

WAC 296-155-53404 Rope. (1) Selection and installation criteria.

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

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

(i) **Option (1).** Rope must comply with the applicable ASME B30 standard for the year of manufacture.

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

(c) Rope must be compatible with the safe functioning of the crane/equipment.

(d) **Boom hoist reeving.**

(i) Fiber core ropes must not be used for boom hoist or luffing attachment reeving, except for derricks.

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

(e) **Rotation resistant ropes.**

(i) **Definitions.**

Type I rotation resistant wire rope (Type I). Type I rotation resistant rope is stranded rope constructed to have little or no tendency to rotate or, if guided, transmits little or no torque. It has at least 15 outer strands and comprises an assembly of at least 3 layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

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

Type III rotation resistant wire rope (Type III). Type III rotation resistant rope is stranded rope constructed to have limited resistance to rotation. It has no more than 9 outer strands, and comprises an assembly of two layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(ii) **Requirements.**

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

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

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

(D) Types II and III must have an operating design factor of no less than 5, except where the requirements of (e)(iii) of this subsection are met.

(iii) When Types II and III with an operation design factor of less than 5 are used (for nonduty cycle, nonrepetitive lifts), the following requirements must be met for each lifting operation:

(A) A qualified person must inspect the rope in accordance with subsection (2)(a) of this section. The rope must be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any one rope lay must be considered a hazard.

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

(C) Each lift made under these provisions must be recorded in the monthly and annual inspection documents. Such prior uses must be considered by the qualified person in determining whether to use the rope again.

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

(A) Rotation resistant ropes must not be used for boom hoist reeving, except where the requirements of (e)(iv)(B) of this subsection are met.

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

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

(II) The requirements in WAC 296-155-53400(43) (irrespective of the date of manufacture of the crane/equipment), and WAC 296-155-53400(44).

(III) The requirements of the applicable ASME B30 standard for the year of manufacture.

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

(V) The operating design factor for the boom hoist reeving system must be not less than 5.

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

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

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

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

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

(2) **Inspection of ropes.**

(a) **Shift inspection.**

(i) A competent person must begin a visual inspection prior to each shift the crane/equipment is used, which must be completed before that shift begins. The inspection must consist of observation of ac-

cessible ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies, including those listed in (a)(ii) of this subsection. Untwisting (opening) of rope or booming down is not required as part of this inspection.

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

(I) Distortion of the rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands;

(II) Corrosion;

(III) Electric arc damage (from a source other than power lines) or heat damage;

(IV) Improperly applied end connections; and

(V) Corroded, cracked, bent, or worn end connections (such as from severe service).

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

(I) Visibly broken wires in running wire ropes: Six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope;

(II) Visibly broken wires in rotation resistant ropes: Two randomly distributed broken wires in six rope diameters, or four randomly distributed broken wires in 30 rope diameters;

(III) Visibly broken wires in pendants or standing wire ropes: More than two broken wires in one rope lay located in rope beyond end connections, and/or more than one broken wire at an end connection; and

(IV) A diameter reduction of more than 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) Prior electrical contact with a power line; and

(III) A broken strand.

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

(A) Rotation resistant wire rope in use;

(B) Rope being used for boom hoists and luffing hoists, particularly at reverse bends;

(C) Rope at flange points, crossover points, and repetitive pick-up points on drums;

(D) Rope at or near terminal ends; and

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

(iii) **Removal from service.**

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

(I) The rope is replaced; or

(II) If the deficiency is localized, the problem is corrected by removing the damaged section of the rope; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this subsection, the crane owner and crane user must ensure that the drum will still have two wraps of rope when the load and/or boom is in its lowest position.

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

(I) The rope is replaced; or

(II) The crane owner and crane user must comply with the rope manufacturer's established criteria for removal from service, or a different criteria that the rope manufacturer has approved, in writing, for that specific rope.

(C) If the deficiency is localized, the problem is corrected by severing the rope in two; the undamaged portion may continue to be used. Joining lengths of rope by splicing is prohibited. If a rope is shortened under this subsection, the crane owner and crane user must ensure that the drum will still have two wraps of rope when the load and/or boom is in its lowest position. If a deficiency in Category III is identified, operations involving use of the wire rope in question must be prohibited until:

(I) The rope is replaced; or

(II) If the deficiency (other than power line contact) is localized, the problem is corrected by severing the rope in two; the undamaged portion may continue to be used. Joining lengths of rope by splicing is prohibited. Repair of rope that contacted an energized power line is also prohibited. If a rope is shortened under this subsection, the crane owner and crane user must ensure that the drum will still have two wraps of rope when the load and/or boom is in its lowest position.

(D) Where a rope is required to be removed from service under this section, either the crane/equipment (as a whole), or the hoist with that rope, must be tagged-out, in accordance with WAC 296-155-53400(67), until the rope is repaired or replaced.

(b) Monthly inspection.

(i) Each month an inspection must be conducted in accordance with (a) of this subsection (shift inspection).

(ii) Deficiencies found by the qualified person who is conducting the annual inspection must be documented, and (c)(iii) of this subsection must be followed.

(iii) Ropes on a crane/equipment must not be used until an inspection under this subsection demonstrates that no corrective action under (a)(iii) of this subsection is required.

(iv) This inspection must be documented and be kept and made available upon request. Electronic records are acceptable.

(c) Annual/comprehensive, for cranes and equipment not covered by WAC 296-155-531 through 296-155-53214.

(i) At least every 12 months, ropes in use on the crane/equipment must be inspected by a qualified person in accordance with (a) of this subsection (shift inspection).

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

(A) The inspection must be for deficiencies of the types listed in (a)(i)(B) of this subsection;

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

(I) Critical review items listed in (a)(ii) of this subsection;

(II) Those sections that are normally hidden during shift and monthly inspections;

(III) Rope in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited;

- (IV) Rope subject to reverse bends;
- (V) Rope passing over sheaves; and
- (VI) Rope at or near terminal ends.

(C) Exception: In the event an inspection under (c)(ii) of this subsection is not feasible due to existing set-up and configuration of the crane/equipment (such as where an assist crane is needed), or due to site conditions (such as a dense urban setting). The inspection must consist of observation of the working range, plus three additional wraps (running and standing) prior to use.

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

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

(I) The rope is replaced; or

(II) If the deficiency is localized, the problem is corrected by severing the rope in two; the undamaged portion may continue to be used. Joining lengths of rope by splicing is prohibited. If a rope is shortened under this subsection, the qualified person must ensure that the drum will still have two wraps of rope when the load and/or boom is in its lowest position.

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

(iv) This inspection must be documented and be kept and made available upon request. Electronic records are acceptable.

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

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

[Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060, and chapter 49.17 RCW. WSR 25-16-089, s 296-155-53404, filed 8/5/25, effective 9/5/25. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. WSR 16-09-085, § 296-155-53404, filed 4/19/16, effective 5/20/16. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060 and chapter 49.17 RCW, and 29 C.F.R. 1926, Subpart CC. WSR 13-02-068, § 296-155-53404, filed 12/31/12, effective 2/1/13. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.440, 49.17.060, and 29 C.F.R. 1926, Subpart CC. WSR 12-01-086, § 296-155-53404, filed 12/20/11, effective 2/1/12.]