

**WAC 296-155-584 through 296-155-58432
CONSTRUCTION CRANE CERTIFICATION**

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WAC 296-155-584 Scope

(1) Except as provided in subsection (3) below, this standard applies to cranes and derricks used in construction that can hoist, lower and horizontally move a suspended load. Such equipment includes, but is not limited to: articulating cranes (such as knuckle-boom cranes); crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial cranes (such as carry-deck cranes); dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as 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. However, items listed in paragraph (3) are excluded from the scope of this standard.

(2) Attachments. This standard applies to equipment included in paragraph (1) when used with attachments. Such attachments, whether crane-attached or suspended include, but are not limited to: hooks, magnets, grapples, clamshell buckets, orange peel buckets, concrete buckets, drag lines, personnel platforms, augers or drills and pile driving equipment.

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(3) Exclusions. This part does not cover:

- (a) Equipment included in paragraph (1) while it has been converted or adapted for non-hoisting/lifting use. Such conversions/adaptations 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) Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries, such as digger derricks (radial boom derricks), when used in these industries for auguring holes to set power and utility poles, or handling associated materials to be installed or removed from utility poles.
- (e) Equipment originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms.
- (f) Hydraulic jacking systems, including telescopic/hydraulic gantries.
- (g) Stacker cranes.
- (h) Powered industrial trucks (forklifts).
- (i) Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair.
- (j) Equipment that hoists by using a come-a-long or chainfall.
- (k) Dedicated drilling rigs.
- (l) Gin poles used for the erection of communication towers.
- (m) Tree trimming and tree removal work.
- (n) Anchor handling with a vessel or barge using an affixed A-frame.
- (o) Roustabouts.

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- (p) Cranes used on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work; and
 - (q) Crane operators operating cranes on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work.
- (4) 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.

WAC 296-155-58400 Definitions

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

Articulating crane. 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.

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

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

Bogie. See “travel bogie”.

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

Boom (tower cranes). On tower cranes: if the “boom” (i.e., principle 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. 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.

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

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

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

Crane/derrick. Includes all equipment covered by this part.

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

Crossover points. 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 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.

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. 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. 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.

Equipment means equipment covered by this part.

Equipment criteria means instructions, recommendations, limitations and specifications.

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

Flange points. 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.

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

Hoisting. 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.

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

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

Load 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.

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Load moment (or rated capacity) indicator. 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. 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.

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

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

Mobile cranes. 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. These are referred to in Europe as a crane mounted on a truck carrier.

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

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

Operator is a person who is operating the equipment.

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

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.

Power lines electrical distribution and electrical transmission lines.

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.

Rated capacity. 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.

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

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

Superstructure. See Upperstructure.

Taglines. 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.

Tower Crane. A type of lifting structure which utilizes a vertical mast or tower to support a working boom (jib) suspended from the working boom. While the working boom may be fixed horizontally or have luffing capability, it can always rotate about the tower center to swing loads. The tower base may be fixed in one location or ballasted and moveable between locations.

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

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.

Upperstructure. See upperworks.

Upperworks. The revolving frame of equipment on which the engine and operating machinery 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.

WAC 296-155-58402 Accreditation of Crane Certifiers of Cranes and Derricks - Requirements

(1) Any person engaging in the testing, examination or inspection for the certification of a crane and/or derrick, 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 or agency holding a certificate of accreditation pursuant to this regulation.

(2) Any person authorized by the department to certify maritime cranes and/or derricks prior to the effective date of this rule may continue to perform services under this regulation until June 1, 2010. 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 June 1, 2010.

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

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WAC 296-155-58404 Accreditation - Application Form and Applicant Qualifications

(1) An accreditation to certify cranes and/or derricks 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) 902-5460 or by written request to:
Post Office 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 and/or derrick types. The application and resume must include knowledge, training and experience with verifiable references.

(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 and derricks, including those specifically applicable to the types of cranes and/or derricks for which an accreditation will be issued.

(c) All applicants must demonstrate at least five years related experience with cranes and/or derricks. The five years of experience must include not less than two years of crane related field duties such as crane inspection or as a crane operator, heavy equipment mechanic, shop foreman, operations supervision, rigging specialist, or mechanical or civil engineer. Related education may be substituted for experience at a ratio of two years of education for one year of experience up to three years.

(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 types of cranes and/or derricks, including their capacities, the applicant desires to certify pursuant to the accreditation.

(b) A statement of qualifications and experience 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.

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- (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 and/or derricks types subject to the accreditation, including inspection and proof loading requirements.
- (5) Crane certifiers accredited by any other State, will be authorized to inspect cranes in Washington State provided the certifier submits an application, resume along with your certificate of accreditation from that state. This authorization will expire on June 1, 2010. 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 June 1, 2010.

WAC 296-155-58406 Issuance of Accreditation.

- (1) The department must issue a certificate of accreditation if the applicant satisfies the requirements of this rule.
- (2) The department may impose restrictions on the scope and use of the accreditation, such as limiting it to specific types of cranes and/or derricks based upon the qualifications of the applicant.
- (3) The department must deny issuance of an accreditation if the applicant does not satisfy the requirements of this rule.

WAC 296-155-58408 Accreditation Application--Processing Time

- (1) Within 45 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. An application is considered complete if it is in compliance with the requirements of this rule.

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(2) Within 45 calendar days of the date of the filing of a completed application, the department must inform the applicant if the minimum requirements of this rule are satisfied and of the applicants eligibility to take the written examinations.

(3) Within 75 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.

WAC 296-155-58410 Duration and Renewal of an Accreditation

(1) The accreditation will be valid for three years.

(2) Application for renewal must be filed with the department not less than 60 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 296-155-58404 hereof providing the applicant has been actively inspecting cranes and/or derricks during their prior accreditation period. An applicant is considered active if he/she has inspected at least twelve cranes and/or derricks during their accreditation period. If the applicant certified cranes/derricks in another state, then that applicant must provide documentation showing they were active during their accreditation period.

(3) All applicants for renewal must successfully complete the written examinations every six years.

WAC 296-155-58412 Revocation or Suspension of an Accreditation

(1) The department may deny, suspend, or revoke a certificate for failure of the holder to comply with any requirement of chapter 49.17 RCW, the provisions of these rules, or any other applicable health or safety standards and regulations. In addition to any penalty imposed by RCW 49.17.180, the department may suspend or revoke any certificate issued under the provisions of these rules for a period of not less than six months upon the following grounds:

(a) Performing work requiring accreditation at a job site without being in physical possession of initial and current accreditation certificates;

(b) Permitting the duplication or use of one's own accreditation certificate by another;

(c) Performing work for which accreditation has not been received;

(d) Obtaining accreditation from a training provider that does not have approval to offer training for the particular discipline;

(e) Any person who obtains accreditation through fraudulent representation of training or examination documents;

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- (f) Any person who obtains training documentation through fraudulent means;
 - (g) Any person who gains admission to and completes refresher training through fraudulent representation of initial or previous refresher training documentation;
or
 - (h) Any person who obtains accreditation through fraudulent representation of accreditation requirements such as education, training, professional registration, or experience.
 - (i) The certificate was obtained through error or fraud;
 - (j) The holder of the certificate is found to be incompetent to carry out the work for which the certificate was issued;
 - (k) Gross negligence, gross incompetence, a pattern of incompetence, or fraud in the certification of a crane;
 - (l) Willful or deliberate disregard of any occupational safety standard while certifying a crane;
 - (m) Misrepresentation of a material fact in applying for, or obtaining, a license to certify under this chapter;
 - (n) Failure by an accredited crane and/or derrick certifier to maintain records may result in accreditation suspension or revocation;
 - (o) Failure by an accredited crane and/or derrick certifier to report crane and/or derrick safety deficiencies affecting the safe operation of a crane and/or derrick may result in accreditation suspension or revocation;
 - (p) Failure to meet or comply with the requirements of this rule or the limitations imposed on the accreditation; or
 - (q) 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 registered mail, return receipt requested to the address as shown on the application form. The notice must specify the reasons for the department action and must give the certificate holder the opportunity to request a hearing before the department. 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. At the suspension/revocation hearing the department must give the certificate holder the opportunity to produce witnesses and give testimony.

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(3) The hearing will be held at the department's headquarters office or at such other location as may be designated by the assistant director and must be presided over an authorized representative of the assistant director.

(4) A denial, suspension, or revocation order may be appealed to the board of industrial insurance appeals within fifteen working days after the denial, suspension, or revocation order is entered. The notice of appeal may be filed with the department or the board of industrial insurance appeals. 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.

(5) The period of suspension or revocation for the commission of any act referenced in *the above paragraph* must be six months for the first such suspension and one year for each subsequent suspension or revocation.

(6) Following the period of suspension or revocation, an application for an accreditation may be filed with the department.

(7) The filing of an appeal must not stay the revocation or suspension, 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.

WAC 296-155-58414 Monitoring of Accredited Crane Certifiers

The Division of Occupational Safety and Health must monitor accredited crane and/or derrick certifiers to ensure that these certifiers certify cranes and/or derricks in accordance with all applicable Washington State laws and regulations. Monitoring activities will include, but not be limited to, audits of crane and/or derrick certifier's activities, complaint inspections, referrals, or accident investigations. Accredited crane and/or derrick certifiers will not be given advance notice of monitoring activities.

WAC 296-155-58416 Issuance of Temporary and Permanent 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 and/or derrick.

(2) The accredited crane certifier will submit inspection worksheets and proof of load testing to the department within ten working days of the inspection and load proof test for consideration of the department for the issuance of a permanent certificate of operation.

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(3) If the accredited crane certifier upon inspection of a crane and/or derrick identifies deficiencies that would affect the safe operation or load handling capabilities of the crane and/or derrick, the accredited inspector must notify the department within five working days of the onsite 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 and/or derrick no temporary certificate of operation will be issued until all identified deficiencies have corrected and verified by an onsite visit by an accredited crane inspector.

(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 employer and within ten days of the inspection to the department for consideration of the department for the issuance of a permanent certificate of operation.

(5) If a partial certification is being performed, the accredited crane and/or derrick certifier will indicate on the worksheet exactly what configuration the crane and/or derrick is certified to operate in. This partial certification must be clearly marked as to its limitations on the temporary and permanent certificate issued to the crane and/or derrick owner. Should the crane and/or derrick owner desire to have a full certification of that crane and/or derrick prior to the expiration of the partial certification, an inspection and proof load test must be completed in the configurations that were not inspected during the partial certification; the expiration date for this certification will be one year from the date that the partial certification was completed.

(6) **Maintaining Required Records.** Accredited crane and derrick certifiers are required to maintain complete and accurate records pertaining to each crane and/or derrick 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 or derrick certifier to maintain required records may result in accreditation suspension or revocation.

WAC 296-155-58418 Circumstances to cause a crane certification to become invalid.

- (1) If any of the following occur, the certification becomes invalid:
- (a) Contact with high voltage;
 - (b) Any overload, other than proof load testing;
 - (c) Any repair or modification that effects the safe operation of the equipment such as modifications or additions involving a safety device or operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism or capacity;
 - (d) Or other deficiencies identified by a qualified person.

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(2) The employer must notify the department within 24 hours if any of the above occurs.

WAC 296-155-58420 Inspection Criteria – General (All Cranes and Derricks)

- 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.
- All accredited crane certifiers must meet and follow the requirements relating to work area control, located in chapter 296-155 WAC, Part L.

(1) Safety devices. Make sure all safety devices are installed on equipment in accordance with the requirements located in chapter 296-155 WAC, Part L.

(2) Operational aids. Operations must not begin unless operational aids are in proper working order, except where the employer meets the specified temporary alternative measures. See chapter 296-155 WAC, Part L for the list of operational aids.

(3) General.

(a) The accredited crane certifier must determine that the configurations of the crane/derrick 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.

(4) After it is determined that the crane configurations meet the criteria in subsection (3) above, the accredited crane certifier must conduct a visual inspection of the following components:

(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.

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- (e) Safety latches on hooks for damage.
- (f) Hooks for deformation, cracks, excessive wear, or damage such as from chemicals or heat
- (g) Magnetic particle or other suitable crack detecting inspections on hooks must be performed.
- (h) Wire rope reeving for compliance with the manufacturer's specifications.
- (i) Wire rope, in accordance with WAC 296-155-58420(5).
- (j) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.
- (k) Tires (when in use) for proper inflation and condition.
- (l) Ground conditions around the equipment for proper support, including ground settling under and around outriggers and supporting foundations, ground water accumulation, or similar conditions.
- (m) The equipment for level position, both shift and after each move and setup.
- (n) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.
- (o) Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling.
- (p) Safety devices and operational aids for proper operation.
- (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).

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- (v) Gasoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature), condition and operation.
- (x) Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch.
- (y) Travel steering, brakes, and locking devices, for proper operation.
- (z) Tires for damage or excessive wear.
- (aa) 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.
- (bb) Hydraulic and pneumatic pumps and motors, as follows:
 - (i) Performance indicators: unusual noises or vibration, low operating speed, excessive heating of the fluid, low pressure.
 - (ii) Loose bolts or fasteners.
 - (iii) Shaft seals and joints between pump sections for leaks.
- (cc) Hydraulic and pneumatic valves, as follows:
 - (i) Spools: sticking, improper return to neutral, and leaks.
 - (ii) Leaks.
 - (iii) Valve housing cracks.
 - (iv) Relief valves: failure to reach correct pressure (if there is a manufacturer procedure for checking pressure it must be followed).
- (dd) Hydraulic and pneumatic cylinders, as follows:
 - (i) Drifting caused by fluid leaking across the piston.
 - (ii) Rod seals and welded joints for leaks.
 - (iii) Cylinder rods for scores, nick and dents.
 - (iv) Case (barrel) for significant dents.
 - (v) Rod eyes and connecting joints: loose or deformed.
- (ee) Hydraulic filters. Evidence of rubber particles on the filter element may indicate hose, "O" ring, or other rubber component deterioration. Metal chips or pieces on the filter may denote failure in pumps, motors, or cylinders. Further checking will be necessary to determine the origin of the problem before corrective action can be taken.
- (ff) Outrigger pads/floats and slider pads for excessive wear or cracks.

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

(hh) Warning labels and decals required under this standard: missing or unreadable.

(ii) Operator seat: missing or unusable.

(jj) Originally equipped steps, ladders, handrails, guards: missing.

(kk) Steps, ladders, handrails, guards: in unusable/unsafe condition.

(5) Wire Rope Deficiency Categories. Wire rope deficiencies are divided into 3 different categories as follows:

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

(i) Significant distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands.

(ii) Significant corrosion.

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

(iv) Improperly applied end connections.

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

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

(i) Visible broken wires, as follows:

(A) 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. See Figure (xx)

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

(C) In pendants or standing wire ropes: more than two broken wires in one rope lay located in rope beyond end connections

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and/or more than one broken wire in a rope lay located at an end connection.

(ii) A diameter reduction of more than 5% 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) Electrical contact with a power line.

(iii) A broken strand.

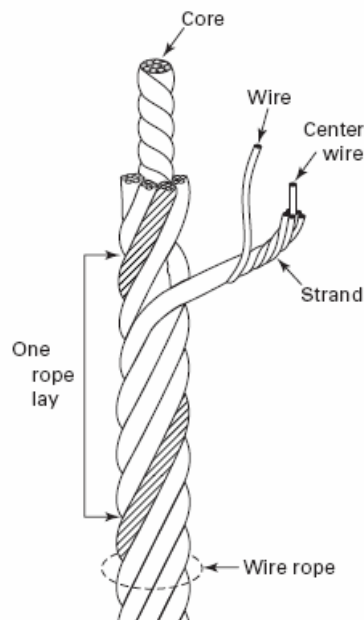


Figure (xx) Wire Rope

(d) The accredited crane certifier must perform a complete and thorough inspection, covering the surface of the entire length of the wire ropes, with particular attention given to:

(i) Critical review items listed in paragraph (1)(f).

(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.

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(e) 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.

(i) If the deficiency is determined to constitute a safety hazard, the crane/derrick must not be certified until:

(A) The wire rope is replaced and verified by the accredited crane certifier, or

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

(ii) If the accredited crane certifier determines that, though not presently a safety hazard, the deficiency needs to be monitored, the accredited crane certifier must inform the employer to ensure that the deficiency is checked during the monthly inspections.

(f) Critical Review Items. The accredited crane certifier must give particular attention to:

(i) Rotation resistant wire rope in use.

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

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

(iv) Wire rope adjacent to end connections.

(v) Wire rope at and on equalizer sheaves.

(g) Removal from service.

(i) If a deficiency in Category I 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, operations involving use of the wire rope in question must be prohibited until:

(A) The wire rope is replaced, or

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

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(ii) If a deficiency in Category II is identified, the accredited crane certifier must comply with Option A or Option B, as follows:

- (A) Option A. Consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard, operations involving use of the wire rope in question must be prohibited until the wire rope is replaced, or the damage is removed in accordance with paragraph (f)(i)(B).
- (B) Option B.. Institute the alternative measures specified in paragraph (f)(iii).

(iii) Alternative measures for a Category II deficiency. The wire rope may continue to be used if the employer ensures that the following measures are implemented:

- (A) The accredited crane certifier assesses the deficiency in light of the load and other conditions of use and determines it is safe to continue to use the wire rope as long as the conditions established under this paragraph are met.
- (B) The accredited crane certifier establishes the parameters for the use of the equipment with the deficiency, including a reduced maximum rated load.
- (C) The accredited crane certifier establishes a specific number of broken wires, broken strands, or diameter reduction that, when reached, will require the equipment to be taken out of service until the wire rope is replaced or the damage is removed in accordance with paragraph (f)(i)(A) or (B).
- (D) The accredited crane certifier sets a time limit, not to exceed 30 days from the date the deficiency is first identified, by which the wire rope must be replaced, or the damage removed in accordance with paragraph (f)(i)(B).
- (E) The employer ensures that the workers who will conduct the shift inspections are informed of this deficiency and the measures taken under this paragraph.
- (F) The accredited crane certifier's findings and procedures in paragraphs (A)-(D) are documented.

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

(A) The wire rope is replaced, or

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

(v) Where a wire rope is required to be removed from service under this section, either the equipment (as a whole) or the hoist with that wire rope must be tagged-out, in accordance with WAC 296-155-58534(6)(a), until the wire rope is repaired or replaced.

(6) If any deficiency is identified, an immediate determination must be made by the accredited crane certifier as to whether the deficiency constitutes a safety hazard or, though not yet a safety hazard, needs to be monitored by the employer in the monthly inspection.

(7) If the accredited crane certifier 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) If the accredited crane certifier determines that a deficiency is a safety hazard, the equipment must not be certified until it has been corrected and verified by an accredited crane certifier.

(9) 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/derrick 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) Trolling mechanism;
- (e) Swinging mechanism;
- (f) Travel mechanism;
- (g) Brakes and clutches; and
- (h) Limit, locking, and safety devices.

(10) 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.

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(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/derrick.

(c) The employer must ensure all load test personnel understand the safety procedures of the test.

(d) Proof load tests 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, normal 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 certified weights, or scaled weights using a certified scale with a current certificate of calibration.

(g) Proof load tests must be conducted in accordance with the manufacturer's instructions. Where these instructions are unavailable, a registered professional engineer familiar with the type of equipment involved must develop written load test procedures.

Note: For proof load testing requirements for specific types of cranes, see WAC 296-155-58424 through 296-155-58432.

WAC 296-155-58422 Specific Proof Load Testing – Mobile Cranes

Requirements for general inspection criteria that apply to all cranes and derricks are located in WAC 296-155-58420.

(1) Test load. Complete tests must be performed on each load hook. The nominal test load must be 110 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

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weight deduction values. Check accuracy of load indicators where installed. Test procedures for these cranes must follow OEM procedures and recommendations. Where no procedures are provided by the OEM, procedures must be developed by a registered professional engineer (RPE) using the procedures of this section as a guide. Articulating boom cranes must be tested in accordance with subsection () of this section.

(2) Pre-test preparation. Select a test site that is level and free of ground obstructions. Extend outriggers or stabilizers as specified by the OEM, when so equipped. For cranes with variable outrigger positions, only the fully extended position requires testing, tests are not required for intermediate outrigger settings. For most truck and cruiser cranes, crane carrier must be raised sufficiently to completely unload tires. Level crane as required by OEM's load chart. Rotate the boom 90 degrees from the longitudinal axis of the crane carrier and position the boom at the minimum working radius.

Note: Precautions should be considered such as attaching guy wires to the crane or placing cribbing under the counterweight to preclude possible overturning in the event of wire rope or mechanical failure. During stability testing, mobile cranes have little margin of safety against overturning. Test personnel must remain fully alert to wind, other weather, and visibility conditions that may jeopardize the safe performance of the tests.

(3) No-load tests

(a) Hoist(s)

(i) Raise and lower each hook through the maximum possible working distance of hook travel.

Note: After lowering hook, ensure wire rope is packed tightly on the drum prior to proceeding with load tests to prevent wire rope displacement and crushing.

(ii) Run each hoist block into the limit switch (where installed) at slow speed.

(iii) Run each hoist block beyond the limit switch by using the bypass switch (where installed).

(b) Boom

(i) Raise and lower the boom through the full working range.

(ii) Raise the boom into the upper limit switch (where installed). Raise the boom past the boom upper limit switch using the bypass switch (where installed).

(iii) Test the lower limit switch (where installed) by the same procedure prescribed for testing the upper limit switch.

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(iv) Extend and retract telescoping boom sections the full distance of travel.

(c) Other functions. Other functions including swing must be operated through a minimum of one cycle (one full revolution of major components).

(d) Load test. The load test consists of basically two parts, a maximum load test and a stability load test. The following test sequence is time and cost effective. The sequence may be varied by the certifier.

(e) Maximum test load for the main hoist.

Note: Lift the test load only high enough to perform the required tests.

(i) Static test. Raise the test load to clear the ground with boom at minimum possible radius and hold for 10 minutes without boom and load hoist pawls (dogs) engaged. Rotate load and hook to check bearing operation. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers.

For telescoping boom cranes, tests (3)(e)(i) through (iv) must be performed with boom fully retracted. If the size of the test load precludes a full 360 degree rotation of the hook, perform the hook rotation test with the boom fully extended as part of the hydraulic component slippage test.

Note: Due to the number of layers of wire rope on the drum, some cranes may not be able to lift the test load per the OEM's load chart. If the crane has the same maximum capacity at extended boom length(s), perform the test with the boom extended. If the crane can not lift the test load, check the OEM's allowable line pull for the particular model hoist and layer of rope. If allowable line pull (available torque) is the limiting factor, reduce the test load based on the allowable line pull limitation and perform the required test. Certify the crane based on the reduced test load (i.e., certified capacity is test load divided by 1.10). If the crane can not lift the reduced test load, verify that the system hydraulic pressure and relief valves are set within OEM specifications. If the settings are within specification, contact the OEM.

(ii) Dynamic test. Raise and lower the test load at normal operating speeds.

(iii) Hoist brake. Test ability of the brake to control and stop the load. Test the ability of the brake to hold and lower the test load with the friction clutch disengaged, if applicable. (Do not lower test load in free-fall mode if the OEM permits lowering in this mode with light loads only.)

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(iv) Boom operation. Operate the boom from minimum radius to maximum radius for the load applied. Repeat the test in the opposite direction.

(v) Hydraulic component slippage. Lift the test load at minimum radius and allow time for fluid and component temperatures to stabilize. Hold the load for 10 minutes without use of controls by the operator. There must be no significant lowering of the load, boom, or outrigger beams due to components or systems malfunction or failure during the test. If boom deflection will cause the load to exceed the allowed radius, and the crane OEM confirms that this deflection is not abnormal for the crane model, this test may be performed at a larger radius. The boom length, radius, load, and OEM correspondence must be documented in the equipment history file.

(A) The significance of any lowering must be evaluated by certifier depending on operating requirements and safety.

(B) For cranes not equipped with telescoping booms, this test may be performed in conjunction with the static test noted above. For telescoping boom cranes, a different test load is usually required. Test telescoping boom cranes at the maximum boom length allowed by the wire rope as reeved (all telescoping cylinders must be at least partially extended). Also observe for boom deflection and twisting.

(C) For cranes without lockable outriggers, this test must be performed on both sides of the crane. For telescoping boom cranes, the static test of subsection (3)(e)(i) will satisfy this requirement for the outrigger test over the other side.

(D) For cranes equipped with outrigger locking devices but where activity operating procedures permit operation without the use of the locking devices, this test must be performed over both sides of the crane with the locking devices disengaged.

(4) Stability test. The test load must be established based on the boom length and radius determined below.

(a) Boom operation. Raise and lower the boom through the full working range for the length of boom extended and radius as determined below. Visually observe for smooth operation. Test boom brake for proper operation.

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(b) Rotation. At slow speed, rotate left and right the maximum rotation allowed by the OEM at the radius as determined below with boom and load hoist pawls (dogs) engaged where applicable. Apply brake periodically during rotation. Brake must demonstrate its ability to stop the rotating motion in a smooth, positive manner. Where brakes are designed for holding only, operate controls by plugging to stop rotation then apply brake. For cranes with outrigger locking devices and where such devices are used in operation, this test must be performed with the locking devices engaged. For cranes with front outriggers/stabilizers, stop rotation with the boom over the front outrigger/stabilizer and hold the load for 10 minutes. There must be no significant lowering of the outrigger/stabilizer.

(i) These tests must be done over the side of the crane. Stability testing of mobile cranes can be extremely hazardous, particularly with long booms and with jibs attached. To minimize the hazard, perform the tests in the following configurations:

(A) For telescoping boom cranes, these tests must be performed with the boom extended approximately halfway between fully retracted and fully extended. (For example, if a boom has a retracted length of 40 feet and ratings for eight foot increments of extension to a fully extended length of 96 feet, the mid point between fully retracted and fully extended is 68 feet. Since this length is not on the load chart, test the crane with a boom length of 64 or 72 feet.) However, if the rated load for maximum radius for that boom length is not governed by stability (e.g., below the bold line) select the first longer increment of boom length where stability governs. If no ratings are governed by stability, perform the test with the maximum boom length.

(B) For all cranes test at any radius below the stability line (for the hydraulic telescoping boom length selected - see paragraph 5.5.2 a) where the weight of the test weights hanging from the hook are equal to or greater than the weight of the deductions. If no ratings are governed by stability, perform the test at the maximum boom length where the weight of the test weights hanging from the hook are equal to or greater than the weight of the deductions. For example, for a crane with configuration deductions (load block, jib, hook, etc.) of 6,000 pounds, test at a radius where the weight of the test weights hanging from the hook will be at least 6,000 pounds.

(ii) When lifting test loads, always lift the load well within the maximum radius and slowly boom down to the pre-measured radius (as determined above) stopping at least once to test the effectiveness of the boom brake. Lift the test load only high enough to perform the required tests.

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(iii) A crane outrigger may become light (start to raise up within the outrigger pad) and the outrigger pad may clear the ground during this procedure (with the boom positioned over the opposite corner) depending on the make and model. Generally, this is normal and not an indication of tipping. However, the certifier must verify with the crane OEM that a crane exhibiting this condition is safe for use.

(5) Auxiliary and whip hoist. Test load must be based on the maximum rated capacity for the hoist to be tested. For telescoping boom cranes, tests must be performed with the boom fully extended or until 2 wraps of wire rope remain on a grooved hoist drum or 3 wraps of wire rope remain on a smooth hoist drum.

(a) Static test. Raise the test load to clear the ground and hold for 10 minutes. Observe for any lowering that may occur, which may indicate a malfunction of hoisting components or brakes.

(b) Dynamic test. Raise and lower the test load at normal operating speeds.

(c) Hoist brake. Test the ability of the brake to control and stop the load. Test the ability of the brake to hold and lower the test load with the friction clutch disengaged, if applicable.

(6) Auxiliary equipment. For cranes that will use auxiliary equipment or alternate configurations (swing-away jibs, power pinned fly sections, manual extensions, jibs at variable offsets) using auxiliary equipment, load tests are required. Test load must be based on the maximum rated load for the equipment or as limited by wire rope line pull if the equipment is not fully reeved. For jibs with variable offset angles, test at the greatest offset used. Record each test configuration and test load on the certification supplement form, figure XX.

(a) For multiple boom sections installed in lattice cranes, testing of all possible boom insert combinations is not required. Perform a static and dynamic load test at the maximum and minimum boom lengths anticipated for use during the certification period.

(b) For multiple reeving configurations testing of all possible reeving configurations is not required. Perform a static and dynamic load test for both an even and odd number of line parts (if both an even and odd number of line parts are to be used during the certification period) using a test load and reeving configuration that produces the maximum allowable line pull for the wire rope.

(c) For cranes that will be re-reeved to use alternate hook block(s), static and dynamic load tests, at the maximum capacity the block(s) will be used, are required for each hook block and dead end connection to be used.

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(d) For cranes with multiple counterweight configurations, testing of all possible counterweight combinations is not required. However, all counterweights that will be used during the certification period must be tested in some combination during the annual load test.

(7) Free rated load test. 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.

Note: Ensure all "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 (3 to 4 inches) above ground. Test personnel must stand clear of tires during load tests.

(a) 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 (i) and (ii).

(i) Rotate through the appropriate working arc.

(ii) Travel a minimum of 50 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.

(b) Stability test. Repeat step (a) above 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. For all boom types, see subparagraph (4) for determination of radius, but ensure test is performed in the stability region of the load chart. 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 pre-measured radius. Lift the test load only high enough to perform the required tests.

(8) Test after change or repair of tires. For cranes with "on rubber" lift capability, in lieu of a load test the following test may be performed after change or repair of tires. The crane must be traveled (with no load on hook) a minimum of 100 feet, forward and reverse, with the counterweight positioned over the corner of the crane with the affected tire (if allowed by the OEM) and with the boom at minimum radius or as required by the OEM.

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(9) Articulating boom crane. Follow the requirements of subsection (1) and (2), and perform a no-load test in accordance with subsection (3) as applicable. Definitions and nomenclature are extracted from ASME B30.22, Articulating Boom Cranes.

(10) Maximum test load for the outer hook or padeye.

Note: Lift the test load only high enough to perform the required tests. Use of long slings or chain falls to maintain a safe load height is recommended.

(a) Static test. Raise the test load to clear the ground with boom sections at either the minimum allowable articulating angle (typically inner boom and secondary boom in a straight line for a 0 degrees articulation angle) or at the maximum allowable articulating angle (knuckled in) for the size of the load, and at the minimum possible radius for the load and hold for ten minutes. Rotate load and hook to check bearing operation, if applicable. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers/stabilizers. Tests in subsection (10) must be performed with any manual or hydraulic telescoping boom sections fully retracted.

Note: The length of the test slings and safety of the lift will govern the actual minimum test radius. Use extreme caution when lifting load for cranes that have no winch (wire rope hoist) to maintain load within radius. See note under subsection (3)(e) for winch, if applicable.

(b) Dynamic test. Raise and lower the test load at normal operating speeds using the winch if so equipped. Test the ability of the winch brake and controls to control and stop the load. If the crane is not equipped with a winch skip this step.

(c) Boom operation. Using the inner and secondary boom lift cylinders, operate the boom from minimum radius to maximum radius for the load applied. Repeat the test in the opposite direction.

(d) Hydraulic component slippage for cranes equipped with hydraulic extension (telescoping) cylinders. Lift the test load inside the maximum radius and allow time for fluid and component temperatures to stabilize. Hold the load for ten minutes without use of controls by the operator. There must be no significant lowering of the load, boom, or outrigger/stabilizer beams due to components or systems malfunction or failure during the test.

(i) Test at the maximum hydraulically extended boom length, minimum allowable articulating angle, and minimum radius corresponding to that boom length and articulating angle (long slings or portable manual hoists may be required to keep the load as close to the ground as possible).

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(ii) In addition, for cranes with load chart configurations that allow lifts with the secondary boom (and/or other boom sections) articulated below horizontal (knuckled in), perform the test with all extension (telescoping) cylinders fully retracted, at the maximum articulating angle (knuckled in), and at the minimum radius for that configuration if not previously performed in subsection (10)(a).

(iii) For cranes without lockable outriggers/stabilizers, or for cranes with lockable outriggers/stabilizers where the activity allows operation without the use of the locking devices, one of the above tests must be performed on the opposite side of the crane (and over the front for cranes with front outriggers).

(iv) For cranes equipped with the same hydraulic holding valve for both directions on the hydraulic extension (telescoping) cylinder(s), the test in subsection (10)(d)(ii) is not required.

(e) For cranes without hydraulic telescoping cylinders, the test in subsection (10)(a) may serve as the hydraulic component slippage test for one side and the stability test in subsection (11)(c) will serve as the hydraulic component slippage test for the opposite side.

(f) The significance of any lowering must be evaluated by the certifier depending on operating requirements and safety.

(11) Stability test. The test load must be established based on the maximum hydraulically extended boom length (for cranes equipped with hydraulic extension cylinders), minimum articulation angles, and maximum allowable radius as determined by the posted load chart (typically “straight out”). See exception below.

(a) Boom operation. Raise and lower the boom using the inner boom lift cylinder through a safe working range based on the length of the slings for the length of boom extended and radius as determined below. Visually observe for smooth operation.

(b) Rotation. At slow speed, rotate left and right the maximum degrees allowed by the OEM at the radius as determined below with boom and load hoist pawls (dogs) engaged where applicable. The crane must demonstrate its ability to stop the rotating motion in a smooth, positive manner.

(c) Hydraulic component slippage for cranes equipped without hydraulic extension (telescoping) cylinders. Lift the test load inside the maximum radius and allow time for fluid and component temperatures to stabilize. Hold the load for ten minutes without use of controls by the operator. There must be no significant lowering of

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the load, boom, or outrigger/stabilizer beams due to components or systems malfunction or failure during the test.

(i) For cranes without lockable outriggers/stabilizers, or for cranes with lockable outriggers/stabilizers where the activity allows operation without the use of the locking devices, one of the above tests must be performed on the opposite side of the crane (and over the front for cranes with front outriggers).

(ii) The significance of any lowering must be evaluated by the certifier depending on operating requirements and safety.

(d) These tests must be performed over the side of the crane. Stability testing can be extremely hazardous, particularly with long booms. To minimize the hazard, perform the test in the following configurations:

(e) If no ratings are governed by stability, perform the above tests with the boom at the maximum hydraulically extended boom length (for cranes equipped with hydraulic extension cylinders), minimum articulation angles, and maximum allowable radius as determined by the posted load chart (typically "straight out"). If some load chart ratings are governed by stability, perform the test with the boom positioned at the first boom length governed by stability, minimum articulation angle, and maximum allowable radius and load for that boom length.

(f) When lifting test loads, always lift the load well within the maximum radius and slowly boom down to the pre-measured radius (as determined above) stopping at least once to test the effectiveness of the boom hydraulic system to control the load. Lift the test load only high enough to perform the required tests.

(g) A crane outrigger/stabilizer may become light (start to raise up within the outrigger/stabilizer pad) and the outrigger/stabilizer pad may clear the ground during this procedure (with the boom positioned over the opposite corner) depending on the make and model. Generally, this is normal and not an indication of tipping. However, the certifier must verify with the crane OEM that a crane exhibiting this condition is safe for use.

(12) Maximum test load for the inner hook or padeye. If crane is equipped with an inner hook or padeye, that is utilized by the employer, perform the test required by subsection (10)(a) and (c), on the inner hook or padeye.

(13) Auxiliary equipment. When authorized, auxiliary equipment (manual extensions, etc.) must be load tested. Test load must be based on the maximum rated load for the equipment, or as limited by wire rope line pull if the equipment is not fully reeved. Record each test configuration and test load on the certification supplement form, figure XX.

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(14) Weight handling equipment used for other than lift crane service. Locomotive, crawler, truck, and cruiser cranes that are used for clamshell, dragline, magnet, pile driving, or other non-lift crane work must be tested at the maximum safe working load permitted for the size wire rope being used. This test must be performed in all working motions except travel. Buckets, magnets, etc., may be removed for testing wire rope. No test is required after reassembly. Retesting is not required when end attachment is changed from original connection (i.e., changed from clamshell use to dragline and so on) during the certification period.

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Mobile Crane Load Test Report					
Complete as applicable for the type of crane certified. Indicate "NA" for configurations that do not apply.					
Crane ID:		Crane Type:		Serial No.:	
Manufacturer:		Model:	Employer's Name:		
OEM's Rated Capacity			Certified Capacity (If different from OEM's rated capacity, explain in remarks)		
	Pounds	Feet		Pounds	Feet
Main			Main		
Aux			Aux		
Whip			Whip		
Boom Length	Test load %	Minimum Radius		Maximum Radius	
		Pounds	Feet	Pounds	Feet
Main					
Aux					
Whip					
Other					
Hook Tram Measurements		Base Measurement		Before Test	After Test
Main Hook					
Aux					
Other					
Lattice Boom Crane			Telescoping Boom Crane		
Boom Length (Feet)					
On Out Riggers	Test Load	Radius	On Outriggers	Test Load	Radius Boom Length
Min. Radius			Min. Radius Boom Retracted		
Max. Radius			Max. Radius Boom Extended		
On Tires (Stationary)	Test Load	Radius	Max. Radius (Boom 50% Extended)		
Min. Radius			On Tires (Stationary)	Test Load	Radius Boom Length
Max. Radius			Min. Radius		
On Tires (Pick and Carry) (Describe configurations and list test loads/radii)			Max. Radius (Boom 50% Extended)		
			On Tires (Pick and Carry) (Describe configurations and list test loads/radii/boom length)		

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<p>Other Configurations, including auxiliary equipment if applicable. (Describe and list test loads/radii)</p>		
<p>This is to certify that the inspections and tests have been conducted in accordance with the provisions set forth in chapter 296-155 WAC. It is further certified that the crane identified above is satisfactory to lift its certified capacity.</p>		
<p>Certifier ID:</p>	<p>Signature</p>	<p>Date of Load Test:</p>
<p>List all configurations (e.g., over the side/over rear, boom extended/retracted, lifts on tires, traveling, etc.)</p>		

WAC 296-155-58424 Specific Inspection Criteria and Proof Load Testing – Tower Cranes

This section contains supplemental requirements for tower cranes; all sections of this part apply to tower cranes unless specified otherwise. Requirements for general inspection criteria that apply to all cranes and derricks are located in WAC 296-155-58420.

(1) The accredited crane certifier must inspect the following items on tower cranes to make sure they are safe and functioning properly per the manufacturer’s recommendations:

- (a) All control mechanisms for maladjustment interfering with proper operation for excessive wear of components and contamination by lubricants or other foreign matter;
- (b) All crane function operating mechanisms for maladjustment interfering with proper operation and excessive wear of components;
- (c) Motion limiting devices for proper operation with the crane unloaded; each motion should be inched into its limiting device or run in at slow speed with care exercised;
- (d) Load limiting devices for proper operation and accuracy of settings;
- (e) All hydraulic and pneumatic hoses, particularly those that flex in normal operation;

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- (f) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation;
 - (g) Hooks and latches for deformation, chemical damage, cracks, and wear;
 - (h) Wedges and supports of climbing cranes for looseness or dislocation;
 - (i) Braces or guys supporting cranes masts (towers) and anchor bolt base connections for looseness;
 - (j) Hydraulic system for proper fluid level;
 - (k) Deformed, cracked or corroded members in the crane structure and boom (jib);
 - (l) Loose bolts or rivets;
 - (m) Cracked or worn sheaves and drums;
 - (n) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices, sprockets, and drive chains or belts;
 - (o) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets;
 - (p) Load, wind, and other indicators for inaccuracies outside the tolerances recommended by the manufacturer;
 - (q) Power plants for performance and compliance with safety requirements;
 - (r) Electrical apparatus for signs of deterioration in controllers, master switches, contacts, limiting devices, and controls;
 - (s) Crane hooks inspected per WAC 296-155-58420;
 - (t) Travel mechanisms for malfunction, excessive wear or damage;
 - (u) Hydraulic and pneumatic pumps, motors, valves, hoses, fittings, and tubing for excessive wear or damage.
- (2) Tower crane pre-operation tests.
- (a) When tower cranes are erected, and after each climbing operation, before placing the crane in service, all functional motions, motion limiting devices, and brakes must be tested for operation.
 - (b) When tower cranes are erected, load-limiting devices must be tested for proper setting and operation before the crane is placed in service.
 - (c) After erection, the structural support or foundation to which the crane base is attached must be tested before placing the crane in service. The test must be conducted with the rated load placed at maximum radius permitted by site conditions. For free-standing cranes, when the crane support (base) is symmetrical, the superstructure must be rotated through 90 degree with 10 minute stops at the starting position and at each 45 degree position. When the support is asymmetrical, the superstructure must be rotated through 360 degree with 10 minute stops at the starting position and at each 45 degree position. If any part of the support structure becomes displaced or distressed all crane operations must be stopped until an evaluation is made by the accredited crane certifier.

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- (d) For traveling tower cranes, a load test must be conducted with the boom (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 the accredited crane certifier. If track ballast needs to be reset or repairs made, a satisfactory test must be performed and verified by the accredited crane certifier.
- (e) Initial functional motion tests, must be performed at rated load. Functional motion tests made after climbing or telescoping may be performed without load. Each test must include:
- (i) Load hoisting and lowering;
 - (ii) Boom hoisting and lowering, or traversing the trolley;
 - (iii) Swing motion;
 - (iv) Brakes and clutches;
 - (v) Limit, locking, and safety devices.
- (f) The test listed in (e) above, must continue until all controls, drives, and braking means have been engaged and they have functioned correctly.
- (g) The order in which tests of tower cranes are to be performed is as follows:
- (i) Functional motion tests without load;
 - (ii) Functional motion tests at rated load (for other than traveling cranes, this may be combined with tests of supports);
 - (iii) Tests of supports per subsection (2)(c).
- (h) During functional motion tests, the crane supports must be checked. Any observed displacement is reason to refrain from continuing testing until an evaluation is made by an accredited crane certifier.
- (3) Tower crane operational tests. The trip setting of hoist limit devices must be determined by tests, with an empty hook, comprising a series of runs each at increasing hook speed up to the maximum speed. The actuating mechanism of the limit device must be located so that it will trip the device, under all conditions, in sufficient time to prevent contact of the lower load block with the upper load block or boom point sheaves.
- (4) Load limit device test. Load limit device settings must be verified by means of a static test using test loads of 102.5% to 110% of the applicable ratings as recommended by the crane manufacturer. Test loads are to be lifted at creep speed until just clear of the ground.

WAC 296-155-58426 Specific Inspection Criteria and Proof Load Testing – Self-Erecting Tower Cranes (Research being done on this section)

**WAC 296-155-58428 Specific Inspection Criteria and Proof Load Testing –
Overhead and Gantry Cranes**

Requirements for general inspection criteria that apply to all cranes and derricks are located in WAC 296-155-58420.

- (1) This paragraph applies to the following equipment when used in construction and permanently installed in a facility: overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and other having the same fundamental characteristics.
- (2) The accredited crane certifier must inspect the following items on overhead and gantry cranes to make sure they are safe and functioning properly per the manufacturer's recommendations:
- (a) Operating mechanisms for proper operation, proper adjustment, and unusual sounds;
 - (b) Upper-limit device(s). Inch the load block into the limit device to ensure the device operates properly;
 - (c) Tanks, valves, pumps, lines, and other parts of air or hydraulic systems for leakage;
 - (d) Hooks and hook latches in accordance with WAC 296-155-58420;
 - (e) Hoist ropes and end connections in accordance with WAC 296-155-58420;
 - (f) Rope of proper spooling onto the drum(s) and sheave(s);
 - (g) Deformed, cracked, or corroded members;
 - (h) Loose or missing bolts, nuts, pins, or rivets;
 - (i) Cracked or worn sheaves and drums;
 - (j) Worn, cracked, or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers, and stops;
 - (k) Excessive wear of brake system parts;
 - (l) Excessive wear of drive chain sprockets and excessive drive chain stretch;
 - (m) Deterioration of controllers, master switches, contacts, limit switches, and push-button stations, but not limited to these items;
 - (n) Wind indicators for proper operation;
 - (o) Gasoline, diesel, electric, or other power plants for proper operation;
 - (p) Motion-limit devices that interrupt power or cause a warning to be activated for proper performance. Each motion must be inched or operated at low speed into the limit device with no load on the crane;
 - (q) Rope reeving for compliance with crane manufacturer's design;
 - (r) All function, instruction, caution, and warning labels or plates for legibility and replacement.
- (3) An operational test must be made without a load applied to the hook. Tests must include, as applicable, the following functions:

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- (a) Lifting and lowering;
- (b) Trolley travel;
- (c) Bridge travel;
- (d) Hoist-limit devices

- (i) The trip setting of hoist-limit devices must be determined by tests with an empty hook comprising a series of runs, each at increasing hook speed up to the maximum speed, unless the hoist has only a single speed;

- (ii) The actuating mechanism of the upper-limit device must be located or adjusted so that it will trip the device in sufficient time to prevent contact of the load block or load with any part of the trolley or bridge.

- (e) Travel-limiting devices.

- (f) Locking and indicating devices, if provided.

(4) Annual rated load test for overhead cranes.

- (a) The replacement of load chain and rope is specifically excluded from this load test; however, an operational test of the hoist must include:

- (i) Lifting and lowering.
 - (ii) Trolley travel.
 - (iii) Bridge travel.
 - (iv) Hoist-limit devices.

- (A) The trip setting of hoist-limit devices must be determined by tests with an empty hook comprising a series of runs, each at increasing hook speed up to the maximum speed, unless the hoist has only a single speed.

- (B) The actuating mechanism of the upper-limit device must be located or adjusted so that it will trip the device in sufficient time to prevent contact of the load block or load with any part of the trolley or bridge.

- (v) Travel-limiting devices.

- (vi) Locking and indicating devices, if provide.

- (b) The proof load test must be not less than 100% of the rated load of the crane or hoist(s), whichever governs; or more than 125% of the rated load of the crane or hoist(s), whichever governs; unless otherwise recommended by the manufacturer.

- (c) The proof load test must be performed as outlined below:

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- (i) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s).
- (ii) Transport the test load by means of the trolley for the full length of the bridge.
- (iii) 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.
- (iv) Lower the test load, and stop and hold the test load with the break(s).

**WAC 296-155-58430 Specific Inspection Criteria and Proof Load Testing–
Derricks**

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.

Requirements for general inspection criteria that apply to all cranes and derricks are located in WAC 296-155-58420.

- (1) The accredited crane certifier must inspect the following items on derricks to make sure they are safe and functioning properly per the manufacturer's recommendations:
- (a) All control mechanisms;
 - (b) All chords and lacing;
 - (c) Tension in guys;
 - (d) Plumb of the mast;
 - (e) External indication of deterioration or leakage in air or hydraulic systems;
 - (f) Derrick hooks for deformation or cracks;
 - (g) Rope reeving;
 - (h) Hoist brakes;
 - (i) Electrical apparatus;
 - (j) Structural members for deformation, cracks, and corrosion;
 - (k) Bolts and rivets for tightness;
 - (l) Parts such as pins, bearings, shafts, gears, sheaves, drums, rollers, locking and clamping devices, for wear, cracks, and distortion;
 - (m) Gudgeon pin for cracks, wear, and distortion;
 - (n) Power plants for performance and compliance with applicable safety requirements;

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(o) Foundation or supports must be inspected for continued ability to sustain the imposed load.

(2) Annual proof load testing. 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 exceed the safe working load (SWL) as follows:

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

(3) Proof loads must be applied at the designed maximum and minimum boom angles or radii or, if this is impracticable, as close to these as practicable. The angles or radii of test must be in the certificate of test. Proof loads must be swung as far as possible in both directions. The weight of all auxiliary handling devices such as blocks, hooks, etc., must be considered a part of the load.

(4) After satisfactory completion of a proof load test, the derrick and all component parts thereof must be carefully examined in all applicable respects to the requirements in subsection (1).

WAC 296-155-58432 Specific Inspection Criteria and Proof Load Testing – Floating Cranes/Derricks and Land Cranes/Derricks on Barges

Requirements for general inspection criteria that apply to all cranes and derricks are located in WAC 296-155-58420.

(1) This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of floatation; all sections of this part apply to floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of floatation, unless specified otherwise. The requirements of this section do not apply to jacked barges when the jacks are deployed to the river/lake/sea bed and barge is fully supported by the jacks.

(2) During the annual certification, the accredited crane certifier must inspect the crane /derrick in accordance with WAC 296-155-58420 and also inspect the barge, pontoons, vessel or other means of floatation used to support a land crane/derrick. This inspection must also include the means used to secure/attach the equipment to the vessel/floatation device for proper condition, including wear, corrosion, loose or missing fasteners, defective welds, and (where applicable) insufficient tension. The means used to secure

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the crane/derricks to the barge/pontoons/vessel must not allow any amount of shifting in any direction.

- (a) The vessel/means of flotation used must be inspected for the following:
 - (i) The means used to secure/attach the equipment to the vessel/flotation device must be inspected for proper condition, including wear, corrosion and (where applicable) insufficient tension.
 - (ii) Taking on water.
 - (iii) Deckload for proper securing.
 - (iv) Chain lockers, storage, fuel compartments and battening of hatches for serviceability as a water-tight appliance.
 - (v) Firefighting and lifesaving equipment in place and functional.

- (b) External vessel/flotation device inspection.
 - (i) The external portion of the barge, pontoons, vessel or other means of flotation used must be inspected annually by an accredited crane certifier who has expertise with respect to vessels/flotation devices. The inspection must include the following items:
 - (A) Cleats, bits, chocks, fenders, capstans, ladders, and stanchions, for significant corrosion, wear, deterioration, and deformation.
 - (B) External evidence of leaks and structural damage.
 - (C) Four- corner draft readings.
 - (D) Firefighting equipment for serviceability
 - (ii) Rescue skiffs, lifelines, work vests, life preservers and ring buoys must be inspected for proper condition.
 - (iii) If any deficiency is identified, an immediate determination must be made by the accredited crane certifier as to whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly inspections. If the deficiency is determined to constitute a hazard, the vessel/flotation device must be removed from service until it has been corrected and verified by the accredited crane certifier.
 - (iv) If the qualified person determines that, though not presently a hazard, the deficiency needs to be monitored, the accredited crane certifier must notify the employer to ensure that the deficiency is checked in the monthly inspections.

- (c) Quadrennial: internal vessel//flotation device inspection.
 - (i) The internal portion of the barge, pontoons, vessel or other means of flotation used must be surveyed once every 4 years by a marine engineer,

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marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices.

(ii) If any deficiency is identified, an immediate determination must be 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.

(iii) If the deficiency is determined to constitute a hazard, the vessel/flotation device must be removed from service until it has been corrected.

(iv) If the surveyor determines that, though not presently a hazard, the deficiency needs to be monitored, the employer must ensure that the deficiency is checked in the monthly or annual inspections, as appropriate.

(d) Documentation. The quadrennial inspection required in paragraph (2)(c) must be documented, with a copy provided to the department, employer, and the accredited crane certifier and must be retained for a minimum of 4 years.

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