Crane Operations Program

PURPOSE

The purpose of this program is to advise Advanced Excavating Specialists and Five Rivers Construction employees on crane operations and other suspended load operations. Any job that requires hoisting loads that need a crane rated for over 1 ton will be done by a qualified subcontractor.

Power shovels, excavators, wheel loaders, backhoes, loader backhoes, and track loaders using chains, slings, or other rigging to suspend loads and Service/Mechanical Truck Cranes are a part of subsection 3 of WAC 296-155-52900 but are still subject to the same general requirements.

ROLES & RESPONSIBILITIES

All Employees:

- Employees of Advanced Excavating Specialists and Five Rivers Construction are not to rig or signal for a third-party contractor.
- Any employee using service/mechanical truck cranes or rigging suspended loads with chains, slings or other methods is required to be qualified in these operations by showing understanding of this safety manual as well as Advanced Excavating Specialists and Five Rivers Construction “Power Line Safety Program” and “Rigging and Signaling Program”.
- Must have a crane operators manual in any crane operated at all times.

Jobsite Foreman/Superintendent:

- Supervisors are to retrain employees on these safety programs if they witness any lack of knowledge, near misses, or incidents before that employee continues to perform work with service/mechanical truck cranes or rigging suspended loads with chains, slings.
- Prior to having any crane operating subcontractor on site, the jobsite foreman/superintendent is to notify the project manager and project managers assistant.
- Ensure that all jobsite activities are in accordance with this safety program and upon leaving the jobsite assign a qualified and competent person to be in command if any changes must be made.

Office Staff:

- The project manager or project manager’s assistant is responsible for contacting any first-time hired crane subcontractor to ensure that they have policies in place in accordance with RCW 49.17.430 before work begins. They will also get copies of certifications for all crane operators on site and verify that they have been certified by a crane operator testing organization accredited by a nationally recognized accrediting agency.

OPERATIONS

A qualified person must be responsible for identifying the work zone and directing the assembly/disassembly of the equipment. Manufacturer's specifications must be followed during assembly and disassembly of cranes. Before traveling a crane with a load, it must be determined that this practice is not prohibited by the manufacturer. Decisions such as the necessity to reduce crane ratings, load position, boom location, ground support, travel route, and speed of movement must be in accordance with that person's determination. Specified tire pressure must be maintained. The boom should be carried in line with the direction of travel. The area of the cranes swing radius should be marked or barricaded. Sudden starts and stops should be avoided.

A foreman or superintendent must ensure that ground conditions are firm, drained, and graded to a sufficient extent, so that, in conjunction (if necessary) with the use of supporting materials, the crane manufacturer's specifications for adequate support and degree of level of the crane are met. The requirement for the ground to be drained does not apply to marshes/wetlands. Inform the user of the crane and the operator of the location of hazards beneath the crane set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.

If the operator determines that ground conditions do not meet the requirements above, the superintendent must have a discussion with the site foreman regarding the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary), the requirements above can be met.

If any part of the crane operations could get closer than 20 feet of a power line that is up to 350 kV or closer than 50 feet of a power line that exceeds 350 kV during the assembly/disassembly process you must confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite. If power lines cannot be deenergized the competent person on site will:

- Conduct a planning meeting with the assembly/disassembly director, operator, assembly/disassembly crew and the other workers who will be in the assembly/disassembly area to review the location of the power line(s) and the steps that will be implemented to prevent encroachment/electrocution.
- If tag lines are used, ensure they are nonconductive.
- At least one of the following additional measures must be in place. The measure selected from this list must be effective in preventing encroachment. The additional measures are:
    - Use a dedicated spotter who is in continuous contact with the crane/derrick operator, plus an elevated warning line, barricade, or line of signs, in view of the spotter, equipped with flags or similar high-visibility markings. The dedicated spotter must:

  - Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include A clearly visible line painted on the ground; a clearly visible line on stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).
  - Be positioned to effectively gauge the clearance distance.
  - Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator, in accordance with WAC **296-155-53406**(13).
- Give timely information to the operator so that the required clearance distance can be maintained.

Anytime operators view is obstructed a designated spotter must be assigned who:

- Is positioned to effectively gauge the clearance distance.
- Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
- Give timely information to the operator so that the required clearance distance can be maintained.

No Advanced Excavating Specialists and Five Rivers Construction owned service/mechanical truck cranes, power shovels, excavators, wheel loaders, backhoes, loader backhoes, or track loaders have a live boom or boom free fall function.

Hydraulic telescoping booms must have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure.

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

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

WIRE ROPE

Original crane wire rope and replacement wire rope must be selected and installed in accordance with the requirements of this section. Selection of replacement wire rope must be in accordance

with the recommendations of the wire rope manufacturer, the crane manufacturer, or a qualified person.

Wire rope (other than rotation resistant rope) must comply with either of the below and be compatible with safe functioning of the crane it is for:

- Wire rope must comply with Section 5-1.7.1 of ASME B30.5-2007 except that section's paragraph (c) must not apply.
- Wire rope must be designed to have, in relation to the crane'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.

Fiber core ropes must not be used for boom hoist or luffing attachment reeving. Rotation resistant ropes must be used for boom hoist reeving only where the requirements listed after these definitions are met.

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 3 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.

Requirements:

- Types II and III with an operation design factor of less than 5 must not be used for duty cycle or repetitive lifts.
- Rotation resistant ropes (including Types I, II and III) must have an operating design factor of no less than 3.5.
- Type I must have an operating design factor of no less than 5, except where the wire rope manufacturer and the crane manufacturer approve the design factor, in writing.
- Types II and III must have an operating design factor of no less than 5, except 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 qualified person must inspect the rope in accordance with subsection the shift inspection requirements of this program. 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.

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

Rotation resistant ropes must not be used for boom hoist reeving, except when 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 the following requirements must be met:

- The drum must provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.
- 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.
- The operating design factor for the boom hoist reeving system must be not less than 5.
- The operating design factor for these ropes must be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure and the load within the crane's/derrick's rated capacity.
- When provided, a power-controlled lowering system must be capable of handling rated capacities and speeds as specified by the manufacturer.

Wire rope clips used in conjunction with wedge sockets must be attached to the unloaded dead end of the rope only, except that the use of devices specifically designed for dead-ending rope in a wedge socket is permitted. Socketing must be done in the manner specified by the manufacturer of the wire rope or fitting. Prior to cutting a wire rope, seizing's must be placed on each side of the point to be cut. The length and number of seizing's must be in accordance with the wire rope manufacturer's instructions.

INSPECTIONS

A competent person must begin a visual inspection prior to each shift the crane is used, which must be completed before or during that shift and once a month at minimum when not in use. The inspection must consist of observation of accessible wire ropes (running and standing) that are likely to be in use during the shift for apparent deficiencies. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.

Inspections of cranes under 1 ton must include the items listed below.

- Category I – Apparent deficiencies in this category include the following:

  - Distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands.
  - Corrosion.
  - Electric arc damage (from a source other than power lines) or heat damage.
  - Improperly applied end connections.
  - Corroded, cracked, bent, or worn end connections (such as from severe service).
- Category II – Apparent deficiencies in this category are:
  - Visibly broken wires in running wire ropes: 6 randomly distributed broken wires in one rope lay or 3 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;
  - broken wires in rotation resistant ropes: Two randomly distributed broken wires in 6 rope diameters or 4 randomly distributed broken wires in 30 rope diameters;
  - 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
  - A diameter reduction of more than 5% from nominal diameter.
- Category III – Apparent deficiencies in this category include the following:
  - In rotation resistant wire rope, core protrusion or other distortion indicating core failure.
  - Prior electrical contact with a power line.
  - A broken strand.
- Critical review items – The competent person must give particular attention to all of the following:
  - Rotation resistant wire rope in use.
  - Wire rope is being used for boom hoists and luffing hoists, particularly at reverse bends.
  - Wire rope at flange points, crossover points and repetitive pickup points on drums.
  - Wire rope at or near terminal ends.
  - Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.

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:

- the wire rope is replaced.
- or if the deficiency is localized, the problem is corrected by removing the damaged section of the wire rope; the undamaged portion may continue to be used.

Joining lengths of wire rope by splicing is prohibited. If a rope is shortened under this subsection, you must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

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

- you comply with the wire rope manufacturer's established criterion for removal from service or a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope;
- or the wire rope is replaced.

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

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

- the wire rope is replaced.
- or if the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used.

Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited. If a rope is shortened under this subsection, you must ensure that the drum will still have two wraps of wire when the load and/or boom is in its lowest position.

Where a wire rope is required to be removed from service under this section, either the crane (as a whole) or the hoist with that wire rope must be tagged-out. A tag must be placed in the cab or at the operator station stating that the equipment is out of service and is not to be used. Where you have taken a function(s) out of service, a tag must be placed in a conspicuous position stating that the function is out of service and is not to be used.