrees or greater.
 - (e) Have the manufacturer or a qualified person determine the rated load if the angle of choke in a choker hitch is less than one hundred twenty degrees.

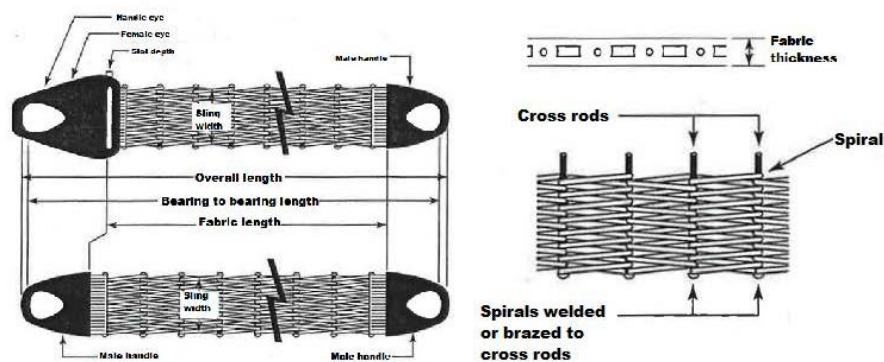


Figure 22-Metal Mesh Slings.

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- (6) Use of metal mesh slings.
 - (a) Use metal mesh slings safely by doing all of the following:
 - (i) Shorten or adjust slings using only the methods approved by the manufacturer or a qualified person;
 - (ii) Sling legs must not be kinked;
 - (iii) Hitch slings in a way that provides control of the load.
 - (b) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
 - (c) Prohibit the following:
 - (i) The use of metal mesh slings as bridles on suspended personnel platforms;
 - (ii) Intentional shock loading;
 - (iii) Straightening a spiral or cross rod or forcing a spiral into position;
 - (iv) Avoid twisting and kinking.

Note: Slings in contact with edges, corners, or protrusions should be protected with a material of sufficient strength, thickness, and construction to prevent damage. See Figure 14.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55810, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55815 Synthetic rope slings.

- (1) Identification. Verify all slings have legible identification information attached to the sling which includes the following information:
 - (a) Name or trademark of the manufacturer;
 - (b) Manufacturer's code or stock number;
 - (c) Type of fiber material;
 - (d) Rated loads for the types of hitches used, and the angle that the load is based on;
 - (e) Number of legs, if more than one;
 - (f) Repairing agency, if the sling has ever been repaired.

WAC 296-155-55815 (Cont.)

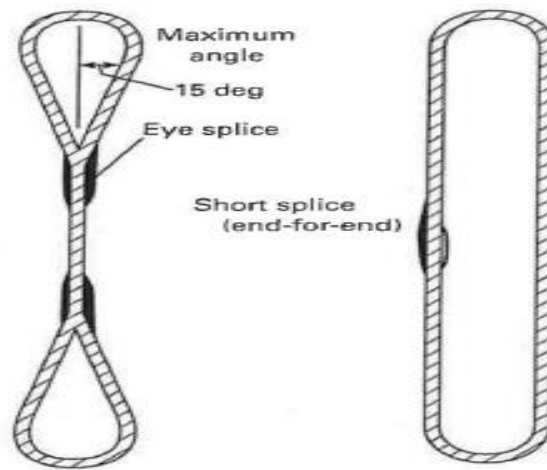


Figure 23-Synthetic Fiber Rope Slings.

- (2) Inspection.
- (a) A qualified person must inspect synthetic fiber rope slings before their initial use, according to Table 23, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
 - (b) A qualified person must perform a visual inspection for damage, each day or shift the synthetic fiber rope sling is used. Immediately remove any sling from service that is damaged beyond the criteria listed in Table 23.
 - (c) A qualified person must perform periodic inspections on synthetic fiber rope slings, according to Table 23.
 - (i) Examine each sling and component individually, taking care to expose and examine all surfaces.
 - (ii) Inspect the entire length including splices, end attachments, and fittings.
 - (iii) Remove slings from use if any of the conditions in Table 23 are found.
 - (iv) Keep a record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

WAC 296-155-55815 (Cont.)

Table 23 Synthetic Rope Sling Inspection and Removal Criteria	
Inspect synthetic rope slings for the following conditions:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Cuts, gouges, or areas of extensive fiber breakage along the length. • Abraded areas on the rope. • Damage that is estimated to have reduced the effective diameter of the rope by more than ten percent. • Uniform fiber breakage along the major part of the length of the rope in the sling such that the entire rope appears covered with fuzz or whiskers. • Inside the rope, fiber breakage, fused or melted fiber (observed by prying or twisting to open the strands) involving damage estimated at ten percent of the fiber in any strand or the rope as a whole. • Discoloration, brittle fibers, and hard or stiff areas that may indicate chemical, ultraviolet or heat damage. • Dirt and grit in the interior of the rope structure that is deemed excessive. • Foreign matter that has permeated the rope, making it difficult to handle and attracting and holding grit. • Kinks or distortion in the rope structure, particularly if caused by forcibly pulling on loops (known as hockles). • Melted, hard, or charred areas that affect more than ten percent of the diameter of the rope or affect several adjacent strands along the length that affect more than ten percent of strand diameters. • Poor condition of thimbles or other components manifested by corrosion, cracks, distortion, sharp edges, or localized wear. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook; – Any distortion causing an increase in throat opening five percent, not to exceed one-quarter inch, or as recommended by the manufacturer; – Wear exceeding ten percent, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer; – Self-locking mechanism that does not lock. • Other visible damage that raises doubt about the safety of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service. • At least once a quarter for slings in severe service. • As recommended by a qualified person for slings in special service.

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- (3) Repair, alteration, or modifications. Meet the following requirements when repairing synthetic rope slings:
- (a) Synthetic rope slings must only be repaired by the manufacturer or a qualified person;
 - (b) Mark the sling to show the repairing agency;
 - (c) Use components that meet the requirements of this part for sling repair;
 - (d) Do not repair slings by knotting or resplicing existing sling ropes;
 - (e) Proof load test repaired slings according to the requirements in subsection (4) of this section.
- (4) Proof load test. The sling manufacturer or a qualified person must proof load test repaired slings and slings incorporating previously used or welded fittings before initial use, according to Table 24:

Table 24	
Synthetic Rope Sling Proof Load Requirements	
Type of equipment:	Proof load test:
<ul style="list-style-type: none"> Single leg slings. Multiple leg slings. Endless slings. Fittings attached to single legs. 	To a minimum of two times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> Master links for two-leg bridle slings. 	To a minimum of four times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> Master links for three-leg bridle slings. 	To a minimum of six times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> Master links for four-leg bridle slings. 	To a minimum of eight times the single leg vertical hitch rated load.

- (5) Rated load.

Note: Rated loads are based on the following factors:

- *Strength of the sling material;*
 - *Design factor;*
 - *Type of hitch (see Figure 24, Hitch Types for Synthetic Rope Slings);*
 - *Angle of loading (see Figure 18, Angle of Loading);*
 - *Diameter of curvature over which the sling is used (see Figure 19, D/d Ratio).*
- (a) Synthetic rope slings must be used within the rated loads shown in Tables 18 and 19 in ASME B30.9-2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or one calculated by a qualified person.
 - (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower-rated capacity.
 - (c) The use of horizontal sling angles less than thirty degrees is prohibited, unless recommended by the sling manufacturer or a qualified person. (See Figure 18.)

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- (d) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced tables, provided that the angle of choke is one hundred twenty degrees or greater.
- (e) Use Figure 20, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than one hundred twenty degrees.

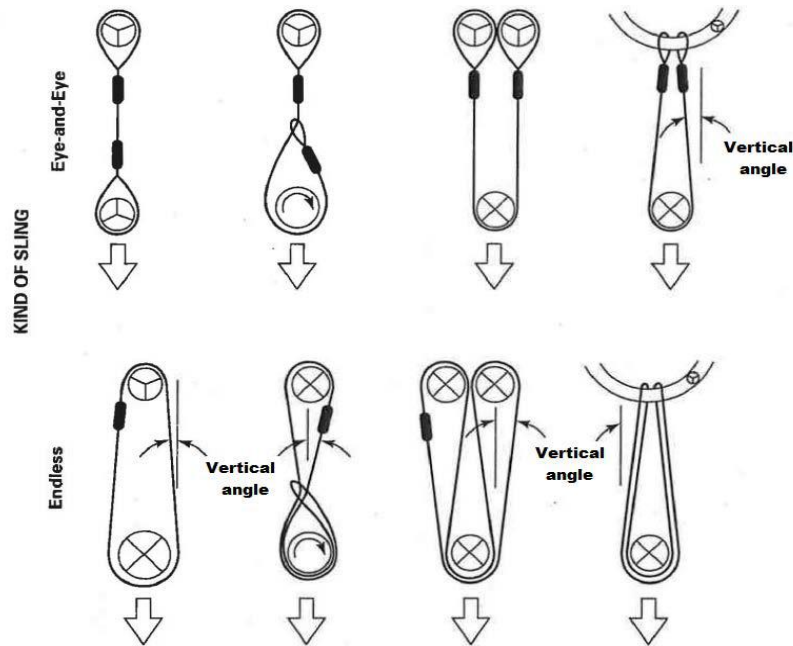


Figure 24-Hitch Types for Synthetic Rope

The symbols below represent load or support in contact with the rope sling. The contact surface diameter divided by the rope diameter is designated D/d ratio as described in Figure 19.



Represents a contact surface which must have a diameter of curvature at least double the diameter of the rope from which the sling is made.



Represents a contact surface which must have a diameter of curvature at least 8 times the diameter of the rope.



Represents a load in choker hitch and illustrates the rotary force on the load and/or the slippage of the rope in contact with the load. Diameter of curvature of load surface must be at least double the diameter of the rope.

Note: Legs five degrees or less from vertical may be considered vertical. For slings more than five degrees vertical, the actual angle must be used.

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- (6) Use of synthetic ropes.
 - (a) Use synthetic rope slings safely by doing all of the following:
 - (i) Shorten or adjust slings only with methods approved by the manufacturer or qualified person;
 - (ii) Slings must not be shortened or lengthened by knotting or twisting;
 - (iii) Hitch slings in a way that provides control of the load;
 - (iv) Slings in contact with edges, corners, protrusions, or abrasive surfaces must be protected with a material of sufficient strength, thickness, and construction to prevent damage, see Figure 14;
 - (v) Do not allow the sling or load to rotate when hand-tucked slings are used in a single-leg vertical lift application; and
 - (vi) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
 - (b) All of the following is prohibited:
 - (i) Intentional shock loading; and
 - (ii) Twisting or kinking.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55815, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55820 Synthetic webbing slings.

- (1) Identification. Make sure all slings have legible identification information permanently attached to the sling which includes the following information:
 - (a) Name or trademark of the manufacturer;
 - (b) Manufacturer's code or stock number;
 - (c) Rated loads for the types of hitches used, and the angle that the load is based on;
 - (d) Type of synthetic web material;
 - (e) Number of legs, if more than one;
 - (f) Repairing agency, if the sling is ever repaired.

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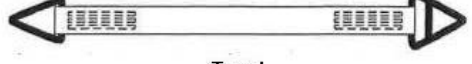
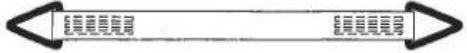
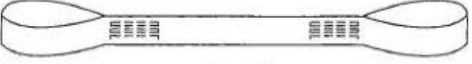
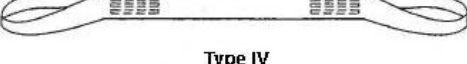


 <p>Type I Sling made with triangle fitting on one end and a slotted triangle choker fitting on the other end. It can be used in a vertical, basket, or choker hitch.</p>	 <p>Type II Sling made with a triangle fitting on both ends. It can be used in a vertical or basket hitch only.</p>
 <p>Type III Sling made with a flat loop eye on each end with loop eye opening on same plane as sling body. This type of sling is sometimes called a flat eye-and-eye, eye-and-eye, or double-eye sling.</p>	 <p>Type IV Sling made with both loop eyes formed as in Type III, except that the loop eyes are turned to form a loop eye which is at a right angle to the plane of the sling body. This type of sling is commonly referred to as a twisted-eye sling.</p>
 <p>Type V Endless sling, sometimes referred to as a grommet. It is a continuous loop formed by joining the ends of the webbing together.</p>	 <p>Type VI Return-eye (reversed-eye) sling is formed by using multiple widths of webbing held edge-to-edge. A wear pad is attached on one or both sides of the sling body and one or both sides of the loop eyes to form a loop eye at each end which is at a right angle to the plane of the sling body.</p>

Figure 25-Synthetic Webbing Slings.

- (2) Inspection.
 - (a) A qualified person must inspect synthetic webbing slings before their initial use, according to Table 25:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
 - (b) A qualified person must perform a visual inspection for damage, each day or shift the synthetic webbing sling is used. Immediately remove from service any sling that is damaged beyond the criteria listed in Table 25.
 - (c) A qualified person must perform periodic inspections on synthetic webbing slings, according to Table 25.
 - (i) Examine each sling and component individually, taking care to expose and examine all surfaces.
 - (ii) Remove slings from use if any of the conditions in Table 25 are found.
 - (iii) Keep a written record of the most recent periodic inspection available, including the condition of the sling.

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Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

Table 25 Synthetic Webbing Sling Inspection	
Inspect synthetic webbing slings for the following conditions:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Acid or caustic burns. • Melting or charring on any part of the sling • Holes, tears, cuts or snags. • Broken or worn stitching in load bearing splices. • Excessive abrasive wear. • Knots in any part of the sling. • Discoloration, brittle fibers, and hard or stiff areas that may indicate chemical or ultraviolet/sunlight damage. • Fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook; – Any distortion causing an increase in throat opening five percent, not to exceed one-quarter inch, or as recommended by the manufacturer; – Wear exceeding ten percent, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer; – Self-locking mechanism that does not lock. • Other visible damage that causes doubt about the safety of continued use of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service. • At least once a quarter for slings in severe service. • As recommended by a qualified person for slings in special service.

(3) Repair, alterations, or modifications.

(a) Meet the following requirements when repairing synthetic webbing slings:

- (i) Slings are only to be repaired by the manufacturer or a qualified person;
- (ii) Temporary repairs are prohibited;
- (iii) Mark the sling to show the repairing agency;
- (iv) Components used for sling repair must meet the requirements of this part;

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- (v) Cracked, broken, melted, or otherwise damaged webbing material or fittings other than hooks must not be repaired;
- (vi) Load bearing splices must not be repaired;
- (b) Proof load test repaired slings according to the requirements in subsection (4) of this section.
- (4) Proof load test. The sling manufacturer or a qualified person must proof load test repaired slings and slings that have been altered or modified before initial use according to Table 26:

Table 26 Synthetic Webbing Sling Proof Test Requirements	
Type of equipment:	Proof load test:
<ul style="list-style-type: none"> • Single leg slings.. • Multiple leg slings. • Endless slings. • Fittings attached to single legs. 	To a minimum of two times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for two-leg bridle slings 	To a minimum of four times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for three-leg bridle slings 	To a minimum of six times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for four-leg bridle slings 	To a minimum of eight times the single leg vertical hitch rated load.

- (5) Rated loads.

Note: Rated loads are based on the following factors:

- *Strength of the material;*
 - *Design factor;*
 - *Type of hitch;*
 - *Angle of loading (see Figure 18, Angle of Loading);*
 - *Fabrication efficiency;*
 - *Diameter of curvature over which the sling is used.*
- (a) Synthetic web slings must be used within the rated loads shown in Tables 20 through 24 in ASME B30.9-2010. For angles that are not shown in these tables, use either the rated load for the next lower angle or one calculated by a qualified person.
 - (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower-rated capacity.
 - (c) The use of horizontal sling angles less than thirty degrees is prohibited, unless recommended by the sling manufacturer or a qualified person. (See Figure 18.)
 - (d) Use Figure 20, Angle of Choke, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than one hundred twenty degrees.
 - (e) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced tables, provided that the angle of choke is one hundred twenty degrees or greater. (See Figure 20.)

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- (6) Use of synthetic webbing slings.
 - (a) Use synthetic webbing slings safely by meeting all of the following requirements:
 - (i) Shorten or adjust slings only with methods approved by the manufacturer or qualified person;
 - (ii) Slings must not be shortened or lengthened by knotting or twisting;
 - (iii) Hitch slings in a way that provides control of the load;
 - (iv) Protect slings with material of sufficient strength, thickness, and construction to prevent damage from sharp edges, corners, protrusions, or abrasive surfaces. See Figure 14;
 - (v) Keep all parts of the human body from between the sling and the load, crane, or hoist hook;
 - (vi) Fittings must be of a minimum breaking strength equal to that of the sling.
 - (b) Webbing. Synthetic webbing must be of uniform thickness and width and selvage edges must not split from the webbing's width.
 - (c) Intentional shock loading is prohibited.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-55820, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55820, filed 12/20/11, effective 02/01/12.]

WAC 296-155-55825 Synthetic roundslings.

- (1) Identification. All synthetic roundslings must be marked with the following information:
 - (a) Name or trademark of the manufacturer;
 - (b) Manufacturer's code or stock number;
 - (c) Core material;
 - (d) Cover material if different from core material;
 - (e) Rated loads for the types of hitches used, and the angle that the load is based on;
 - (f) Number of legs, if more than one;
 - (g) Repairing agency, if the sling is ever repaired.

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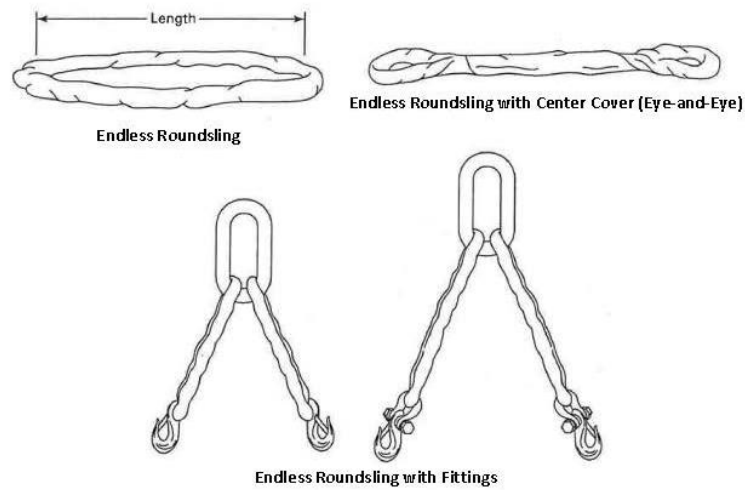


Figure 26-Synthetic Roundslings.

- (2) Inspection.
- (a) A qualified person must inspect synthetic roundslings before their initial use, according to Table 27, both:
 - (i) When the sling is new; and
 - (ii) Whenever a repair, alteration, or modification has been done.
 - (b) A qualified person must perform a visual inspection for damage, each day or shift the synthetic roundsling is used. Immediately remove from service any sling that is damaged beyond the criteria listed in Table 27.
 - (c) A qualified person must perform periodic inspections on synthetic roundslings, according to Table 27.
 - (i) Examine each sling and component individually, taking care to expose and examine all surfaces.
 - (ii) Remove slings from use if any of the conditions in Table 27 are found.
 - (iii) Keep a written record of the most recent periodic inspection available, including the condition of the sling.

Note: An external code mark on the sling is an acceptable means of recording the inspection as long as the code can be traced back to a record.

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Table 27 Synthetic Roundsling Inspection and Removal Criteria	
Inspect synthetic roundslings for conditions such as the following:	Perform inspections:
<ul style="list-style-type: none"> • Missing or illegible sling identification. • Acid or caustic burns. • Evidence of heat damage. • Holes, tears, cuts, abrasive wear or snags that expose the core yarns. • Broken or damaged core yarns. • Weld spatter that exposes core yarns. • Roundslings that are knotted. • Fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken. • Hooks that have any of the following conditions: <ul style="list-style-type: none"> – Any visibly apparent bend or twist from the plane of the unbent hook; – Any distortion causing an increase in throat opening five percent, not to exceed one-quarter inch, or as recommended by the manufacturer; – Wear exceeding ten percent, of the original section dimension of the hook or its load pin, or as recommended by the manufacturer; – Self-locking mechanism that does not lock. • Other visible damage that causes doubt about the safety of continued use of the sling. 	<ul style="list-style-type: none"> • At least once a year for slings in normal service. • At least once a quarter for slings in severe service. • As recommended by a qualified person for slings in special service.

(3) Repair, alterations, or modifications.

(a) Meet the following requirements when repairing synthetic roundslings:

- (i) Only the manufacturer or a qualified person can repair slings;
- (ii) Mark the sling to show the repairing agency;
- (iii) Only use components that meet the requirements of this rule to repair slings;
- (iv) Replace cracked, broken, or bent fittings other than hooks; do not repair them.

(b) Both of the following are prohibited:

- (i) Temporary repairs of roundslings or fittings; and
- (ii) The repair of load bearing yarns.

Proof load test repaired slings according to the requirements in subsection (4) of this section.

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- (4) Proof load tests. The sling manufacturer or a qualified person must proof load test repaired slings and slings that have been altered or modified before initial use, according to Table 28:

Table 28 Synthetic Roundslings Proof Test Requirements	
Type of equipment:	Proof load test:
<ul style="list-style-type: none"> • Single leg slings. • Multiple leg slings. • Endless slings. • Fittings attached to single legs. 	To a minimum of two times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for two-leg bridle slings. 	To a minimum of four times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for three-leg bridle slings. 	To a minimum of six times the single leg vertical hitch rated load.
<ul style="list-style-type: none"> • Master links for four-leg bridle slings. 	To a minimum of eight times the single leg vertical hitch rated load.

- (5) Rated loads.

Note: Rated loads are based on the following factors:

- *Strength of the material.*
 - *Design factor.*
 - *Type of hitch.*
 - *Angle of loading. (See Figure 18, Angle of Loading.)*
 - *Diameter of curvature over which the sling is used.*
- (a) Synthetic roundslings must be used within the rated loads shown in Table 25 in ASME B30.9-2010. For angles that are not shown in these tables, either use the rated load for the next lower angle or one calculated by a qualified person
- (b) Rate slings with the load capacity of the lowest rated component of the sling. For example, if you use fittings that are rated lower than the sling material itself, identify the sling with the lower rated capacity.
- (c) Prohibit the use of horizontal sling angles less than thirty degrees unless recommended by the sling manufacturer or a qualified person.
- (d) Use Figure 18, Angle of Choke, the manufacturer, or a qualified person to determine the rated load if the angle of choke in a choker hitch is less than one hundred twenty degrees.
- (e) Rated loads for slings used in a choker hitch must conform to the values shown in the above referenced Table 20 provided that the angle of choke is one hundred twenty degrees or greater. (See Figure 18.)

- (6) Use of synthetic roundslings.

- (a) Use methods approved by the manufacturer or qualified person to shorten or adjust slings. Slings must not be shortened or lengthened by knotting or twisting.

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- (b) Hitch slings in a way that provides control of the load.
- (c) Protect slings with material of sufficient strength, thickness, and construction to prevent damage from sharp edges, corners, protrusions, or abrasive surfaces. (See Figure 14.)
- (d) Keep all parts of the human body from between the sling and the load, crane, or hoist hook.
- (e) Intentional shock loading is prohibited.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-55825, filed 12/20/11, effective 02/01/12.]

WAC 296-155-561 Rigging hardware.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-561, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56100 General requirements.

- (1) Inspections.
 - (a) A qualified person must perform an inspection on all hardware according to Table 29, each day before using. If a daily inspection is not feasible because the hardware is in a semipermanent or inaccessible location, a periodic inspection is allowed instead of daily.
 - (b) Hardware must be removed from service when it shows any conditions listed in Table 29, or any other hazardous condition.

WAC 296-155-56100 (Cont.)

Table 29 Hardware Inspection	
For all hardware, inspect for the following:	
<ul style="list-style-type: none"> • Missing or illegible identification. • For shackles, missing or illegible manufacturer's name or trademark and/or rated load identification. 	
<ul style="list-style-type: none"> • Indications of heat damage, including weld spatter or arc strikes. 	
<ul style="list-style-type: none"> • Excessive pitting or corrosion. 	
<ul style="list-style-type: none"> • Load bearing components that are: <ul style="list-style-type: none"> - Bent. - Twisted. - Distorted. - Stretched. - Elongated. - Cracked. - Broken. 	
<ul style="list-style-type: none"> • Excessive nicks or gouges. For riggings blocks, excessive nicks, gouges and wear. 	
<ul style="list-style-type: none"> • Ten percent reduction of the original or catalog dimension at any point. For shackles, this includes at any point around the body or pin. 	
<ul style="list-style-type: none"> • Excessive thread damage or wear, where applicable. 	
<ul style="list-style-type: none"> • Evidence of unauthorized welding or modification. 	
<ul style="list-style-type: none"> • Any other conditions that cause doubt as to the safety of continued use. 	
<ul style="list-style-type: none"> • On Shackles, also inspect for incomplete pin engagement. 	
<ul style="list-style-type: none"> • On swivels and swivel hoist rings, check for lack of ability to freely rotate or pivot. 	
<ul style="list-style-type: none"> • On Compression hardware, also check for: <ul style="list-style-type: none"> - Unauthorized replacement components. - Insufficient number of wire rope clips. - Improperly tightened wire rope clips. - Damaged wire rope. - Indications of wire rope slippage. - Improper assembly. 	
<ul style="list-style-type: none"> • On Swivels, check for loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices. 	
<ul style="list-style-type: none"> • On Blocks check for: <ul style="list-style-type: none"> - Loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices. - Misalignment or wobble in sheaves. - Excessive sheave groove corrugation or wear. 	

(2) Repairs, alterations, or modifications.

- (a) Rigging hardware must be repaired, altered or modified according to the hardware manufacturer or a qualified person.
- (b) Welding of hardware is prohibited unless authorized by the manufacturer.
- (c) Replacement parts must meet or exceed the original rigging hardware manufacturer's specifications.

WAC 296-155-56100 (Cont.)

- (3) Hardware use.
 - (a) Hardware must be selected with the characteristics suitable for the application and environment where it will be used.
 - (b) The rated load of the hardware must not be exceeded.
 - (c) At least one of the workers using rigging hardware must meet the requirements of WAC 296-155-53306.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-56100, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56100, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56105 Shackles.

- (1) Pins must be connected to the choking eye of the sling when a shackle is used in a choker hitch.
- (2) Screw pins must be:
 - (a) Fully engaged, with the shoulder in contact with the shackle body (see Figure 27, Typical Shackle Components).
 - (b) Rigged in a way that keeps the pin from unscrewing while in use.
 - (c) Secured from rotation or loosening if used for long-term installations.
- (3) Cotter pins must be kept in good working condition.
- (4) If the shackle is side loaded, reduce the rated load, according to the recommendations of the manufacturer or a qualified person (see Figure 28, Side Loading).

Note: See Figure 29, Shackle Types, for examples of types of shackles covered by this rule.

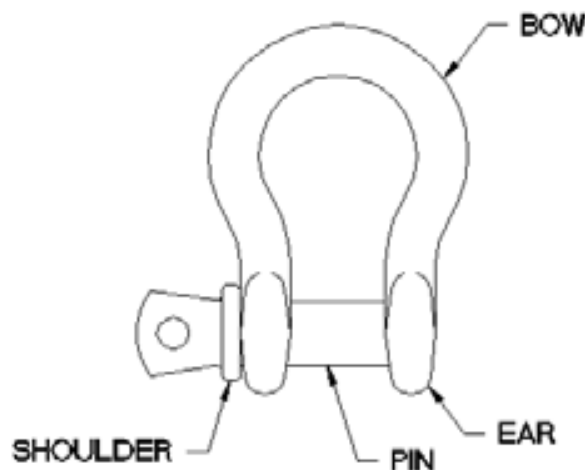
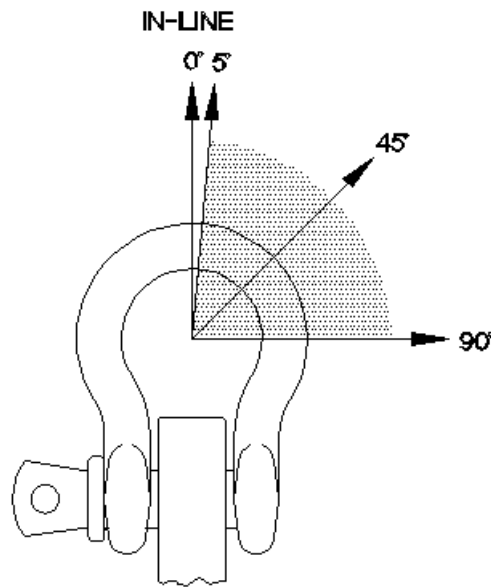


Figure 27-Typical Shackle Components.

WAC 296-155-56105 (Cont.)



Side Loading Angle, deg.	% Rated Load Reduction
In-line (0) to 5	None
6 to 45	30%
46 to 90	50%
Over 90	Not permitted unless authorized by manufacturer or qualified person

Figure 28-Side Loading.

WAC 296-155-56105 (Cont.)

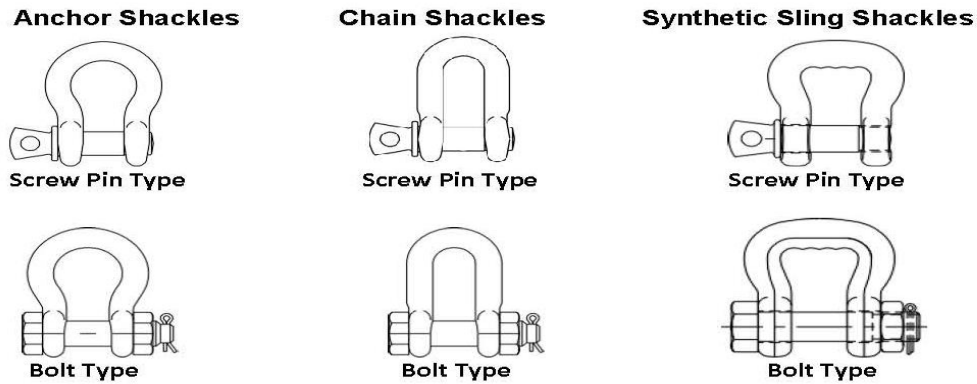


Figure 29-Shackle Types.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56105, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56110 Adjustable hardware.

- (1) Turnbuckles. Follow these rigging practices for turnbuckles:
 - (a) Locking nuts, if used, must be compatible with the threads of the turnbuckle end. (See Figure 30, Turnbuckle Types.)
 - (b) For long-term installations, secure turnbuckles in a way that prevents unscrewing.
 - (c) Turnbuckle end fitting threads must be fully engaged in the body threads.
 - (d) Components, including pins, bolts, nuts, or cotter pins used with jaw ends, must be in good working condition prior to use.

Note:

- See Figure 30 for types of turnbuckles covered by this rule.
- Pipe bodies conceal the length of thread engagement. Verify full engagement before loading. (See Figure 30.)

WAC 296-155-56110 (Cont.)

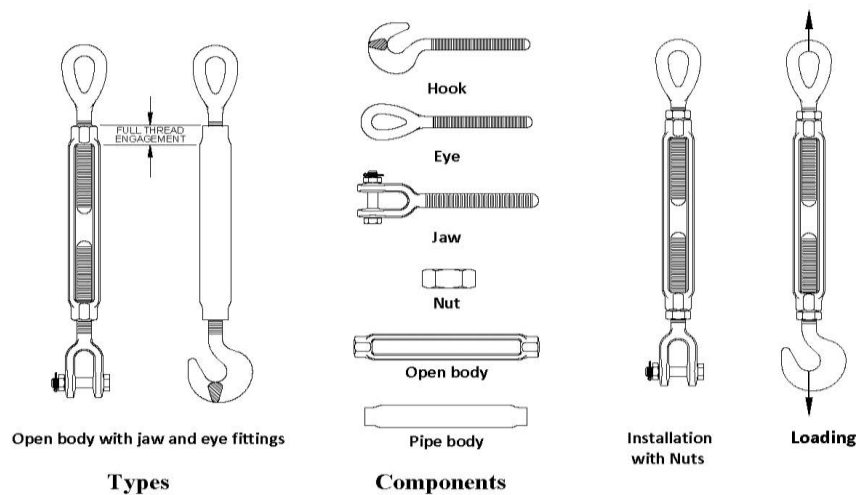


Figure 30-Turnbuckle Types.

- (2) Eyebolts. Follow these rigging practices for eyebolts:
- (a) Eyebolts not shouldered to the load must only be used for in-line loads. (See Figure 31, Eyebolts.)
 - (b) Only shoulder eyebolts must be used for angular lifting.
 - (i) The shoulder must be flush and securely tightened against the load.
 - (ii) The working load limit (WLL) must be reduced as shown in Figure 31.
 - (iii) For angular lifts, the plane of the eye must be aligned with the direction of loading. If needed, flat washers can be used under the shoulder to position the plane of the eye. (See Figure 31.)
 - (c) When using eyebolts in a tapped blind hole, the effective thread length must be at least one and one-half times the diameter of the bolt for engagement in steel. (See Figure 31.) For other engagements, or engagements in other materials, contact the eyebolt manufacturer or a qualified person.
 - (d) When using eyebolts in a tapped through-hole of less than one diameter thickness, a nut must be used under the load, and must be fully engaged and tightened securely against the load. (See Figure 31.)
 - (e) When eyebolts are used in an untapped through-hole, the nut under the load must be fully engaged. If the eyebolt is not shouldered to the load, a second nut on top of the load should be used if possible. (See Figure 31.)

Note: See Figure 31 for examples of eyebolts covered by this rule.

WAC 296-155-56110 (Cont.)

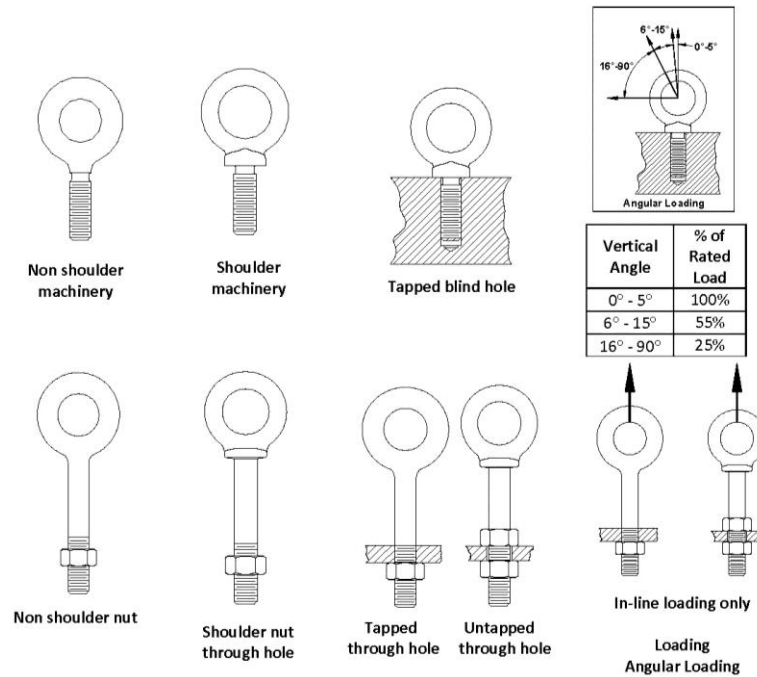


Figure 31-Eyebolts.

- (3) Eye nuts. Follow these rigging practices for eye nuts (see Figure 32, Eye Nuts):
- (a) The threads of eye nuts must be fully engaged;
 - (b) Eye nuts must only be used for in-line loads;
 - (c) Components must be in good working condition prior to use.

WAC 296-155-56110 (Cont.)

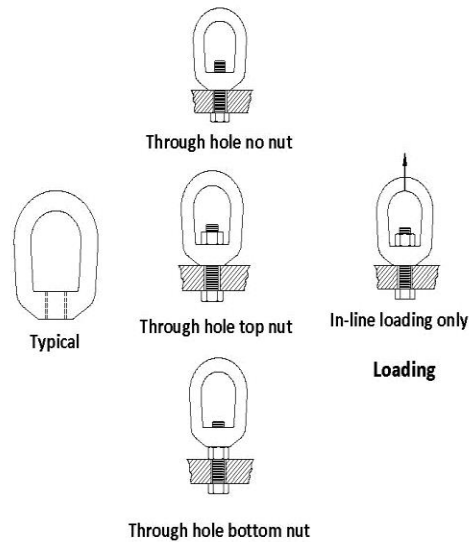


Figure 32-Eye Nuts.

- (4) Swivel hoist rings. Follow these rigging practices for swivel hoist rings:
- (a) The swivel hoist ring working load limit (WLL) must meet or exceed the anticipated angular rigging tension. (See Figure 33, Angle of Loading.)
 - (b) Swivel hoist rings must be tightened to the torque specifications of the manufacturer.
 - (c) The swivel hoist ring must be free to rotate and pivot without interference during lifting. (See Figure 34, Swivel Hoist Rings.)
 - (d) The load applied to the swivel hoist ring must be centered in the bail to prevent side loading.
 - (e) Any attached lifting component must be narrower than the inside width of the bail to avoid spreading.
 - (f) When using swivel hoist rings in a threaded-hole, the effective thread length must be one and one-half times the diameter of the bolt for steel. (See Figure 34.) For other thread engagements or engagement in other materials, contact the manufacturer or a qualified person.
 - (g) When using swivel hoist rings in a through-hole application, a nut and washer must be used. A washer and nut must be in accordance with the manufacturer's recommendations. The nut must be fully engaged. (See Figure 34.)
 - (h) The bushing flange must fully contact the load surface. (See Figure 34.)
 - (i) Spacers or washers must not be used between the bushing flange and the mounting surface of the load being lifted.

Note: See Figure 34 for examples of swivel hoist rings covered by this rule.

WAC 296-155-56110 (Cont.)

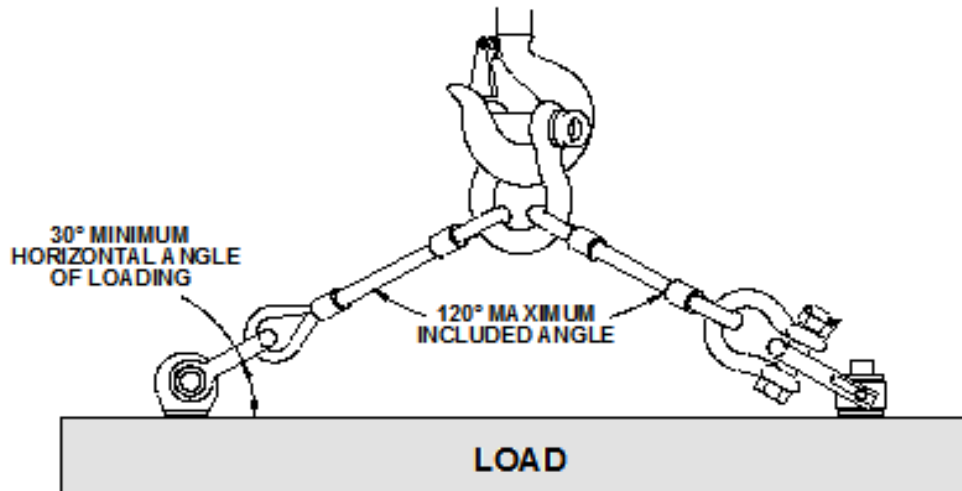


Figure 33-Angle of Loading (Adjustable Hardware).

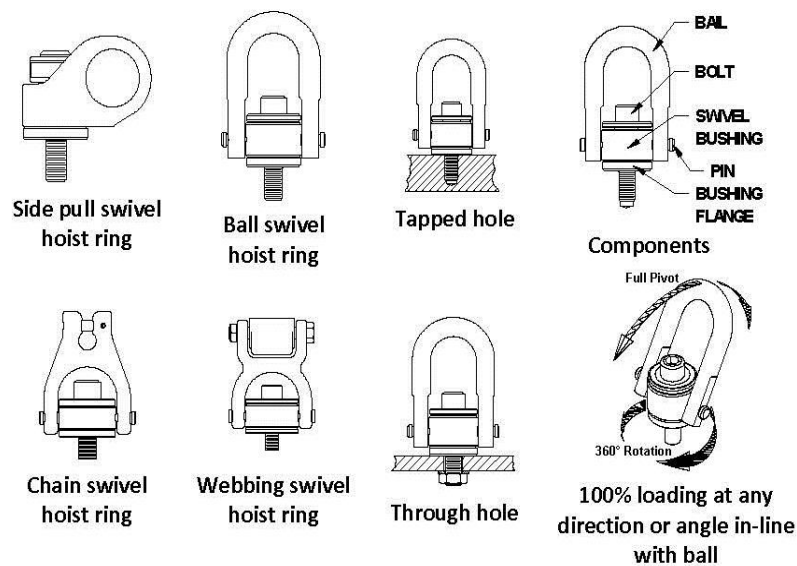


Figure 34-Swivel Hoist Rings.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56110, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56115 Compression hardware.

- (1) Wire rope clips. Follow these assembly requirements for wire rope clips:
- (a) Before installing a wire rope clip on plastic coated or plastic impregnated wire rope, the wire rope clip manufacturer, wire rope manufacturer or a qualified person must be consulted.
 - (b) For U-bolt clips used to create end terminations, the saddle must be placed on the live end of the wire rope, with the U-bolt on the dead end side. (See Figure 35, Wire Rope Clips.)
 - (c) The assembly must be tested by loading the connection to at least the expected working load. After unloading, retighten the wire rope clips to the torque recommended by the manufacturer or a qualified person.
 - (d) Follow the manufacturer's recommendations for the minimum number of clips, spacing and turn-back measurements, and to the recommended torque values. In the absence of the manufacturer's recommendations follow Table 15.

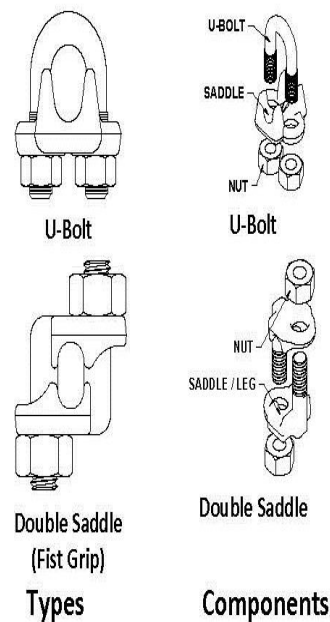


Figure 35-Wire Rope Clips.

WAC 296-155-56115 (Cont.)

- (2) Wedge sockets. Follow these assembly requirements for wedge sockets:
- (a) Wedge sockets must be assembled as recommended by the manufacturer or a qualified person.
 - (b) Before installing a wedge socket on plastic coated or plastic impregnated wire rope the wedge socket manufacturer, wire rope manufacturer or a qualified person must be consulted.
 - (c) The assembler must match the proper wedge with the socket for the wire rope to be installed. Wedges must not be interchanged between different manufacturers' sockets or models.
 - (d) The live end of the wire rope in the wedge socket cavity must be in alignment with the socket's pin. (See Figure 36, Wedge Sockets.)
 - (e) The length of the dead end tail of the wire rope must be as required by the manufacturer or a qualified person.
 - (f) The tail of the dead end of the wire rope extending beyond the wedge socket must be secured as recommended by the wedge socket manufacturer or a qualified person.
 - (g) The dead end of the wire rope must not be secured to the live end of the wire rope in a way that restricts the movement of the live end. (See Figure 36.)
 - (h) After assembly the connection must be loaded to fully seat the wedge before use.

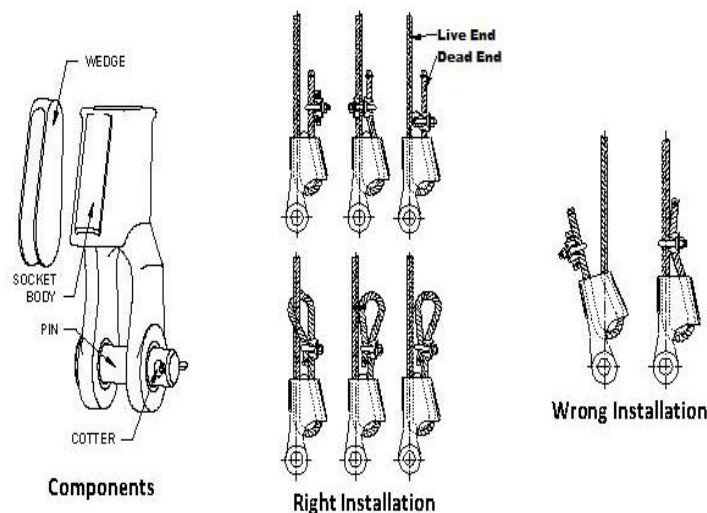


Figure 36-Wedge Sockets.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56115, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56120 Links, rings, and swivels.

- (1) Follow these rigging practices for links and rings:
 - (a) The link or ring must be of the proper shape and size to make sure it seats properly in the hook or lifting device.
 - (b) Multiple slings or rigging hardware gathered in a link or ring must not exceed a one hundred twenty degree included angle. (See Figure 33, Angle of Loading.)

Note: See Figure 37, Links and Rings, for examples of links and rings covered by this rule.

- (2) Follow these rigging practices for swivels:

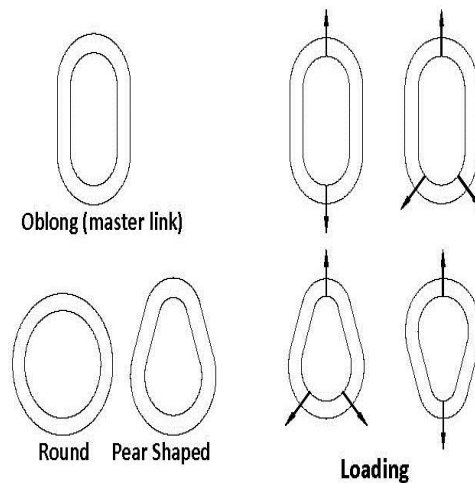


Figure 37-Links and Rings.

- (a) Swivels must only be used on in-line loads. (See Figure 38, Swivels.)

Note: Swivels are positioning hardware, and are not intended to be rotated under load.

- (b) Swivels must be of the proper shape and size to make sure it seats correctly in the hook or lifting device.
- (c) All swivel components must be kept in good working condition.

WAC 296-155-56120 (Cont.)

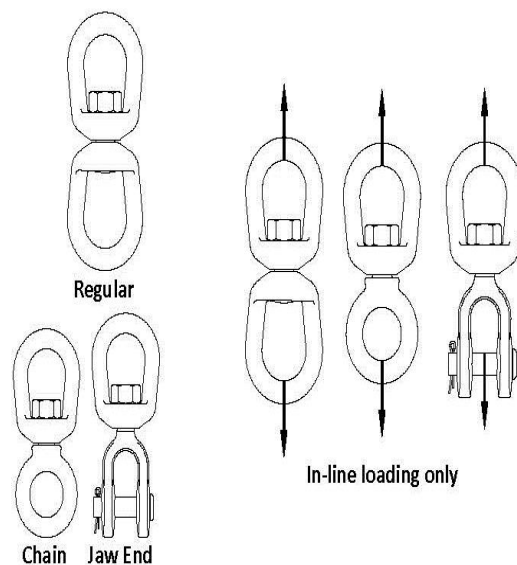


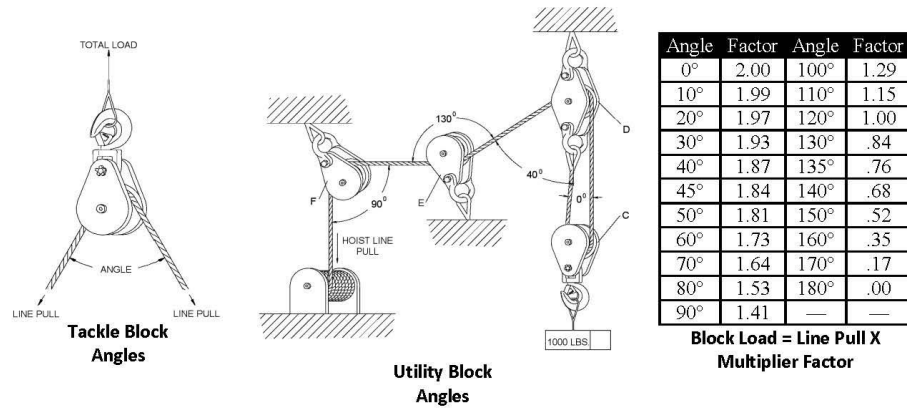
Figure 38-Swivels.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56120, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56125 Rigging blocks.

- (1) The rigging block components must be fully engaged, with all fasteners and retaining devices in place and in good working order before use.
- (2) The rope must be in the sheave groove when the rigging block begins to take load.
- (3) The load line multiplied by the block load factor must not exceed the rated load of the rigging block. (See Figure 39, Block Load Factor Multipliers.)
- (4) Load line fittings must not contact the rigging block sheave(s).

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Example: Load = 1,000 lb
Line Pull: $1,000 \text{ lb} \div 2 = 500 \text{ lb}$
Load Block "C" = $500 \text{ lb} \times 2 = 1,000 \text{ lb}$
(line pull X factor for 0 deg angle)
Load Block "D" = $500 \text{ lb} \times 1.87 + 500 \text{ lb} = 1,435 \text{ lb}$
(line pull X factor for 40 deg angle + dead-end load)
Load Block "E" = $500 \text{ lb} \times 0.84 = 420 \text{ lb}$
(line pull X factor for 130 deg angle)
Load Block "F" = $500 \text{ lb} \times 1.41 = 705 \text{ lb}$
(line pull X factor for 90 deg angle)

Figure 39-Block Load Factor Multipliers.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56125, filed 12/20/11, effective 02/01/12.]

WAC 296-155-562 Lifting devices other than slings and rigging hardware.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-562, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56200 Structural and mechanical lifters.

- (1) Structural and mechanical lifting devices must be constructed in accordance with ASME B30.20-2010, Below-the-Hook Lifting Devices.
- (2) The rated load of the lifting device must be legibly marked on the main structure or on a tag attached to it where it is visible. If the lifting device is made up of several lifters, each detachable from the group, these lifters must also be marked with their individual rated loads.
- (3) All structural and mechanical lifting devices must be marked with the following information:
 - (a) Manufacturer's name and address;
 - (b) Serial number;

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- (c) Lifter weight, if over one hundred pounds (45 kg);
 - (d) Rated load as required in subsection (2) of this section;
 - (e) Name and address of repairer or modifier, when the lifting device has been repaired or modified.
- (4) Installation.
 - (a) Structural and mechanical lifters must be assembled and installed according to manufacturer's instructions.
 - (b) The installer must check for correct rotation of all motors.
- (5) Inspection.
 - (a) A qualified person must inspect all new, altered, repaired, or modified lifting devices according to Tables 30 and 31. The inspection of altered, repaired or modified lifting devices can be limited to the parts affected, if a qualified person determines that is all that is needed.
 - (b) The operator must inspect the lifting device before and during every lift for any indication of damage. Check the following items:
 - (i) Surface of the load for debris;
 - (ii) Condition and operation of the controls; and
 - (iii) Condition and operation of the indicators and meters when installed.
 - (c) Lifting devices must be inspected, by the operator or another competent person, according to Table 30.
 - (i) If any damage is found, have a qualified person determine whether there is a hazard.
 - (ii) Hazardous conditions must be corrected before continuing use.

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Table 30 Structural and Mechanical Lifter Frequent Inspection	
Inspect for:	How often:
Structural members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear on any part of the lifter. 	<ul style="list-style-type: none"> • Normal service – monthly. • Heavy service – weekly to monthly. • Severe service – daily to weekly. • Special or infrequent service – as recommended by a qualified person before and after each occurrence. • Before use, when any lifter has been idle for at least one month.
The device for: <ul style="list-style-type: none"> • Loose or missing: <ul style="list-style-type: none"> - Guards. - Fasteners. - Covers. - Stops. - Nameplates. 	
<ul style="list-style-type: none"> • All functional operating mechanisms for maladjustments interfering with operation. 	
<ul style="list-style-type: none"> • Automatic hold-and-release mechanisms for maladjustments interfering with operation. 	

Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty-five percent of rated load limits.*
- *Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.*
- *Severe service means service that involves normal or heavy service with abnormal operating conditions.*

- (d) A qualified person must perform a periodic inspection on structural and mechanical lifters according to Table 31. Include the items in Table 30 of this section.
- (i) Hazardous conditions must be corrected before continuing use.
 - (ii) Dated inspection reports must be kept of the most recent periodic inspection.

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Table 31 Structural and Mechanical Lifting Device Periodic Inspection	
Inspect for:	How often:
<ul style="list-style-type: none"> • Loose bolts or fasteners. • Cracked or worn gear, pulleys, sheaves, sprockets, bearings, chains, and belts. • Excessive wear of friction pads, linkages, and other mechanical parts. • Excessive wear at hoist hooking points and load support clevises or pins. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly. • Heavy service semiannually. • Severe service – quarterly. • Special or infrequent service – as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences.

Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty-five percent of rated load limits.*
- *Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.*
- *Severe service means service that involves normal or heavy service with abnormal operating conditions.*

(6) Operational tests.

- A qualified person must perform an operational test on new, altered, repaired, or modified lifters before use. The qualified person can limit the testing of altered, repaired or modified lifters to the parts affected.
- The following items must be tested:
 - Lifters with moving parts must be tested to determine that the lifter operates according to the manufacturer's instructions.
 - Lifters with manually operated or automatic latches must be tested to determine that the latch operates according to manufacturer's instructions.
 - All indicator lights, gages, horns, bells, alarms, pointers, and other warning devices must be tested.
- Dated reports of all operational tests must be kept on file.

(7) Repair.

- Structural and mechanical lifting devices must be repaired as follows:
 - Adjustments and testing must be done only by a qualified person;
 - Replacement parts used must be at least equal to the original manufacturer's specifications;
 - The device must be inspected according to subsection (5) of this section before returning to service.

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- (b) The following precautions must be taken before repairs on a lifting device are started:
 - (i) Disconnect, lock out and tag all sources of power “Out of Service,” if applicable;
 - (ii) Tag the lifting device removed from service for repair “Out of Service.”
- (8) Lifting devices must be operated only by qualified personnel.
- (9) Operators must do the following:
 - (a) Test all controls before use, each shift;
 - (b) Consult a competent person before handling the load whenever there is any doubt as to safety;
 - (c) Respond only to instructions from competent persons, except for stop signals. The operator must obey a stop order at all times, no matter who gives it;
 - (d) Do not load the lifting device in excess of its rated load or with any load that it is not specifically designed for;
 - (e) Apply the lifter to the load according to the instruction manual;
 - (f) Check that:
 - (i) Lifter ropes or chains are not kinked.
 - (ii) Multiple part lines are not twisted around each other.
 - (g) Bring the lifter over the load in a way that minimizes swinging;
 - (h) Keep the load or lifter from contacting any obstruction;
 - (i) Set down any attached load and store the lifting device before leaving it;
 - (j) Check that all personnel are clear of the load;
 - (k) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person;
 - (l) Riding on loads or the lifting device is prohibited.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56200, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56205 Vacuum lifters.

- (1) Vacuum lifting devices must be constructed in accordance with ASME B30.20-2010, Below-the-Hook Lifting Devices.
- (2) Rated load.
 - (a) The rated load of each lifter and each pad must be legibly marked on the main structure or on a tag attached to it where it is visible. The marking must refer to the instruction manual for information about decreases in rating due to loads:
 - (i) Rigidity;
 - (ii) Strength;
 - (iii) Overhang;
 - (iv) Surface condition;
 - (v) Angle of load;
 - (vi) Temperature;
 - (vii) Number of pads;
 - (viii) Elevation and vacuum level.
 - (b) If the vacuum lifting device has shut-off valves on individual pads or groups of pads, the rated load of each pad must also be marked.
- (3) The vacuum lifter must be clearly marked on the main structure with all of the following:
 - (a) Manufacturer's name and address;
 - (b) Model number;
 - (c) Serial number;
 - (d) Lifter weight;
 - (e) Electrical power requirements, if applicable;
 - (f) Pressure and volume of compressed air required, if applicable;
 - (g) Rated load, as required in subsection (2) of this section;
 - (h) If repaired or modified, the name, address, and lifter identification of repairer or modifier.
- (4) Installation.
 - (a) Vacuum lifters must be assembled and installed according to manufacturer's instructions.

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- (b) The installer must check:
 - (i) That the power supply is the same as what is shown on the nameplate.
 - (ii) For correct rotation of all motors.
- (c) Connect the electrical power supply to the vacuum lifter to either:
 - (i) The line side of the crane disconnect; or
 - (ii) An independent circuit.
- (5) Inspection.
 - (a) A qualified person must inspect all new, altered, repaired, or modified vacuum lifters. A qualified person can limit the inspection of altered, repaired or modified lifters to the affected parts.
 - (b) The operator must inspect the lifter before and during every lift for any indication of damage, including all of the following:
 - (i) Surface of the load for debris;
 - (ii) Seal of the vacuum pad for debris;
 - (iii) Condition and operation of the controls;
 - (iv) Condition and operation of the indicators, meters and pumps when installed.
 - (c) Lifters must be inspected, by the operator or another competent person, according to Table 32.
 - (d) A qualified person must determine whether signs of damage indicate a hazard.
 - (e) Hazardous conditions must be corrected before continuing use.
 - (f) A qualified person must perform a periodic inspection of vacuum lifters according to Table 33. Include the items in Table 32 of this section.
 - (g) Dated inspection records must be kept on all critical items such as supporting structure, motors, controls, and other auxiliary components.
 - (h) Hazardous conditions must be corrected before continuing use.

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Table 32 Vacuum Lifter Frequent Inspection	
Inspect for:	How often:
Structural members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear. 	<ul style="list-style-type: none"> • Normal service – monthly. • Heavy service – weekly to monthly. • Severe service – daily to weekly. • Special or infrequent service – as recommended by a qualified person before and after each occurrence. • Before using, when a lifting device has been idle for more than one month.
The vacuum generator for output.	
The vacuum pad seal rings for: <ul style="list-style-type: none"> • Cuts. • Tears. • Excessive wear. • Foreign particles. 	
Vacuum lines and connections for: <ul style="list-style-type: none"> • Leakage. • Cuts. • Kinks. • Collapsed areas of hoses. 	
The vacuum reservoir for: <ul style="list-style-type: none"> • Leaks. • Visible damage. 	
The entire vacuum system including indicator lights, gages, horns, bells, pointers or other warning devices, and vacuum level indicators: <ul style="list-style-type: none"> • Attach a nonporous, clean surface to the vacuum pad or pads. • Stop the vacuum source. • Check that the vacuum level in the system does not decrease by more than the manufacturer's specified rate. 	

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Table 33 Vacuum Lifting Device Periodic Inspection	
Inspect for:	How often:
External evidence of: <ul style="list-style-type: none"> • Looseness. • Wear. • Deformation. • Cracking. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly. • Heavy service – semiannually. • Severe service – quarterly. • Special or infrequent service – as recommended by a qualified person before the first such occurrence and as directed by the qualified person for any subsequent occurrences.
External evidence of damage to: <ul style="list-style-type: none"> • Supporting structure. • Motors. • Controls. • Other auxiliary components. 	
Clear warning labels.	

Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty five percent of rated load limits.*
- *Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.*
- *Severe service means service that involves normal or heavy service with abnormal operating conditions.*

(6) Operational tests.

- (a) A qualified person must perform an operational test on new, altered, repaired, or modified vacuum lifters before use. The qualified person can limit the testing of altered, repaired or modified lifters to the parts affected.
- (b) The following items must be tested:
 - (i) Moving parts.
 - (ii) Latches.
 - (iii) Stops.
 - (iv) Limit switches.
 - (v) Control devices.
 - (iv) Vacuum lines.
 - (vii) The seals and connections must be tested for leaks by attaching a smooth nonporous clean material to the vacuum pad or pads and then stopping the vacuum source. The vacuum level in the system must not decrease more than the manufacturer's specified rate.

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- (c) Dated reports of all operations tests must be kept on file.
- (7) Load tests.
 - (a) Prior to initial use, all new, altered, repaired, or modified vacuum lifting devices must be load tested and inspected by a qualified person. The qualified person can limit the test to the areas affected by the alteration, repair or modification.
 - (b) Test loads must not be more than one-hundred and twenty-five percent of the rated load of the system, unless otherwise recommended by the manufacturer or a qualified person.
 - (c) Written reports must be kept confirming the load rating of the vacuum lifting device.
 - (d) The load test must consist of one of the following procedures:
 - (i) Actual load test
 - (A) Attach pads to the designated test load.
 - (B) Raise the test load a small distance to make sure the load is supported by the vacuum-lifting device.
 - (C) Hold the load for two minutes.
 - (D) Lower the load for release.
 - (ii) Simulated load test. Using a test fixture, apply forces to all load bearing components either individually or in assemblies equivalent to the forces encountered by the components if they were supporting a load that was one-hundred and twenty-five of the rated load.
 - (e) After the test, the vacuum lifting device must be visually inspected. Any condition that constitutes a hazard must be corrected before the lifting device is placed in service. If the correction affects the structure, then the lifter must be retested.
- (8) Repair.
 - (a) Repair vacuum lifting devices as follows:
 - (i) Adjustments and testing must be done only by a qualified person.
 - (ii) Use replacement parts that are at least equal to the original manufacturer's specifications.
 - (iii) The lifting device must be inspected before returning to service as required in subsection (5) of this section.
 - (b) Take the following precautions before repairs on a lifting device are started:
 - (i) Move the vacuum-lifting device to an area where it will cause the least interference with other operations.

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- (ii) Disconnect, lock out and tag all sources of power “Out of Service”, if applicable.
 - (iii) Tag the lifting device removed from service for repair “Out of Service”
- (9) Lifting devices must be operated only by qualified personnel.
- (10) Operators must do the following:
 - (a) Test all controls before use during a shift.
 - (b) Consult a competent person before handling the load whenever safety is in doubt
 - (c) Respond only to instructions from competent persons, except for stop orders. The operator must obey a stop order at all times, no matter who gives it.
 - (d) Do not load the lifter in excess of its rated load or with any load that it is not specifically designed for.
 - (e) Apply the lifter to the load according to the manufacturer’s instructions.
 - (f) Check that:
 - (i) Ropes or chains are not kinked.
 - (ii) Multiple part lines are not twisted around each other.
 - (iii) The pad contact surface is clean and free of loose particles.
 - (g) Check that vacuum lines are not:
 - (i) Kinked or twisted.
 - (ii) Wrapped around or looped over parts of the lifting device that will move during the lift.
 - (h) Bring the lifter over the load in a way that minimizes swinging.
 - (i) Lift the load a few inches to make sure that the lifting device was correctly applied.
 - (j) Keep the load or lifter from contacting any obstruction.
 - (k) Do the following if power goes off while making a lift:
 - (i) Warn all people in the area;
 - (ii) Set the load down if possible.
 - (l) Set down any attached load and store the lifting device before leaving it.
 - (m) Check that all personnel are clear of the load.

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- (n) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person.

- (o) Riding on the load or the lifter is prohibited.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56205, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56210 Close proximity lifting magnets.

- (1) Close proximity lifting magnets must be constructed in accordance with ASME B30.20-2010, Below-the-Hook Lifting Devices.
- (2) Rated load.
 - (a) General application magnets must have the rated load (capacity) marked either on the lifting magnet or on a tag attached to it. The marking must refer to the instruction manual for information about decreases in rating due to the loads.
 - (i) Surface condition.
 - (ii) Thickness.
 - (iii) Percentage of contact with the magnet.
 - (iv) Temperature.
 - (v) Metallurgical composition.
 - (vi) Deflection.
 - (b) Specified application magnets must have the rated load (capacity) either on the lifting magnet or on a tag attached to it, referring to the specific loads for which the capacity applies.
- (3) Identification. All close proximity lifting magnets must be marked with the following information:
 - (a) Manufacturer's name and address;
 - (b) Model and lifting magnet unit identification;
 - (c) Weight of lifting magnet;
 - (d) Rated load, as required in subsection (2) of this section;
 - (e) Duty cycle, if applicable;
 - (f) Cold current (amps) at sixty-eight degrees Fahrenheit (twenty degrees Celsius), if applicable; and
 - (g) Voltage of primary power supply or battery, if applicable.
 - (h) If repaired or modified, name and address of repairer or modifier and (a) through (g) of this subsection if changed.

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- (4) Lifting magnets must be installed according to manufacturer's instructions.
- (5) Inspection.
 - (a) A qualified person must inspect all new, altered, repaired, or modified lifting magnets according to Tables 34 and 35. The inspection of altered, repaired or modified lifting magnets can be limited to the parts affected, if a qualified person determines that is all that is needed.
 - (b) The operator must inspect the lifting magnet before and during every lift for any indication of damage. Check all of the following items:
 - (i) Lifting magnet face and surface of the load for foreign materials and smoothness;
 - (ii) Condition and operation of the:
 - (A) Control handle of a manually controlled permanent magnet;
 - (B) Indicators and meters when installed.
 - (c) Lifting magnets must be inspected, by the operator or another competent person, according to Table 34.
 - (d) A qualified person must determine whether signs of damage indicate a hazard.
 - (e) Hazardous conditions must be corrected before continuing use.

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Table 34 Close Proximity Lifting Magnet Frequent Inspection	
Inspect for:	How often:
Structural and suspension members for: <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear on any part of the lifting magnet. 	<ul style="list-style-type: none"> • Normal service – monthly • Heavy service – weekly to monthly • Severe service – daily to weekly • Special or infrequent service – as recommended by a qualified person before and after each occurrence • Before using, when a lifting magnet has been idle for more than one month.
The lifting magnet face for: <ul style="list-style-type: none"> • Foreign materials. • Smoothness. 	
Condition of lifting bail or sling suspension.	
Condition and operation of control handle.	
Condition and operation of indicators and meters, if applicable.	
Electrical conductors, if applicable, that are visible without disassembly for: <ul style="list-style-type: none"> • Loose connections. • Continuity. • Corrosion. • Damage to insulation. 	
Battery operated electromagnets for: <ul style="list-style-type: none"> • Proper level of battery electrolyte. • Corrosion of battery posts or connectors. 	
Cracked housings, welds, and loose bolts.	
Legible labels and marking.	

Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty five percent of rated load limits.*
 - ***Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.***
 - *Severe service means service that involves normal or heavy service with abnormal operating conditions.*
- (f) A qualified person must perform periodic inspections of close proximity lifting magnets according to Table 35. Include the items in Table 34 of this section.
- (g) Dated inspection records must be kept on all critical items such as structural and suspension members, lifting magnet face, lifting bail, control handle, indicators and meters.
- (h) Hazardous conditions must be corrected before continuing use.

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Table 35 Close Proximity Lifting Magnet Periodic Inspection	
Inspect for:	How often:
Members, fasteners, locks, switches, warning labels, and lifting parts for: <ul style="list-style-type: none"> • Deformation. • Wear. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly • Heavy service, unless external conditions indicate that disassembly should be done to permit detailed inspection – quarterly • Severe service—monthly • Special or infrequent service – as recommended by a qualified person before the first occurrence and as directed by the qualified person for any subsequent occurrences.
All electrical components, including controllers, battery, external power supply, power disconnects, meters, indicators, and alarms for: <ul style="list-style-type: none"> • Proper operation. • Condition. 	
Lifting magnet coil must be tested for: <ul style="list-style-type: none"> • Ohmic and ground readings compared to manufacturer's standards. 	

Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty five percent of rated load limits.*
- *Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.*
- *Severe service means service that involves normal or heavy service with abnormal operating conditions.*

(6) Operational tests.

- (a) All new, altered, repaired or modified lifting magnets must be tested either by or under the direction of a qualified person before use. The qualified person can limit the testing of altered, repaired or modified lifting magnets to the parts affected.
- (b) The following items must be tested:
 - (i) Moving parts;
 - (ii) Latches;
 - (iii) Stops;
 - (iv) Switches;
 - (v) Control devices;
 - (vi) Alarms; and

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- (vii) Warning devices, including:
 - (A) Indicator lights;
 - (B) Gauges;
 - (C) Horns;
 - (D) Bells; and
 - (E) Pointers.
 - (c) Dated reports of all operational tests must be kept on file.
- (7) Load tests.
 - (a) Prior to initial use, all new, altered, repaired, or modified close proximity lifting devices must be load tested and inspected by a qualified person. The qualified person can limit the test to the areas affected by the alteration, repair, or modification.
 - (b) The breakaway force of lifting magnets must be tested according to manufacturer's directions or ANSI B30.20-2010.
- (8) Repair.
 - (a) Close proximity lifting magnets must be repaired as follows:
 - (i) Adjustments and testing must be done by or under the direction of a qualified person;
 - (ii) Replacement parts used must be at least equal to the original manufacturer's specifications;
 - (iii) The magnet must be inspected before returning to service as required in subsection (5) of this section.
 - (b) The following precautions must be taken before repairs on a magnet are started:
 - (i) Disconnect, lock out and tag all sources of power "Out of Service," if applicable; and
 - (ii) Tag any lifting magnet removed from service for repair "Out of Service."
- (9) Lifting magnets must be operated only by qualified personnel.

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- (10) Operators must do the following:
- (a) Test all controls before use, each shift;
 - (b) Check all meters and indicators for proper operation before making a lift;
 - (c) Consult a competent person before handling the load whenever there is any doubt as to safety;
 - (d) Respond only to instructions from competent persons, except for stop orders. Operators must obey a stop order at all times, no matter who gives it;
 - (e) Do not load the lifting magnet in excess of its rated load or with any load that it is not specifically designed for;
 - (f) Apply the magnet to the load according to the instruction manual;
 - (g) Check that:
 - (i) Lifter ropes or chains are not kinked;
 - (ii) Multiple part lines are not twisted around each other;
 - (iii) The lifting magnet face and the contact area on the load are clean.
 - (h) Bring the magnet over the load in a way that minimizes swinging;
 - (i) Lift the load a few inches to make sure that the lifting magnet has been correctly applied;
 - (j) Keep the load or lifting magnet from contact with any obstruction;
 - (k) Set down any attached load and store the lifting magnet before leaving it;
 - (l) Check that all people near the lift are warned before lifting;
 - (m) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person; and
 - (n) Riding on loads or the lifting magnet is prohibited.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56210, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56215 Remotely operated lifting magnets.

- (1) Remotely operated lifting magnets must be constructed in accordance with ASME B30.20-2010, Below-the-Hook Lifting Devices.
- (2) Identification. All remotely operated lifting magnets must be marked with the following information:
 - (a) Manufacturer's name and address;
 - (b) Model or unit identification;

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- (c) Weight of lifting magnet;
 - (d) Duty cycle;
 - (e) Cold current;
 - (f) Voltage;
 - (g) If repaired or modified, name and address of repairer or modifier and (a) through (g) of this subsection if changed.
- (3) Lifting magnets must be installed according to manufacturer's instructions.
- (4) Inspections.
- (a) A qualified person must inspect all new, altered, repaired or modified lifting magnets according to Tables 36 and 37. A qualified person can limit the inspection of altered, repaired or modified lifting magnets to the parts affected.
 - (b) Lifting magnets must be inspected, by the operator or another competent person, according to Table 36.
 - (c) A qualified person must determine whether signs of damage indicate a hazard.
 - (d) Hazardous conditions must be corrected before continuing use.
 - (e) A qualified person must perform periodic inspections of remotely operated lifting magnets according to Table 37. Include the items in Table 36.
 - (f) Make records of apparent external conditions to provide the basis for a continuing evaluation.
 - (g) Hazardous conditions must be corrected before continuing use.

Table 36 Remotely Operated Lifting Magnet Frequent Inspection	
Inspect for:	How often:
Structural and suspension members for <ul style="list-style-type: none"> • Deformation. • Cracks. • Excessive wear on any part of the lifting magnet. 	<ul style="list-style-type: none"> • Normal service – monthly. • Heavy service – weekly to monthly. • Severe service – daily to weekly. • Special or infrequent service – as recommended by a qualified person before and after each occurrence. • Before using, when a lifting magnet has been idle for more than one month.
The lifting magnet face for <ul style="list-style-type: none"> • Foreign materials. • Smoothness. 	
Electrical conductors that are visible without disassembly.	
Cracked housings, welds, and loose bolts.	

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Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty five percent of rated load limits.*
- *Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.*
- *Severe service means service that involves normal or heavy service with abnormal operating conditions.*

Table 37	
Remotely Operated Lifting Magnet Periodic Inspection	
Inspect for:	How often:
Members, fasteners, and lifting parts for: <ul style="list-style-type: none"> • Deformation. • Wear. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly. • Heavy service– quarterly. • Severe service–monthly. • Special or infrequent service – as recommended by a qualified person before the first occurrence and as directed by the qualified person for any subsequent occurrences.
All electrical components for: <ul style="list-style-type: none"> • Proper operation. • Condition. 	
Magnet coil, for: <ul style="list-style-type: none"> • Ohmic and ground readings compared to manufacturer's standards. 	

- (5) Operational tests.
- (a) All new, altered, repaired or modified lifting magnets must be tested either by or under the direction of a qualified person before use. The qualified person can limit the testing of altered, repaired or modified lifting magnets to the parts affected.
- (b) The following items must be tested:
- (i) All electrical equipment for proper operation;
- (ii) Warning devices, including:
- (A) Indicator lights;
- (B) Gauges;
- (C) Horns;
- (D) Bells; and
- (E) Pointers.
- (c) Dated reports of all operational tests must be kept on file.

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- (6) Repair.
 - (a) Remotely operated lifting magnets must be repaired as follows:
 - (i) Have adjustments and testing done only by or under the direction of a qualified person;
 - (ii) Use replacement parts that are at least equal to the original manufacturer's specifications; and
 - (iii) Inspect the lifter according to subsection (4) of this section, before returning to service.
 - (b) The following precautions must be taken before repairs on a lifter are started:
 - (i) Disconnect, lock out and tag all sources of power "Out of Service."
 - (ii) Tag any magnet removed from service for repair "Out of Service."
- (7) Lifting devices must be operated only by qualified personnel.
- (8) Operators must do the following:
 - (a) Test all controls before use during a shift;
 - (b) Consult a competent person before handling the load whenever there is any doubt as to safety;
 - (c) Respond only to instructions from competent persons, except for stop orders. Operators must obey a stop order at all times, no matter who gives it;
 - (d) Do not load the lifting magnet in excess of its rated load or with any load that it is not specifically designed for;
 - (e) Apply the lifting magnet to the load according to the instruction manual;
 - (f) Check that:
 - (i) Lifter ropes or chains are not kinked;
 - (ii) Multiple part lines are not twisted around each other.
 - (g) Bring the lifting magnet over the load in a way that minimizes swinging;
 - (h) Keep the load or magnet from contact with any obstruction;
 - (i) Set down any attached load and store the lifting magnet before leaving it;
 - (j) Check that all people are clear of the load;
 - (k) Using the lifter for side pulls or sliding the load is prohibited, unless specifically authorized by a qualified person; and
 - (l) Riding on loads or the lifting magnet is prohibited.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56215, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56220 Scrap and material handling grapples.

- (1) Grapples must be constructed in accordance with ASME B30.20-2010, Below-the-Hook Lifting Devices.
- (2) Identification. All grapples must be marked with the following information:
 - (a) Manufacturer's name and address;
 - (b) Serial number or unit identification;
 - (c) Grapple weight;
 - (d) Rated voltage, if applicable;
 - (e) Operating hydraulic pressure(s), if applicable;
 - (f) Rated capacity;
 - (g) If repaired or modified, name and address of repairer or modifier and (a) through (f) of this subsection if changed.
- (3) Grapple installation.
 - (a) Grapples must be installed according to manufacturer's instructions.
 - (b) The hydraulic flows and pressures must be the same as shown in the manufacturer's instructions.
- (4) Inspections.
 - (a) A qualified person must inspect all new, altered, repaired and modified grapples according to Table 38. A qualified person can limit the inspection of altered, repaired or modified grapples to the parts affected.
 - (b) Grapples must be visually inspected each shift they are used, by the operator or another competent person, according to Table 38.
 - (c) A qualified person must determine whether signs of damage indicate a hazard.
 - (d) Hazardous conditions must be corrected before continuing use.

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Table 38 Grapple Frequent Inspection	
Inspect for:	How often:
Structural members for:	<ul style="list-style-type: none"> • Normal service – monthly. • Heavy service – weekly to monthly. • Severe service – daily to weekly. • Special or infrequent service – as recommended by a qualified person before and after each occurrence. • Before using, when a grapple has been idle for more than one month.
• Deformation.	
• Cracks.	
• Excessive wear on any part of the grapple.	
Pins and bushings.	
Hydraulic lines.	
Hydraulic cylinders.	
Loose bolts.	
Electrical conductors that are visible without disassembly.	

Note:

- *Normal service means service that involves operation with various weights within the rated load limit, averaging less than sixty five percent of rated load limits.*
 - *Heavy service means service that involves operation within the rated load limit, that exceeds the limits of normal service.*
 - *Severe service means service that involves normal or heavy service with abnormal operating conditions.*
- (e) A qualified person must perform a periodic inspection of grapples according to Table 39. Include the items from Table 38 of this section.
- (f) Data inspection reports must be kept on critical items such as structural members, fasteners, lifting parts, hydraulic hoses, fittings and tubing, hydraulic motors and hydraulic cylinders.
- (g) Hazardous conditions must be corrected before continuing use.

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Table 39 Grapple Periodic Inspection	
Inspect for:	How often:
Members, fasteners, and lifting parts for: <ul style="list-style-type: none"> • Deformation. • Wear. • Corrosion. 	<ul style="list-style-type: none"> • Normal service for equipment in place – yearly. • Heavy service, unless external conditions indicate that disassembly should be done to permit detailed inspection – quarterly. • Severe service—monthly. • Special or infrequent service – as recommended by a qualified person before the first occurrence and as directed by the qualified person for any subsequent occurrences.
Hydraulic hose, fittings, and tubing for: <ul style="list-style-type: none"> • Evidence of leakage at the surface of the hose or its junction with metal couplings. • Blistering or abnormal deformation of the outer covering of the hose. • Leakage at threaded or clamped joints that cannot be eliminated by normal tightening or recommended procedures. • Excessive abrasion or scrubbing on the outer surface of hoses, rigid tubes, or fittings. 	
Hydraulic motors for: <ul style="list-style-type: none"> • Loose bolts or fasteners. • Leaks at joints between sections. • Shaft seal leaks. • Unusual noises or vibration. • Loss of operating speed. • Excessive heating of the fluid. • Loss of pressure. 	
Hydraulic cylinders for: <ul style="list-style-type: none"> • Drifting caused by fluid leaking across the piston seals. • Rod seal leakage. • Leaks at welded joints. • Scored, nicked, or dented cylinder rods. • Dented case (barrel). • Loose or deformed rod eyes or connecting joints. 	
All electrical components, including meters, indicators and alarms for: <ul style="list-style-type: none"> • Proper operation. • Condition. 	

(5) Operational tests.

- (a) All new, altered, repaired or modified grapples must be tested either by or under the direction of a qualified person before use. The qualified person can limit the testing of altered, repaired or modified grapples to the parts affected.
- (b) All warning devices must be tested, including:

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- (i) Indicator lights;
 - (ii) Gauges;
 - (iii) Horns;
 - (iv) Bells;
 - (v) Pointers;
 - (vi) Other warning devices.
- (c) Dated reports of all operational tests must be kept on file.
- (6) Repair.
 - (a) Grapples must be repaired as follows:
 - (i) Have adjustments and testing done only by or under the direction of a qualified person;
 - (ii) Use replacement parts that are at least equal to the original manufacturer's specifications;
 - (iii) Inspect the grapple according to subsection (4) of this section, before returning to service;
 - (b) The following precautions must be taken before repairs on a grapple are started:
 - (i) Disconnect, lock out and tag all sources of power "Out of Service";
 - (ii) Tag any grapple removed from service for repair "Out of Service".
- (7) Grapples must be operated only by qualified personnel.
- (8) Operators must do the following:
 - (a) Test all controls before use during a shift.
 - (b) Check all meters and indicators for proper operation before making a lift.
 - (c) Consult a competent person before handling the load whenever there is any doubt as to safety.
 - (d) Respond only to instructions from competent persons, except for stop orders. An operator must obey a stop order at all times, no matter who gives it.
 - (e) Do not load grapples in excess of the rated load or with any load that they are not specifically designed for.
 - (f) Apply the grapple to the load according to the instruction manual.

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- (g) Bring the grapple over the load in a way that minimizes swinging.
- (h) Keep the load or grapple from contact with any obstruction.
- (i) Set down any attached load and store the grapple before leaving it.
- (j) Do not let anyone ride on loads or the grapple.
- (k) Check that all people stay clear of the load.

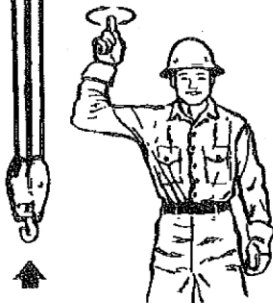
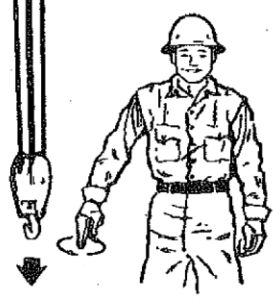


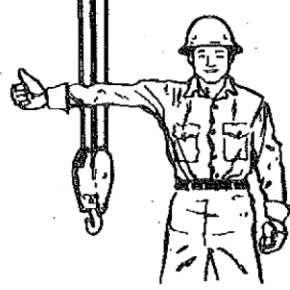
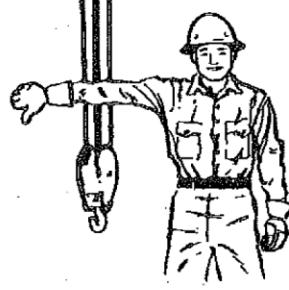
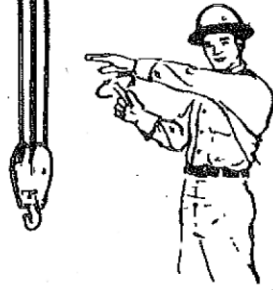
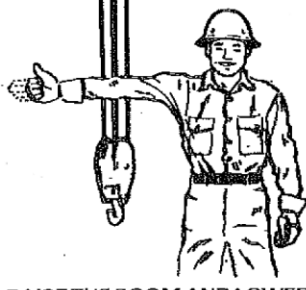
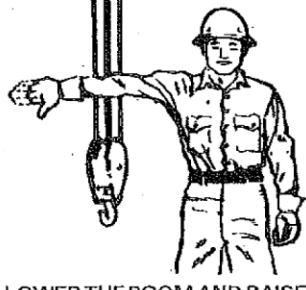
[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56220, filed 12/20/11, effective 02/01/12.]

WAC 296-155-564 Appendices.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-564, filed 12/31/12, effective 02/01/13. Statutory Authority: RCWs 49.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-564, filed 12/20/11, effective 02/01/12.]

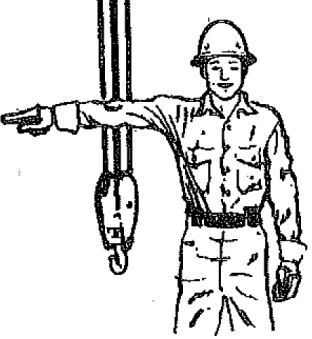
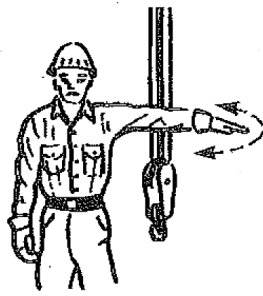
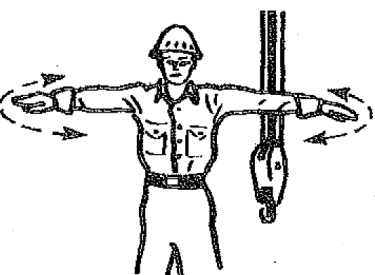
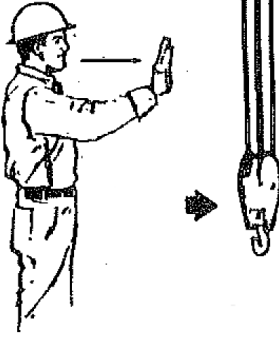
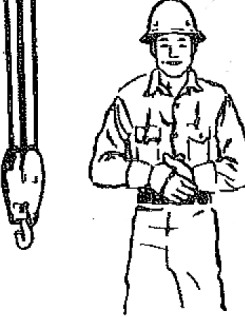
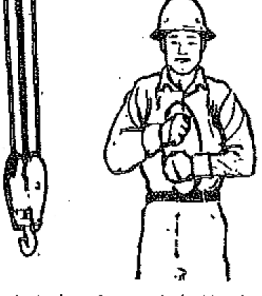
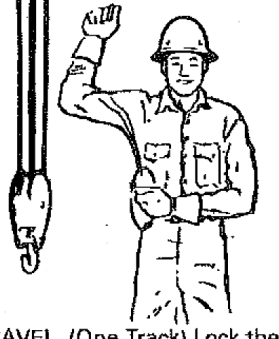

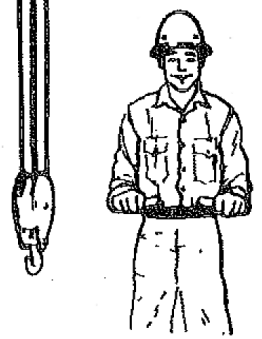
WAC 296-155-56400 Mobile Crane Hand Signal Chart.

Standard Hand Signals for Controlling Crane Operations

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

WAC 296-155-56400 (Cont.)

Standard Hand Signals for Controlling Crane Operations

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

WAC 296-155-56400 (Cont.)

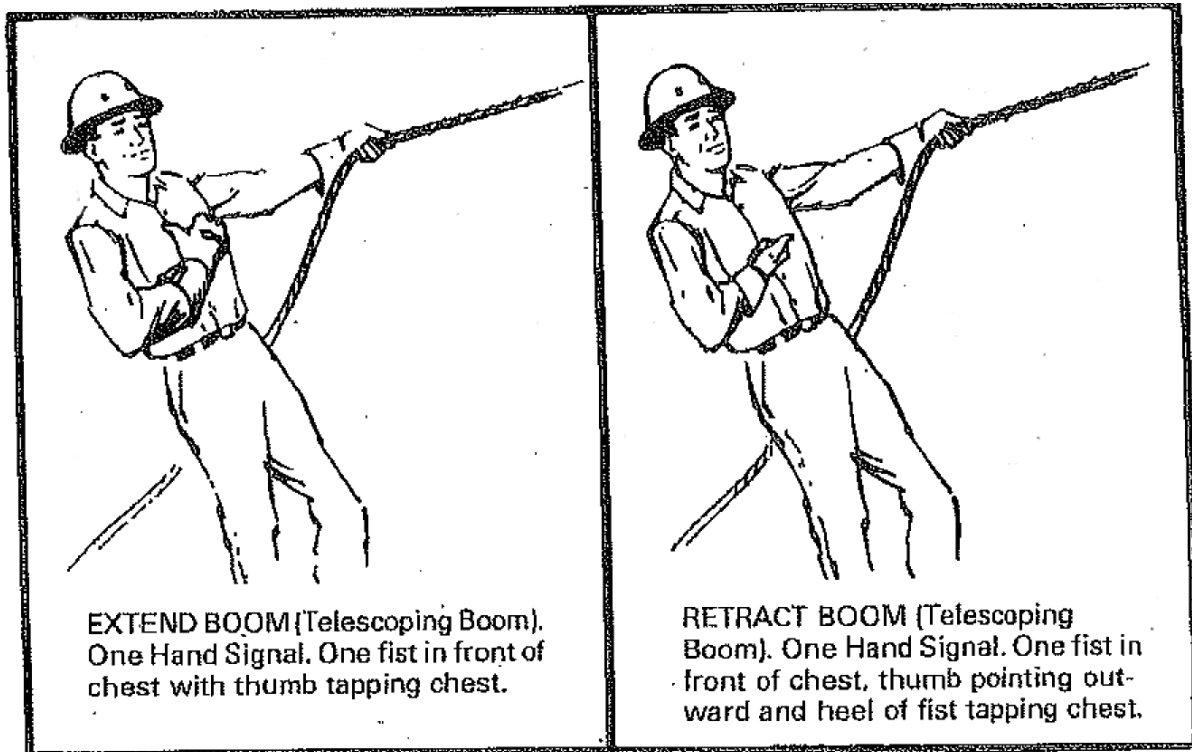
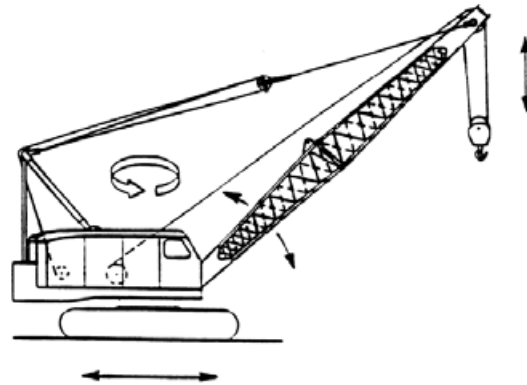


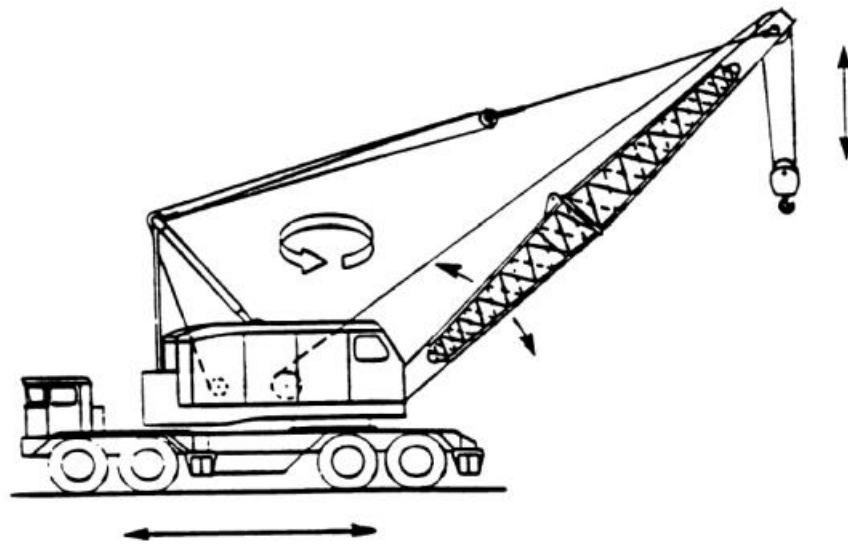
Figure 40-Standard Hand Signals for Controlling Crane Operations.

[Statutory Authority: RCW 49.17.010, .004, .050, and .060. 13-02-068 (Order 12-14), § 296-155-56400, filed 12/31/12, effective 02/01/13.]

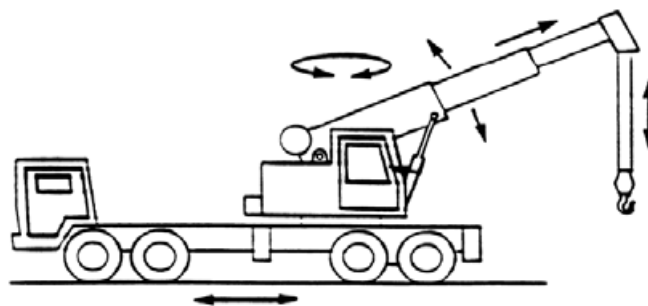
WAC 296-155-56405 Examples of types of cranes.



Lattice Boom Crawler Crane (LBC)



Lattice Boom Truck Crane (LBT)



**Large Telescoping Boom Crane
(Swing Cab)**

WAC 296-155-56405 (Cont.)

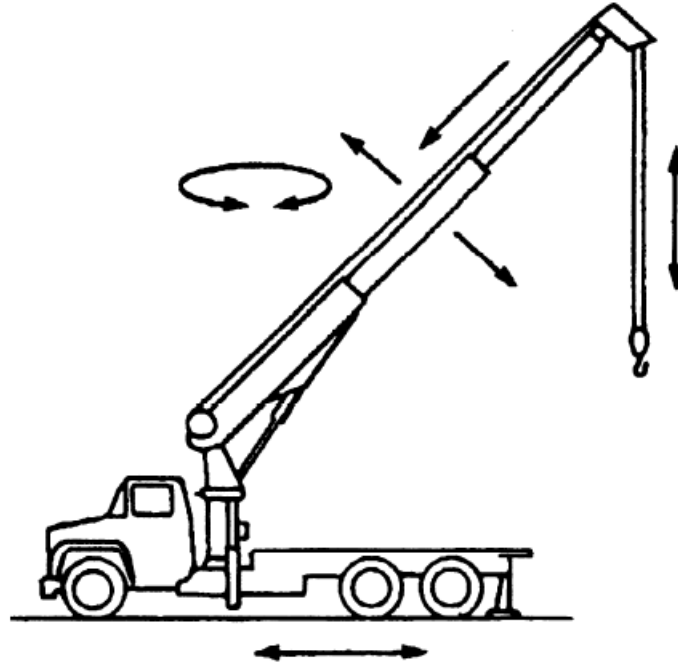
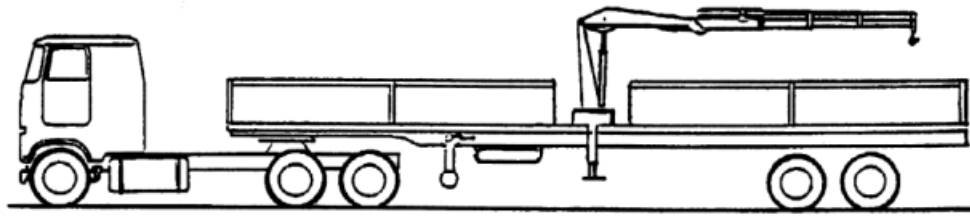
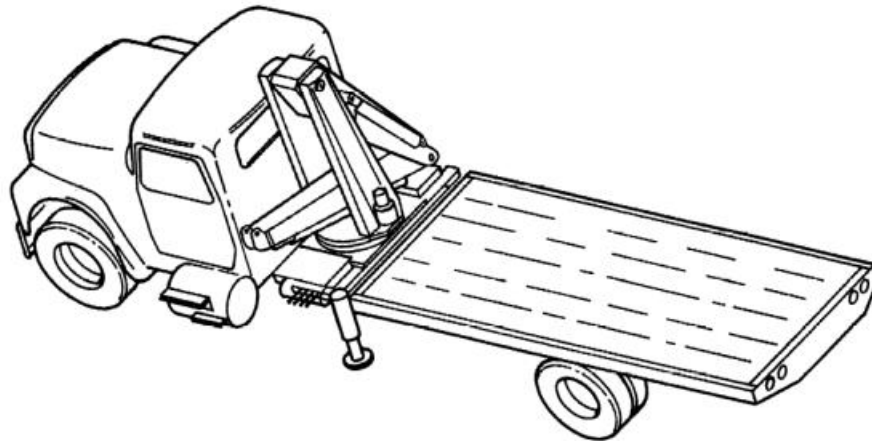


Figure 41-Small Telescoping Boom Crane (Fixed Cab) Mobile Crane Types.

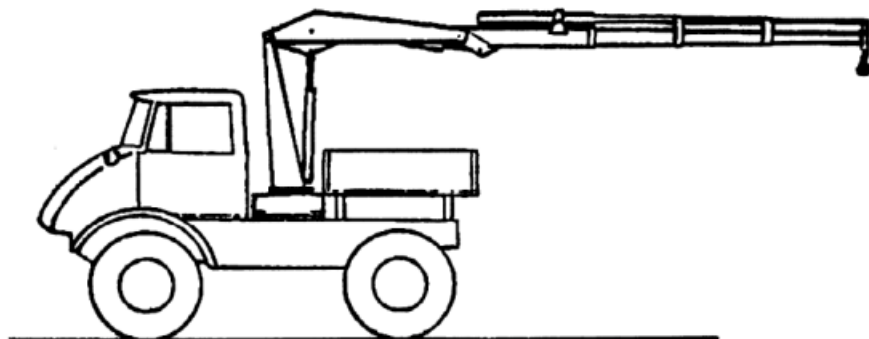
WAC 296-155-56405 (Cont.)



Articulating Boom Crane – Trailer Mounted

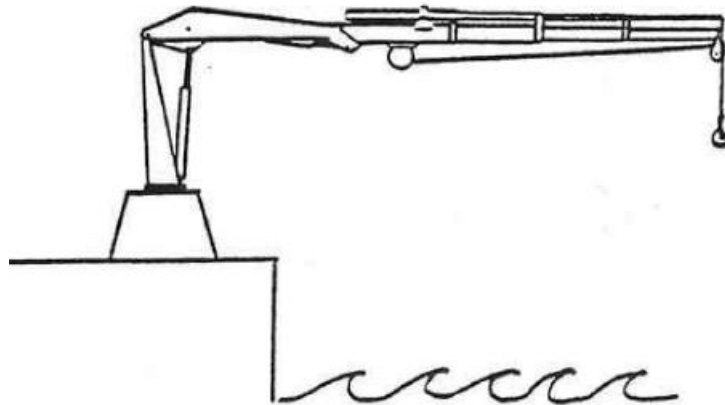


Articulating Boom Crane – Truck Mounted



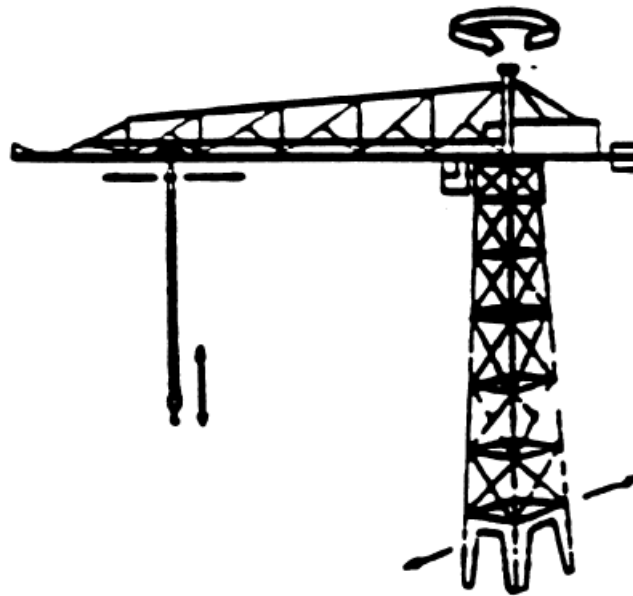
Articulating Boom Crane – Off Road Vehicle

WAC 296-155-56405 (Cont.)

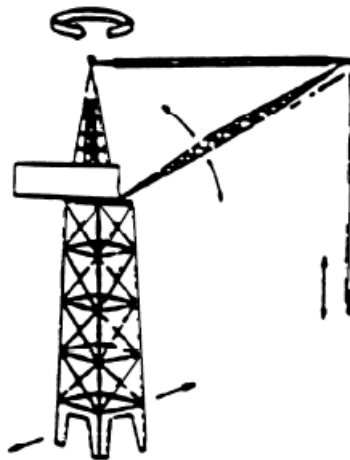


**Figure 42-Articulating Crane-Stationary Installation
Articulating Boom Crane.**

WAC 296-155-56405 (Cont.)



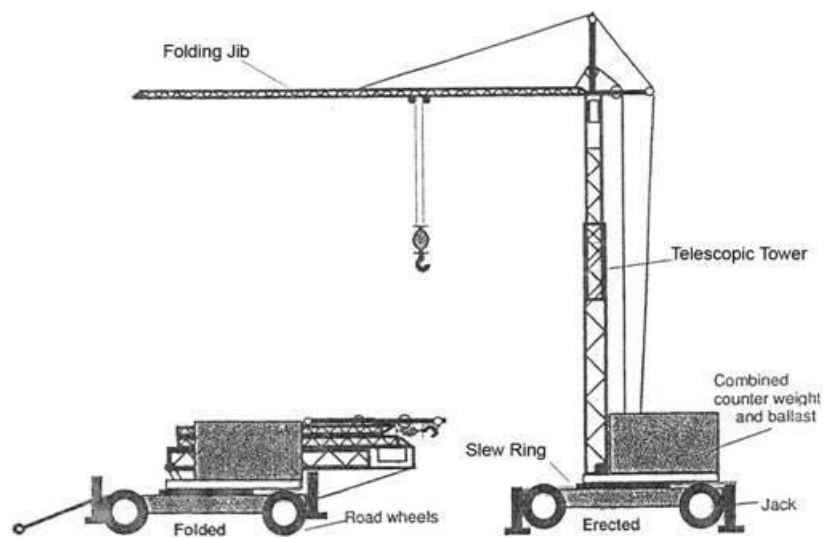
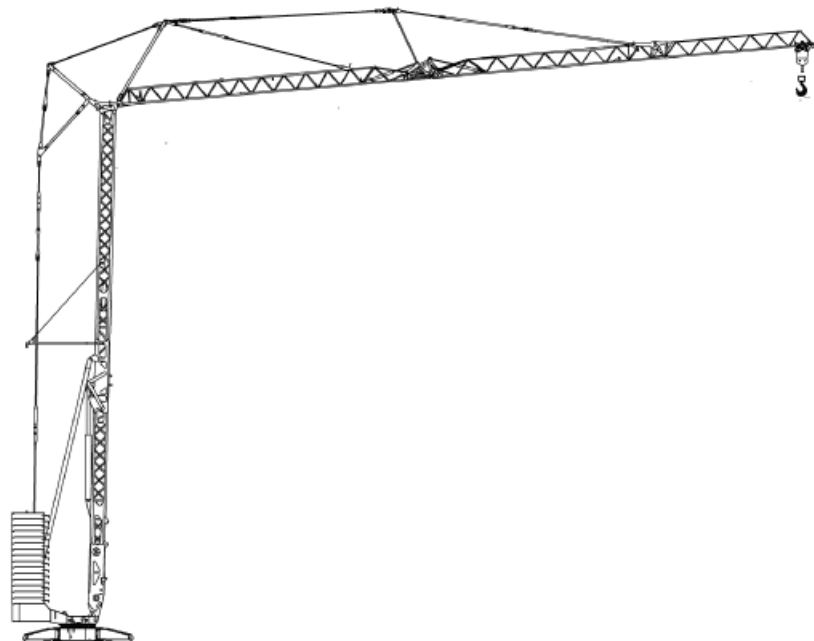
Hammerhead Tower Crane



Luffing Boom Tower Crane

Figure 43-Tower Crane Types.

WAC 296-155-56405 (Cont.)



WAC 296-155-56405 (Cont.)

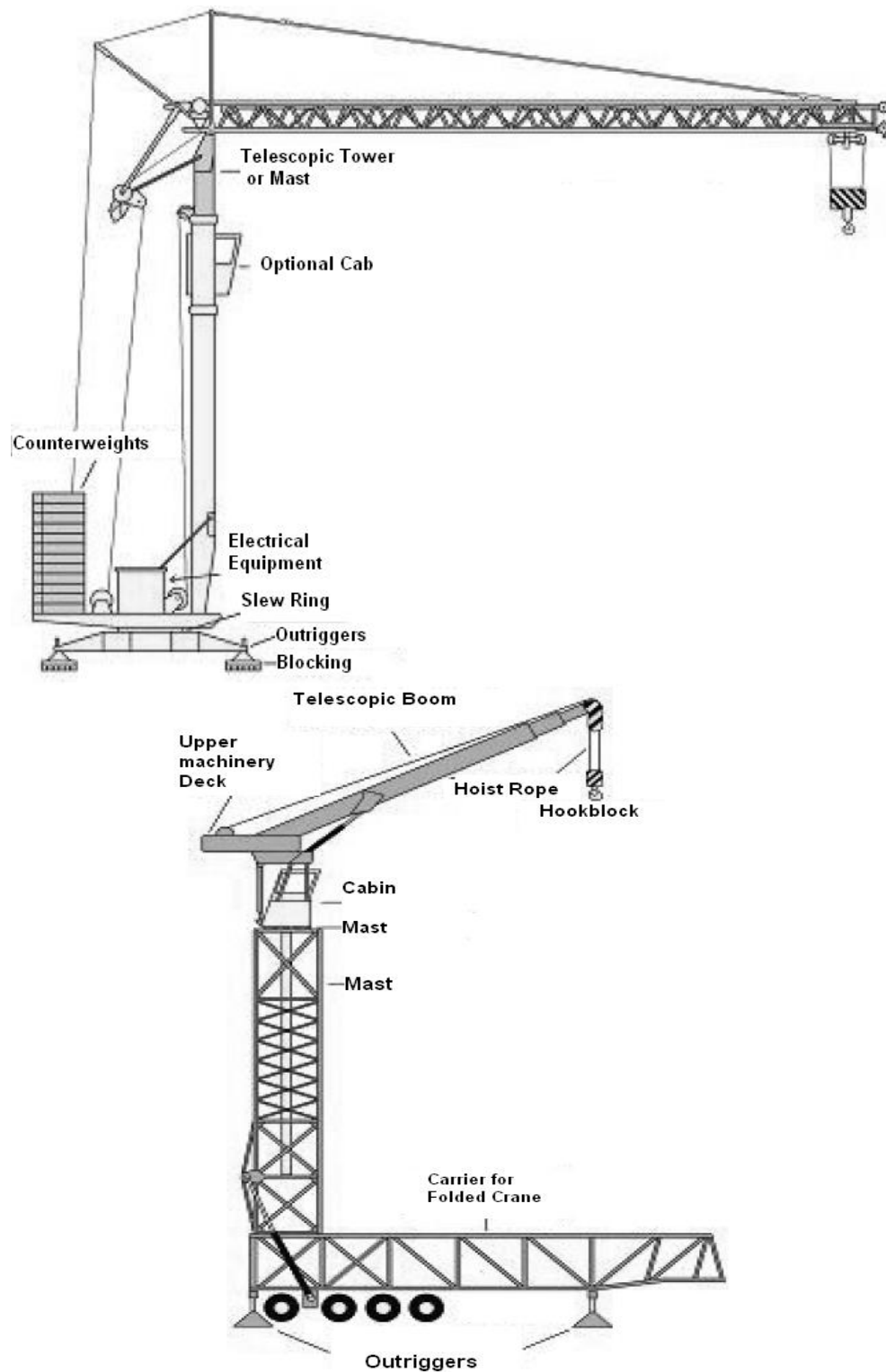
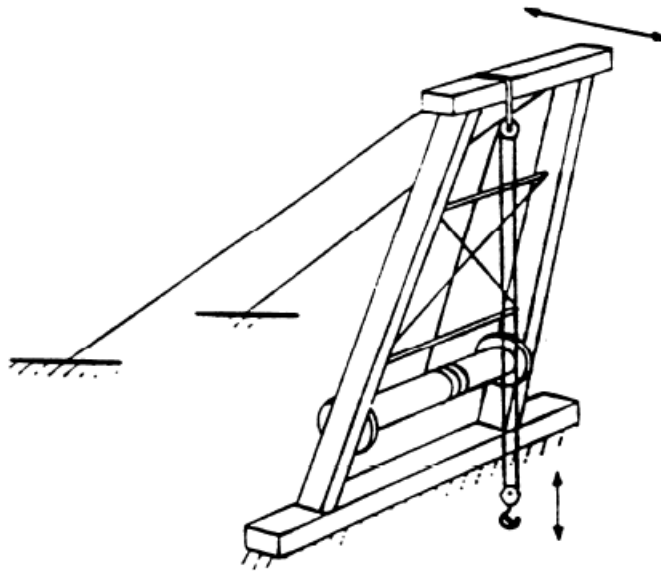
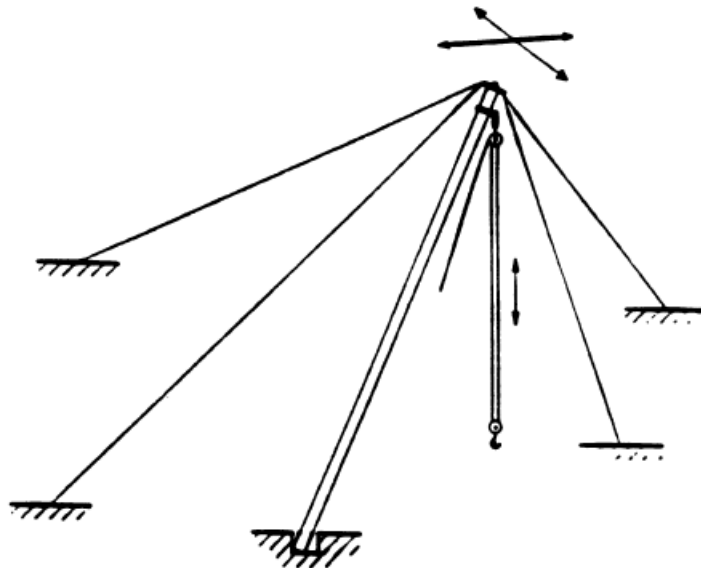


Figure 44-Types of Self-Erecting Tower Cranes.

WAC 296-155-56405 (Cont.)

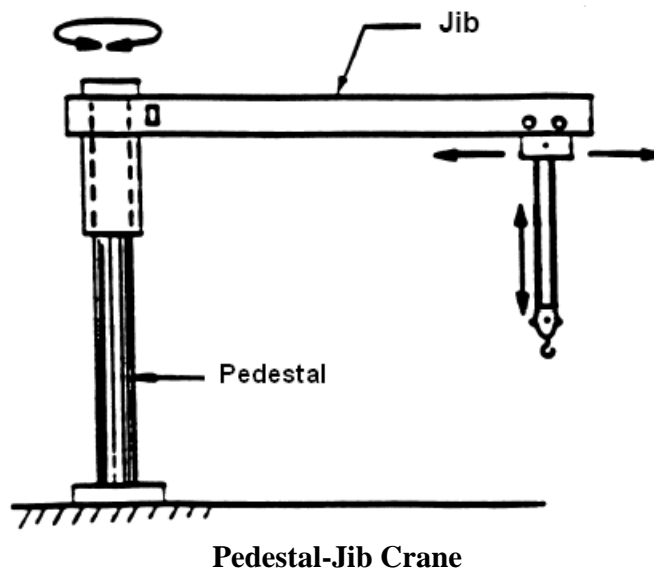
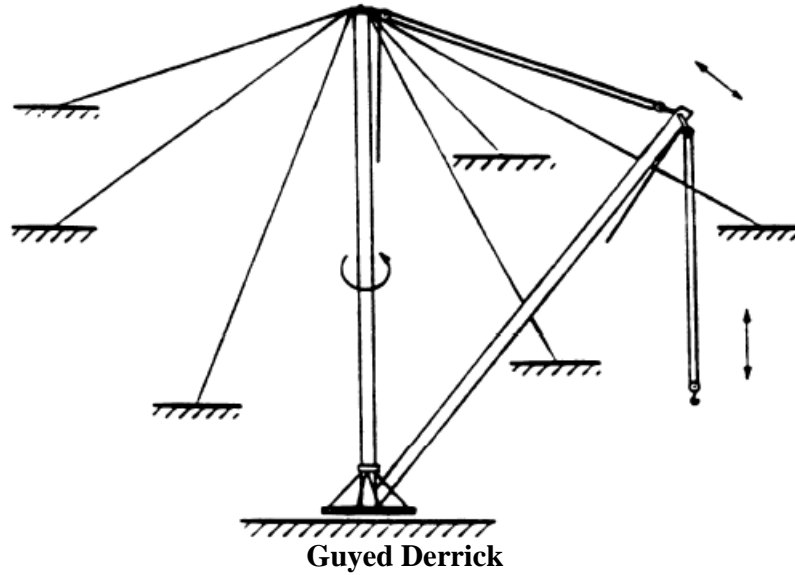


Breast Derrick

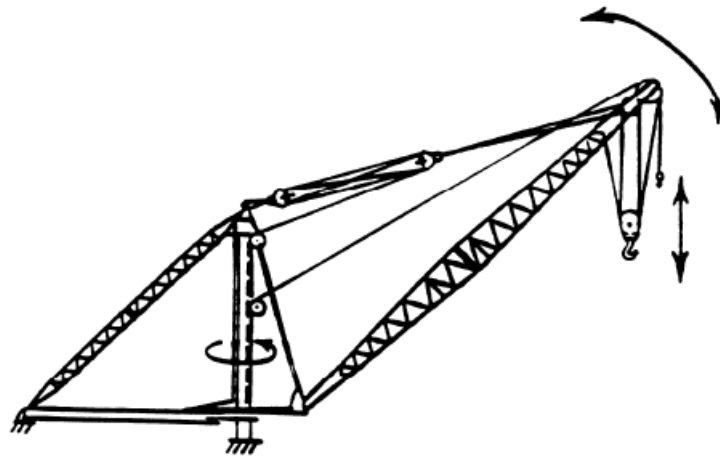


Gin-Pole Derrick

WAC 296-155-56405 (Cont.)



WAC 296-155-56405 (Cont.)



Stiff Leg Derrick

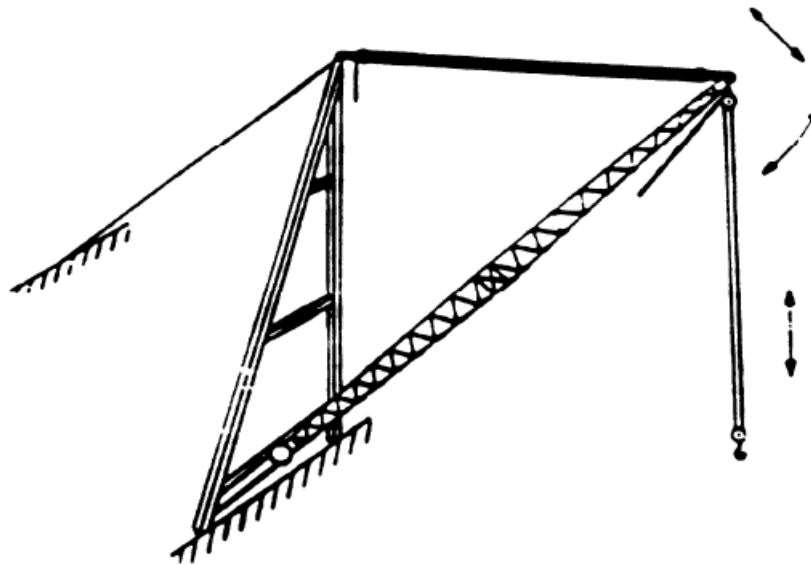
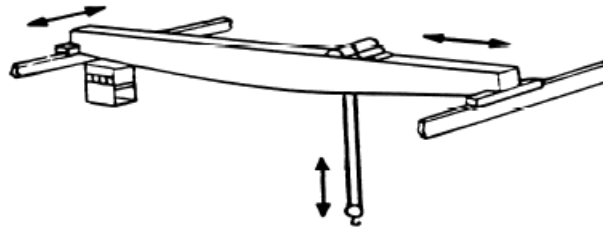
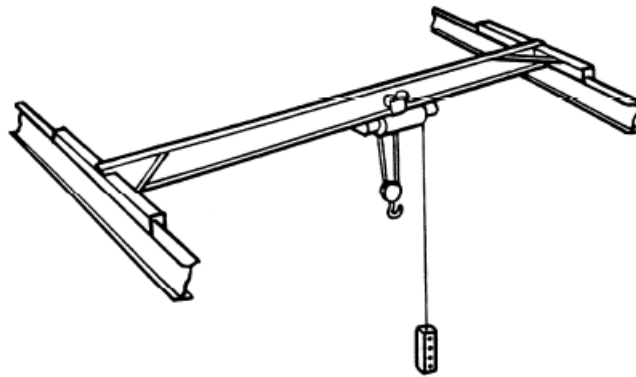


Figure 45-A-Frame Derrick
Types of Derricks.

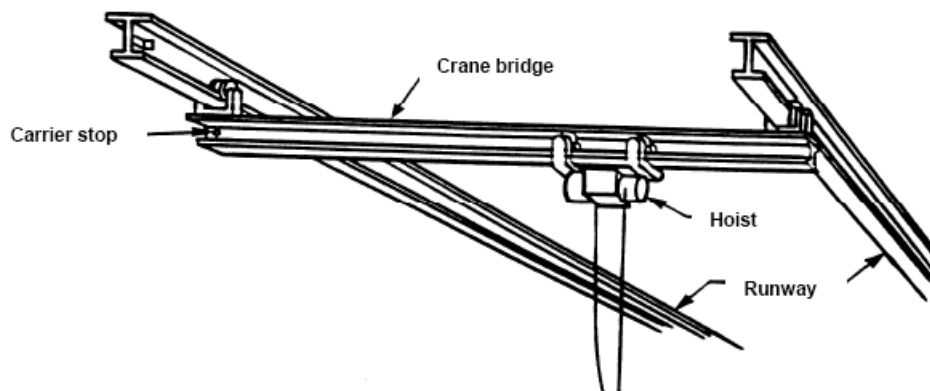
WAC 296-155-56405 (Cont.)



Top Running Bridge/Top Running Trolley

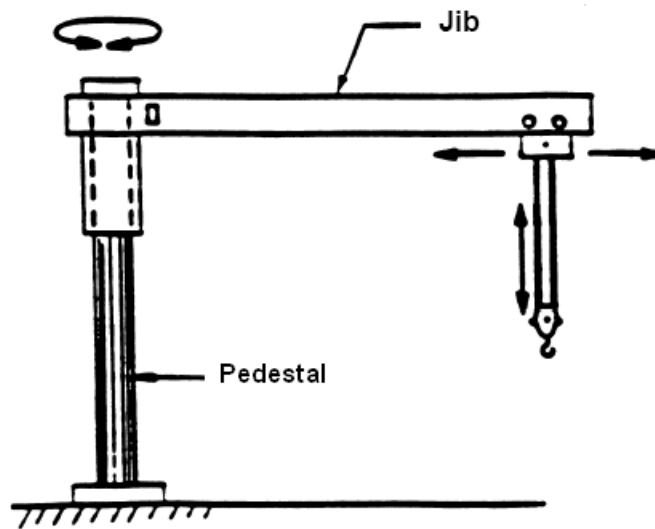


Top Running Bridge/Underhung Trolley

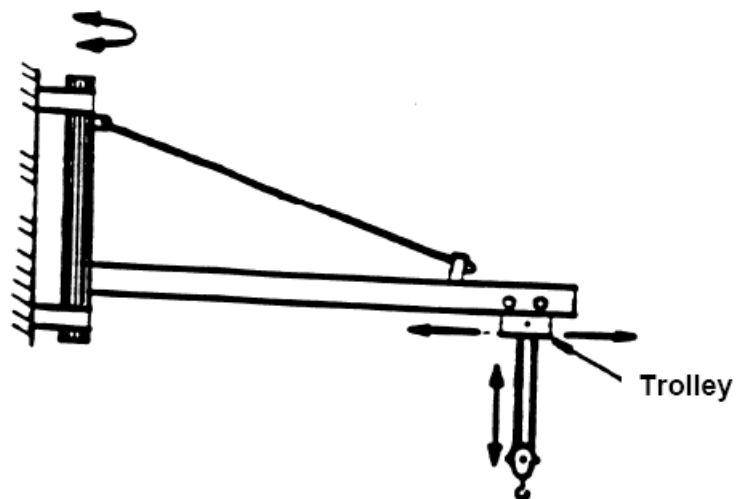


Underhung Bridge/Underhung Trolley

WAC 296-155-56405 (Cont.)



Pedestal-Jib Crane



Jib Crane (Wall Mounted)

WAC 296-155-56405 (Cont.)

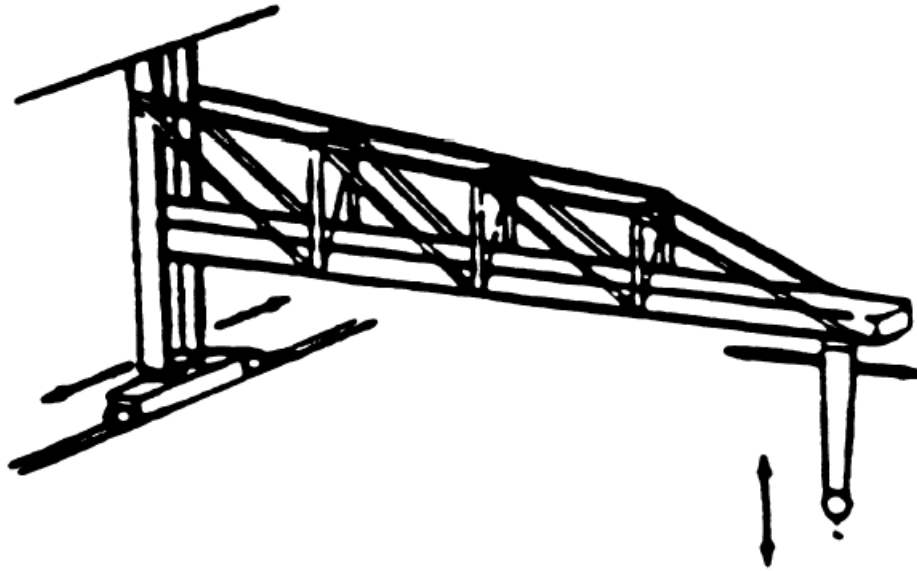


Figure 46-Types of Bridge Cranes.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56405, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56410 Personnel Platform Lift Planning and Authorization Form.

Personnel Platform Lift Planning and Authorization Form

1. Location: _____ Date: _____

2. Purpose of the Lift: _____

3. Hoisting Equip. Mfg: _____ Model #: _____ Serial: _____

4. Expected Radius: _____ (maximum) _____ (at work location)

5. (a) Rated Load at Radius: _____ (b) Maximum Lift Load: _____ [50% of 5(a)]

6. Platform ID: _____ Platform Rating: _____

7. Platform Weight: _____ Type: (Pin On) _____ (Suspended) _____

8. (a) Number of Platform Occupants: _____ (b) Approx. Wt. (With Equip.) _____

9. Total Lift Weight: _____ [7 + 8(b)] [No more than 5(b) above]

10. Personnel Supervisor: _____

11. What are the Alternatives to This Lift? _____

12. Why are they not being used? _____

13. Pre-Lift Briefing Held (Date & Time): _____ / _____ / _____ AM/PM

Attendees: _____

14. Anticipated Hazards (wind, weather, visibility, power lines): _____

15. Lift Accomplished Date: _____ Time: _____

16. Remarks: _____

Employer Signature Date

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56410, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56415 Qualifications for operators of below the hook lifting devices.

Table 40 Qualifications for Operators of Below the Hook Lifting Devices	
Type of Lifter	Knowledge of
All lifters	<ul style="list-style-type: none"> Any special operations or precautions. Manufacturer's suggested operating procedures. Storage requirements of the lifter to protect it from damage.
Structural & Mechanical Vacuum. Close Proximity Lifting Magnets. Remotely Operated Lifting Magnets.	<ul style="list-style-type: none"> Application of the lifter to the load and adjustments, if any, that adapt the lifter to various sizes or kinds of loads. Condition of the load, such as but not limited to: <ul style="list-style-type: none"> Balance. Surface cleanliness. Flatness. Bending. Load thickness. Not exceeding the rated load of the lifting device nor the capacity of the hoisting equipment by the combined weight of the load, lifting device, and rigging. The proper attachment of adapters to lifting for special load handling.
Vacuum Close Proximity Lifting magnets. Remotely Operated Lifting Magnets.	<ul style="list-style-type: none"> Charging of battery (if applicable). The use and understanding of: <ul style="list-style-type: none"> Meters. Alarms.
It is recommended that the operator demonstrates the ability to operate the lifter safely and as outlined above prior to using the lifter.	

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56415, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56420 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.

- (1) General technical information.
 - (a) The functions and limitations of the crane and attachments.
 - (b) Wire rope:
 - (i) Background information necessary to understand the inspection and removal from service criteria in WAC 296-155-53404.
 - (ii) Capacity and when multi-part rope is needed.
 - (iii) Relationship between line pull and safe working load.

WAC 296-155-56420 (Cont.)

- (iv) How to determine the manufacturer's recommended rope for the crane.
- (c) 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).
- (d) 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.
- (e) The effects of load share and load transfer in multi-crane lifts.
- (f) Basic crane terms.
- (g) The basics of machine power flow systems.
 - (i) Mechanical.
 - (ii) Electrical.
 - (iii) Pneumatic.
 - (iv) Hydraulic.
 - (v) Combination.
- (h) The significance of the instruments and gauge readings.
- (i) The effects of thermal expansion and contraction in hydraulic cylinders.
- (j) Background information necessary to understand the requirements of pre-operation and inspection.

WAC 296-155-56420 (Cont.)

- (k) How to use the safety devices and operational aids required under WAC 296-155-53410 and 296-155-53412.
- (l) The difference between duty-cycle and lifting operations.
- (m) How to calculate net capacity for every possible configuration of the equipment using the manufacturer's load chart.
- (n) How to use manufacturer-approved attachments and their effect on the equipment.
- (o) How to obtain dimensions, weight, and center of gravity of the load.
- (p) The effects of dynamic loading from:
 - (i) Wind.
 - (ii) Stopping and starting.
 - (iii) Impact loading.
 - (iv) Moving with the load.
- (q) The effect of side loading.
- (r) The principles of backward stability.
- (2) Site information.
 - (a) 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).
 - (b) Proper use of mats, blocking/cribbing, outriggers, stabilizers, or crawlers.
 - (c) Identification of site hazards such as power lines, piping, and traffic.
 - (d) 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.
 - (e) How to determine if there is adequate room for extension of crawlers or outriggers/stabilizers and counterweights.
- (3) Operations.
 - (a) How to pick, carry, swing and place the load smoothly and safely on rubber tires and on outriggers/stabilizers or crawlers (where applicable).
 - (b) How to communicate at the site with supervisors, the crew and the signal person.

WAC 296-155-56420 (Cont.)

- (c) Proper procedures and methods of reeving wire ropes and methods of reeving multiple-part lines and selecting the proper load block and/or ball.
- (d) How to react to changes in conditions that affect the safe operation of the equipment.
- (e) How to shut down and secure the equipment properly when leaving it unattended.
- (f) 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.
- (g) How to properly level the equipment.
- (h) How to verify the weight of the load and rigging prior to initiating the lift.
- (i) How to determine where the load is to be picked up and placed and how to verify the radii.
- (j) Know basic rigging procedures.
- (k) How to carry out the shift inspection required in this subsection.
- (l) 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.
- (m) 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.

WAC 296-155-56420 (Cont.)

- (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.
 - (n) Know the proper procedures for load control and the use of hand-held tag lines.
 - (o) 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.
 - (p) Know how to properly use outriggers and stabilizers in accordance with manufacturer specifications.
- (4) Use of load charts.
- (a) Know the terminology necessary to use load charts.
 - (b) Know how to ensure that the load chart is the appropriate chart for the equipment in its particular configuration and application.
 - (c) Know how to use load charts. This includes knowing:
 - (i) The operational limits 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.

WAC 296-155-56420 (Cont.)

(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.

(d) Know how to use the load chart together with the load indicators and/or load moment devices.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56420, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56425 Sample declaration form for hours of experience.

DECLARATION OF [enter employee/operator name here]

STATE OF WASHINGTON)
) ss.

COUNTY OF enter county)

I, enter name of operator here, declare as follows:

I am over the age of 18 and competent to testify herein. I make the statements herein based upon personal knowledge.

I declare under penalty of perjury that the following table (on page 2) lists my experience in operating and working with cranes:

The 5 Categories of Cranes and their Types	Number of Hours of Actual Crane Operating Experience	Number of Hours of Crane Related Experience
(1) Mobile Cranes		
(a) Lattice Boom Crawler Cranes (LBC)	300 tons and above _____ Hours	300 tons and above _____ Hours
	Under 300 tons _____ Hours	Under 300 tons _____ Hours
(b) Lattice Boom Truck Cranes (LBT)	300 tons and above _____ Hours	300 tons and above _____ Hours
	Under 300 tons _____ Hours	Under 300 tons _____ Hours
(c) Large Telescopic Boom Cranes (Swing Cab) (TLL) (including digger derricks)	Over 130 tons _____ Hours	Over 130 tons _____ Hours
	Over 40 tons to 130 tons _____ Hours	Over 40 tons to 130 tons _____ Hours
	40 tons and under _____ Hours	40 tons and under _____ Hours
(d) Small Telescopic Boom Cranes (Fixed Cab) (TSS) (including digger derricks)	Over 15 tons _____ Hours	Over 15 tons _____ Hours
	Over 5 tons to 15 tons _____ Hours	Over 5 tons to 15 tons _____ Hours
	5 tons and under _____ hours	5 tons and under _____ hours
(2) Articulating Boom Cranes	_____ Hours	_____ Hours

WAC 296-155-56220 (Cont.)

(3) Tower Cranes		
(a) Hammerhead	_____ Hours	_____ Hours
(b) Luffer	_____ Hours	_____ Hours
(c) Self-Erecting	_____ Hours	_____ Hours
(4) Overhead Cranes/Bridge and Gantry		
(a) Cab Operated	_____ Hours	_____ Hours
(b) Pendant/Remote	_____ Hours	_____ Hours
(5) Derricks (not including digger derricks)	_____ Hours	_____ Hours
Hours of actual crane operating experience. For all cranes: Time while the operator is at the controls of the crane; and/or has direct control of that crane; and/or a combination of operating hours within the same crane type. For mobile cranes: It also includes time while installing/removing boom sections, luffing boom, jib, extending and retracting outriggers/stabilizers, leveling crane, and replacing hoisting rope. For tower cranes: It includes time while jumping (increasing the height of the tower/mast). <i>Note: Additional actual crane operator experience may account for crane related experience.</i>		
Hours of crane related experience: Time as a signal person/bellman, oiler, crane mechanic, crane inspector, formal classroom training, crane simulator operation, and a combination of operating hours on other categories of cranes.		

I declare under penalty of perjury that the foregoing is true and correct.

EXECUTED at City, Washington, this _____ day of month, 201.

Signature of Operator

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56425, filed 12/20/11, effective 02/01/12.]

**WAC 296-155-56430 Assembly/disassembly Working under the boom, jib or other components:
Sample procedures for minimizing the risk of unintended dangerous boom movement.**

1. WAC 296-155-53402(7)(a) 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 subsection (7)(b) are met. The exception in subsection (7)(b) 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 assembly/disassembly supervisor 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 an aboveground structure (as might be found, for example, at some construction sites) 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 Assembly/disassembly 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.

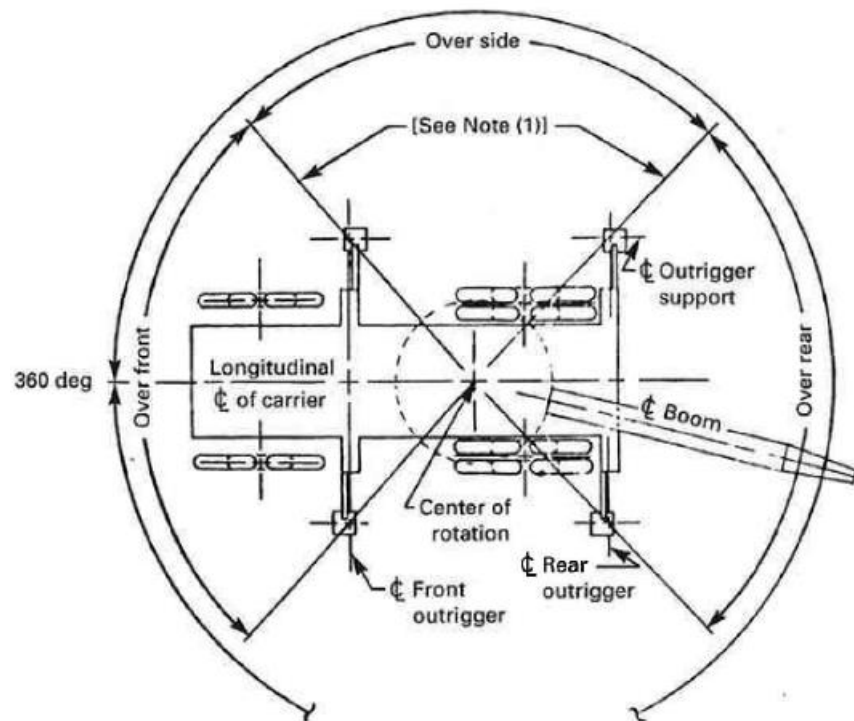
2. WAC 296-155-53402(9)(f)(i) provides that, during assembly/disassembly, the center of gravity of the load must be identified if that is necessary for the method used for maintaining stability. WAC 296-155-53402(9)(f)(ii) states that, where there is insufficient information to accurately identify the 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 WAC 296-155-53402(9)(f)(ii) is as follows. The boom is assembled by lowering boom sections sequentially into place using an assist crane. The assembly/disassembly 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 assembly/disassembly 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 assembly/disassembly director determines that it is rigged over the center of gravity and can be moved into place without dangerous movement.

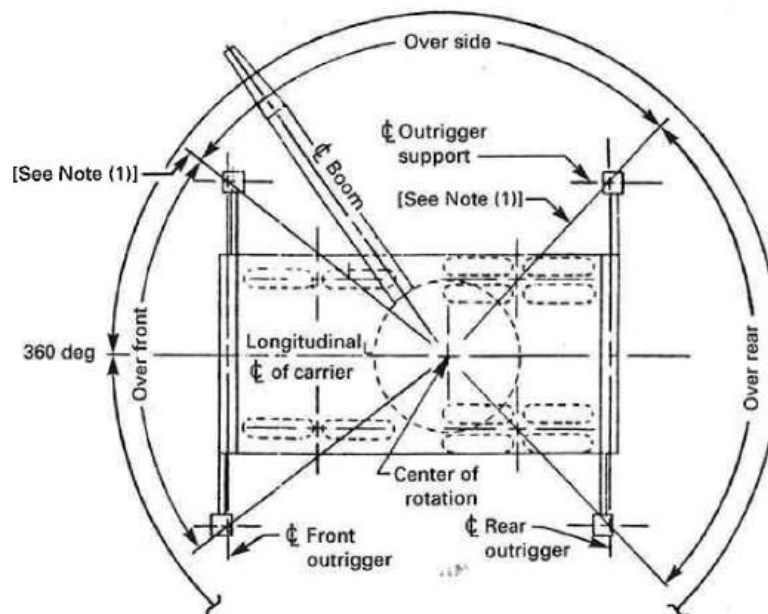
[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56430, filed 12/20/11, effective 02/01/12.]

WAC 296-155-56435 Work area chart.

Figure 47

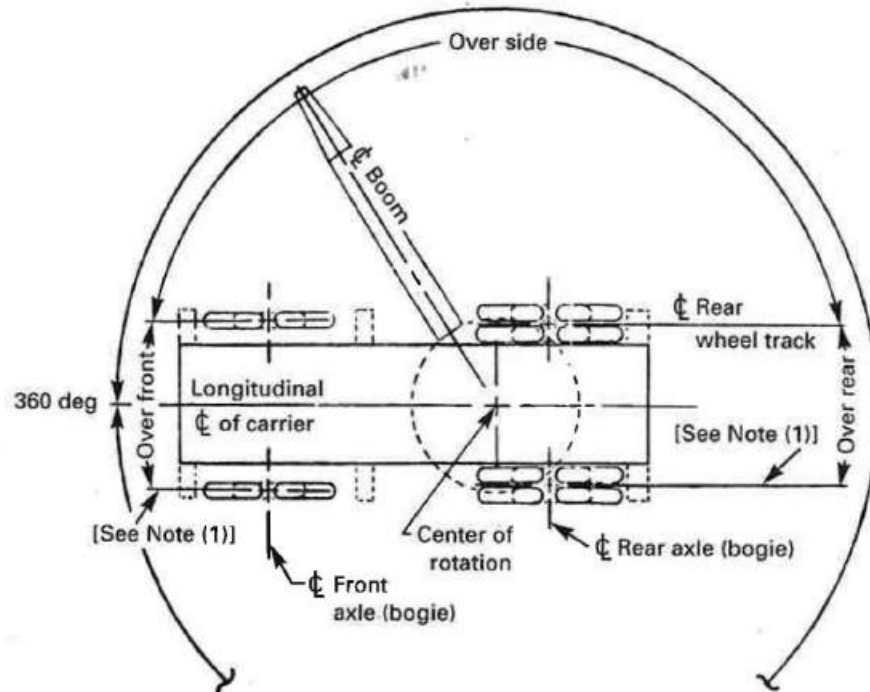


(a) Carrier on Outriggers – Front Outrigger Behind of Front Wheels [Note (2)]

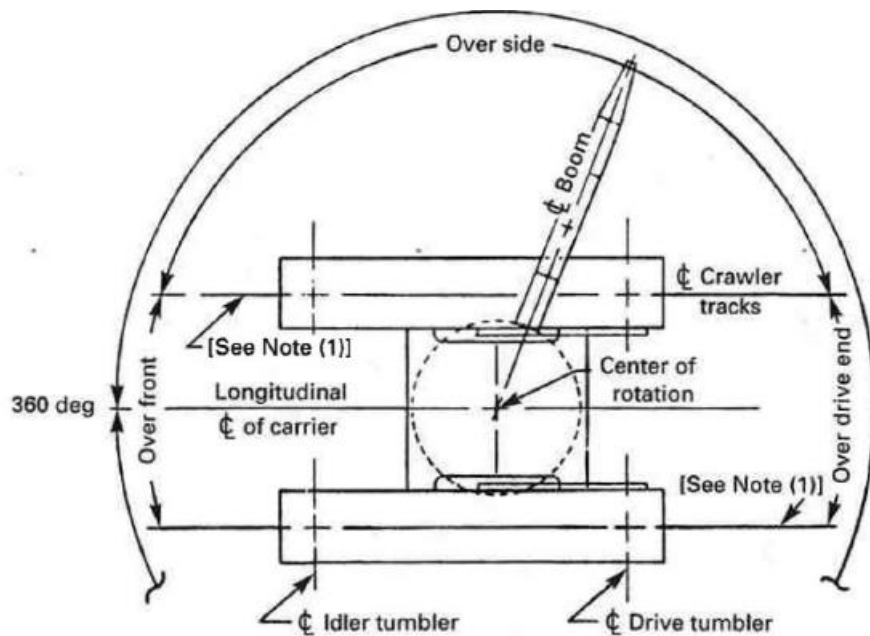


(b) Carrier on Outriggers – Front Outriggers Ahead of Front Wheels [Note (2)]

WAC 296-155-56435 (Cont.)

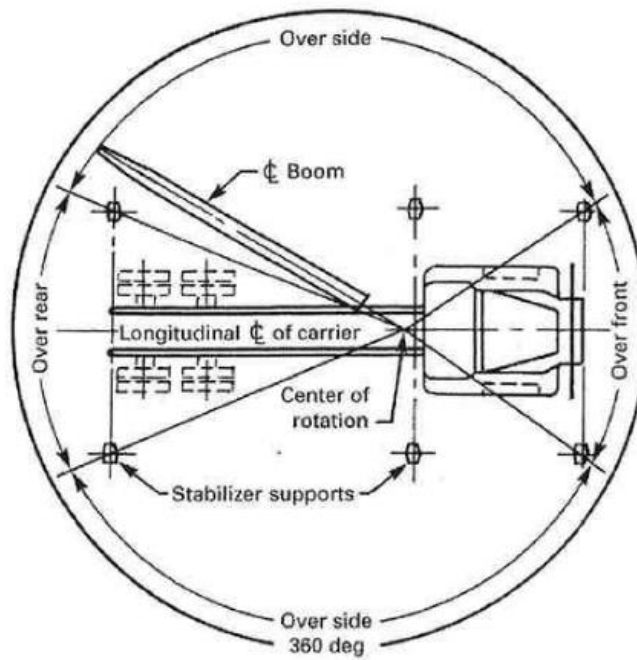


(c) Carrier on Tires [Note (2)]

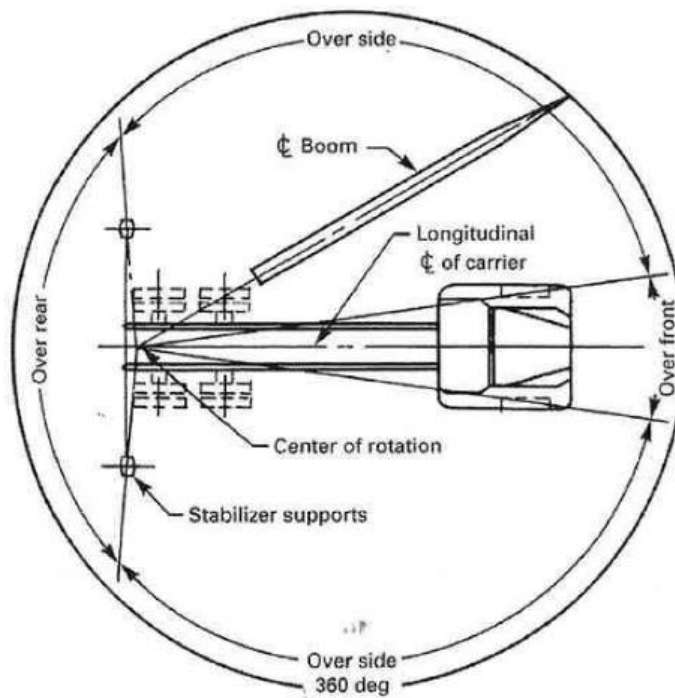


(d) Crawler Type Lower [Note (2)]

WAC 296-155-56435 (Cont.)

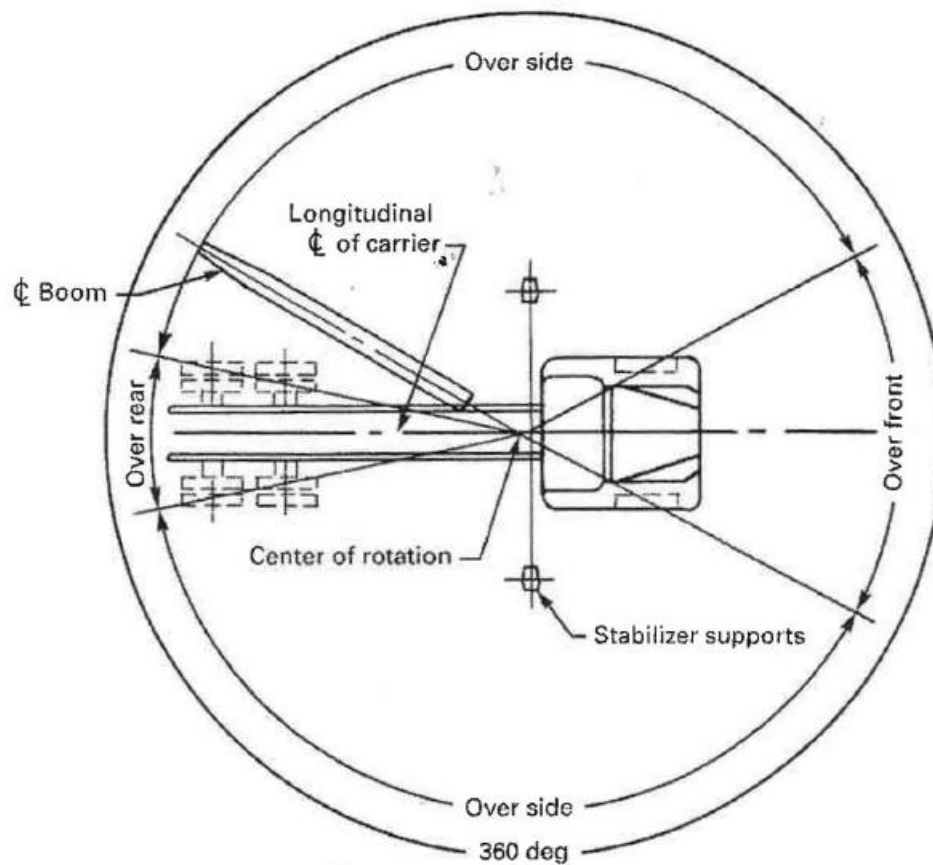


(e) Notes (1) and (2)



(f) Notes (1) and (2)

WAC 296-155-56435 (Cont.)



(g) Notes (1) and (2)

Notes:

- (1) These lines determine the limiting position of any load for operation within the working areas indicated.
- (2) Configurations that deviate sufficiently from the work areas shown in these figures must have their working areas defined by appropriate sets of diagrams supplied by the manufacturer or an RPE.

[Statutory Authority: RCWs 47.17.010, 49.17.040, 49.17.050, 49.17.440 and 49.17.060. 12-01-086 (Order 08-32), § 296-155-56435, filed 12/20/11, effective 02/01/12.]