02.06.2023

CRANE SAFETY

RAISING SAFETY TO HIGHER HEIGHTS.

It is essential that project supervision be familiar with the general characteristics and capabilities of cranes in order to prevent accidents. This policy is intended to cover employee-owners and crane operations where the Company provides the hoisting. For cranes that are owned, rented, or leased and operated by a subcontractor, certain provisions of this policy may also apply, in addition to §29 CFR 1926, Construction Industry Regulations, Subpart CC - Cranes and Derricks in Construction. The intent of policy provisions will be identified throughout Crane Safety.

ASSEMBLY/DISASSEMBLY DIRECTOR (A/D DIRECTOR)

NOUN - [UH-SEM-BLEE/DIS-UH-SEM-BLEE DIH-REK-TER]

An individual who is capable of identifying existing and predictable hazards in the working conditions which are hazardous or dangerous, and who has the authorization to take prompt corrective measures to eliminate them. This person must also, by possession of a recognized degree, certificate, professional standing, or extensive knowledge, training, and experience, demonstrate the ability to solve/resolve problems relating to a crane assembly/disassembly operation or be assisted by someone carrying this qualification. This can be an employee-owner or a subcontractor, depending on who is facilitating the assembly or disassembly.

CRITICAL LIFT

NOUN - [KRIT-I-KUHL LIFT]

A load or lift operation that if not executed safely could:

- *cause damage that would significantly delay operations because of replacement of long lead time items or would be costly to repair,*
- *compromise the safety and operations of a facility now or in the future,*
- *involve significant levels of hazardous materials,*
- *require a load to be maneuvered outside of the operators view,*
- *require multiple cranes for a single lift*

- *have prevailing wind conditions in excess of 15 mph*
- *involve working over live traffic*
- *outriggers not fully extended or*
- *exceed 75% of the crane's rated capacity within the lift configuration being used.*

OPERATOR

NOUN - [OP-UH-REY-TER]

An individual designated to operate a crane on the jobsite.

ROLES AND RESPONSIBILITIES

Project Supervision

- Project supervision shall ensure that operators are qualified and evaluated as required in this section.
- Project supervision should review the subcontractor's crane setup with its onsite management.
- Project supervision should oversee the unloading, loading, assembly, disassembly, rigging, operation, and maintenance of all Company cranes on site, along with the appropriate technical assistance from the lessor or manufacturer. This oversight could also be assigned/contracted to a third-party firm.
- Project supervision should see that the operator is provided with clear signals and that proper directions are communicated.
- Project supervision should participate in the planning of crane access and placement as well as critical lifts, including that the jobsite has been prepared properly for the crane to travel on and for the location where it will be in its static lift position. The soil should be reviewed to determine if the bearing capacity is adequate to support the maximum load imposed on the soil by the crane; and if not, that proper blocking/mats are utilized to assure that the bearing capacity of the soil and blocking/mats combination is greater than the load imposed by the crane. If cranes will be traveling frequently an engineered path should be constructed that will support loads of the moving crane. Third-party software, manufacturer's expertise, and soil engineering firms are available to aid in determining soil bearing capacity, required additional support, and a crane's imposed load.

- When a crane is leased or rented from an outside vendor, project supervision should require the operator to receive instruction on safe operations of that particular crane from the lessor or manufacturer. That includes all appropriate manuals, load charts, and the latest annual inspection.

PROCEDURES

General Requirements

- Cranes shall not be operated when the wind speed is in excess of what the manufacturer recommends for safe operation. When wind speeds are below the manufacturer's recommendations for safe operation, project supervision will determine if the operation should be halted due to the conditions as well as what is being hoisted. All tower cranes shall be equipped with a working anemometer (wind speed indicator). For all cranes, it is recommended to check FAA regulations which may require the use of an aviation flag or beacon affixed to the boom tip.
- Reference material should be kept on the jobsite, including a General Crane Safety Manual, a Rigging Handbook, and a copy of ASME/ANSI B30.5. A Critical Lift Plan must be completed for every Critical Lift as defined above. It is also required for tandem lifts with more than one piece of equipment. For repetitive lifts (concrete buckets, forms, precast, etc.), the form can be used to establish the range of lifts/operating radius. A pre-lift meeting to review the Critical Lift Plan must be conducted prior to all critical lifts. All Company cranes shall be equipped with a working, positive type, anti-two block device (ATBD).
- Other common safety rules to observe include:
  + A crane should not be moved without having a signal person directing the operator.
  + No personnel baskets are to be used without first reviewing with the Safety Manager.
  + No loads should be left suspended while unattended, without having secured, lockable covers in place.

OPERATOR

Operators shall be qualified in the type of crane they are operating.

The methods of qualification will include each of the following:

- The operator will be trained on the type of equipment being operated.
- The method of certification must meet the requirements published in OSHA in §29 CFR 1926.1427. (Certified Crane Operator (CCO) for example).
- The crane operator qualifying procedure must be conducted by an "Authorized Evaluator" who meets the following:
  - Has knowledge, training, and experience necessary to evaluate operators.
  - Is current with one of the following:
    - Maintains a current certification per the OSHA Standard
    - Has completed the OSHA criteria for a certified crane operator.
- Each operator must be experienced in the operation and maintenance of the machine.
- Each operator must be safety conscious, responsible, and reliable.
- Each operator shall make a thorough visual inspection of the machine at the start of each shift.
- If the operator identifies a problem with a pick, the operator will consult with project supervision to obtain input and suggestions for addressing the operator's concern.
- Each operator must be aware of overhead problems, such as power lines, and take appropriate action.

OVERHEAD POWER LINES

Working with, assembling, and dismantling cranes in proximity to overhead power lines can present safety concerns. The Safety Manager should be contacted for direction.

- Assume all power lines are energized unless confirmed de-energized by the utility owner.
- When working around power lines use non-conductive taglines.
- If there are power lines that are within the work zone of a crane, several issues should be addressed. The work zone can be defined as the area three hundred and sixty (360) degrees around the equipment up to the equipment's maximum working radius or more precisely defined by demarcating the boundaries with flags or other high visibility markings, discernible by the operator.

- A determination should be made as to whether any part of the equipment, load line, or load (including rigging and lifting accessories) if operated up to the equipment's maximum working radius in the work zone, could get closer than 20' to a power line. Note: This 20' distance is only good for voltages up to 350kV.
- If any part of the equipment, load line, or load (including rigging and lifting accessories) if operated up to the equipment's maximum working radius in the work zone, could get closer than 20' to a power line, there are three options:
  + Option 1: De-energize and ground at the worksite. This must be confirmed by the utility operator.
  + Option 2: Maintain a minimum 20' clearance. This option also includes planning meetings, maintaining an elevated warning line, and one additional measure from a list contained in the OSHA Regulation Subpart CC, including but not limited to proximity alarms, a dedicated spotter, automatic warning systems, automatic limit switches, or an insulating link.
  + Option 3: Determine the power line voltage and then apply the minimum distances allowed under Table A contained in the OSHA Regulations Subpart CC. This option may allow you to get closer than 20', depending on the voltage of the line. It will also require a greater distance if the line voltage is over 350kV. This option also includes planning meetings, maintaining an elevated warning line, and one additional measure from a list contained in the OSHA Regulation. Subpart CC includes but is not limited to proximity alarms, dedicated spotters, automatic warning systems, automatic limit switches, or an insulating link.

EXHIBIT 3.D.001

Minimum Distance Allowances for Power Line Voltages

VOLTAGE	MINIMUM CLEARANCE
0-50 kV	10 ft.
Over 50-200 kV	15 ft.

200-350 kV	20 ft.
350-500 kV	25 ft.
500-750 kV	35 ft.
750-1000 kV	45 ft.

CRANE ASSEMBLY & DISASSEMBLY

Crane assembly and disassembly is defined as the process of putting together or taking apart the pieces of a crane that must be transported separately due to their size or design. This usually includes boom and jib sections, counterweights, or tracks. On all crane assembly and disassembly operations, whether performed for a Company or subcontractor crane, the safety requirements shall be addressed and the entity operating the crane will be responsible for each requirement herein.

- Assembly/disassembly must be supervised by an A/D director. Documentation of the A/D director's qualification(s) shall be provided upon request. A pre-assembly/disassembly meeting shall be held with all involved entities prior to the operation.
- The assembly and disassembly shall be in accordance with the manufacturer's written instructions and a copy shall be present during the operation.
- No one is allowed, other than those engaged in the assembly or disassembly of the crane, in the area below any part or portion of the project where the crane may pass over during assembly/disassembly. This may also include any area where any portion of a crane may fall into, or onto, in the event of a catastrophic failure.
- Post assembly inspections shall be performed as required by the manufacturer, including a load test.
- When pins or similar devices are being removed, employee-owners must not be under the boom, jib, or other components that are not properly blocked.
- A pre-assembly/disassembly meeting shall be held with all involved entities prior to the operation. This should include project supervision, the crane owner, those responsible for assembly/disassembly, and those providing manufacturer's expertise. In addition:

+ The completed discussion items should be used in the development of a comprehensive Conventional Crane Preassembly/Disassembly plan, to be reviewed and approved by project supervision.
+ For conventional cranes rated to lift one hundred (100) tons or greater, the Company should monitor the assembly/disassembly performed by subcontractors for their cranes by periodically checking adherence to their written Conventional Crane Preassembly/Disassembly plan as referenced in this section. This monitoring may also be assigned/contracted to a third-party firm.

- The size, amount, condition and method of stacking blocking must be sufficient to sustain the loads and maintain stability.
- When blocking is used to support lattice booms or components, it must be appropriately placed to protect the structural integrity of the equipment and prevent dangerous movement or collapse.
- Upon completion of assembly, the equipment must be inspected to ensure compliance with the manufacturer's erection criteria, specifications, and limitations.
- All support cranes fall under the same requirements as outlined in this section; including the crane lift calculation form.

OPERATING RULES

Some basic fundamental rules shall be observed for all cranes in all operations. Examples of these rules are, but are not limited to:

- Inspect the crane prior to use
- A lift plan shall be prepared
- Know the weight of the object before lifting
- Know the planned radius for the lift
- Know the crane's capacity at the planned radius
- Never exceed the capacity of the crane as posted in the load chart for the crane and its configuration
- Know the crane is properly set up;

    - The crane is level within 1%
    - The crane is on firm ground capable of supporting the crane and the load in all positions
- Know the location, size and depth of underground utilities, boxes and structures. Evaluate if the planned lift has the potential to impose loading conditions in excess of the designed intent for these structures.
- Know the location of all overhead power lines:
    - Do not enter the prohibited zone surrounding energized power lines
    - If the crane is capable of making contact, follow procedures to avoid contact
- Never allow personnel to ride a load
- Inspect rigging prior to use
- Do not operate a crane with safety issues or deficiencies
- The crane cab and engine compartment shall be kept clean

OPERATOR CONDUCT

- Before starting the engine, the operator should make sure that:
    - All daily inspection and maintenance services have been performed.
    - All controls are in an off position and all brakes and locking devices are applied or engaged.
    - All personnel are clear of the crane. If equipped, deploy a swing radius barrier.
- If there is a do not start sign at starter controls, the operator shall not start the engine until the warning sign has been removed by the person who installed it.
- Operators shall test all controls, limits, and communication systems at the start of each shift. Any defects found shall be corrected before the operation is begun.
- Operators shall not engage in any practice which diverts their attention while operating the crane.
    - Cell phone usage is prohibited while in the cab of the crane.
    - Walkman-style headphones are prohibited while in the cab of the crane.
- Operators shall not operate cranes when physically or mentally unfit.
- Operators shall be responsible for all operations under their direct control. When the safety of an operation is in doubt, the operator shall consult with the person supervising the lift before lifting the load.

- At no time will the operator operate the crane within the prohibited zone around energized power lines.
- Operators shall not lift any load unless a lift plan is in place and the weight of the load, radius for the lift, and capacity of the crane are all known.
- Operators shall be thoroughly familiar with the operation of the crane and its proper care. If adjustments or repairs are necessary or if there are known defects that impair safe operation, the crane shall not be operated until unsafe conditions have been corrected.
- Operators shall not start crane movement if the load or designated signal person is not within his/her range of vision or communication.
- The operator will not lift loads without the proper tagline(s) attached
- Operators shall understand and respond to signals from the person directing the lift or from the designated signal person. Operators shall obey a stop signal at all times, no matter who gives it.
- Operators shall verify that the capacity chart being used is correct for how the crane is equipped (boom length, load line reeving, counterweight, etc.).
- Operators shall verify that the crane is properly set up including level, fully extending outriggers and all tires are off the ground (RT models).
- Operators shall verify that:
  + All crane inspections and certifications are up to date.
  + All attachments are properly assembled and attached to the crane according to the rigging drawings called for on the capacity chart.
  + The counterweight - to include applicable auxiliary counterweight - is in place and of proper weight. The maximum required counterweight shall not be exceeded.
- Operators shall perform the following operations before leaving the operator's cab for any reason:

☑	Park crane (if mobile) and position rotating bed so the crane does not interfere with the operation of other equipment.
☑	Apply travel and swing brakes or locking devices.
☑	Land any attached load.
☑	Lower boom onto blocking at ground level or onto a boom rest if possible; or securely fasten boom from movement by wind or other outside forces.
☑	Move all controls to off.
☑	Apply all drum brakes and pawls.
☑	Disengage master clutch, if equipped.
☑	Stop the engine.

- Operators shall perform the following operations if power or a control function fails during operation:

☑	Land all suspended loads, if possible, under brake or power control.
☑	Apply all brakes and locking devices.
☑	Move all controls to off.

- If a crane will be operated at night, the operator shall make sure that there is sufficient lighting for safe operation. The load and landing area shall be illuminated.
- Operators shall not operate a crane during periods of bad weather if their ability to see the load or signal person is impaired by darkness, fog, rain, etc. When a local weather storm warning exists, the operation should be stopped and the crane secured.
- Wind can cause cranes to tip or boom and other attachments to collapse. The operator or qualified person directing the lift shall compensate for the effect of wind on load and boom by reducing ratings, reducing operating speeds, or a combination of both. Unless otherwise specified on the capacity chart, or in the operator's manual, stop the operation under the following wind conditions:

  + If wind causes the load to swing forward past the allowable operating radius or sideways past either boom hinge pin, land load, and apply drum brakes.
  + If wind exceeds 35 mph, land all loads and apply drum brakes, lower boom onto blocking at ground level, or otherwise restrain it and apply swing and travel brakes and/or locks.

- Booms, jibs, or masts that are being assembled or disassembled on the ground (with or without the support of boom rigging) shall be securely blocked to prevent dropping of the boom, jib, or mast sections. Workers shall not go under boom, jib, or mast sections when removing connecting pins and bolts.

RIGGING & SIGNALING

General

Please see Section III E, Rigging a Load for more information.

- The rigger is responsible for verifying the correct weight of the load and selecting the proper rigging and method of attaching and detaching the load/rigging from the crane.
- The signal person is responsible for initiating and directing the safe movement of the crane and load, as well as landing the load.
- Depending on the size, complexity, and associated risk of the lifting operation, one person can undertake both roles; in addition, there may be multiple individuals in either one or both roles on a particular site.
- Horns and/or whistles will be blown by the operator, rigger, or signal person anytime a load has the potential to be swung over workers.
- Subcontractors that are hoisting material on any Company project will provide qualified riggers and signal persons that will be designated by name along with appropriate documentation provided before their work starts.
- To be a Company-qualified evaluator for rigging or signaling, one must successfully complete a third-party training program established to train instructors on how to evaluate others relative to the particular subject matter.

- If a subcontractor will be signaling audibly to a crane, they shall provide their own means of communication approved by and compatible with the communication means utilized by the Company. Hand signal charts must be posted on the equipment or readily available at the site and on the crane.

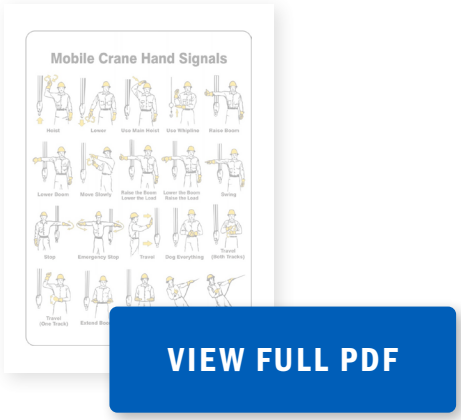
SIGNALING

- The signal person shall be qualified in the fundamentals of signaling. This qualification shall include training on at least the following subjects; hand signals, voice signals, basic crane operation, and limitations, boom deflection, and the dynamics of swinging and stopping loads. For employee-owners, this can be accomplished through a third party or a Company-qualified evaluator. For employee-owners the training should include a verbal or written test and practical exam; a record of said successful training completion shall be kept on file by the employer. Only one person at a time shall give signals to an operator.
- During crane operations requiring signals, the ability to transmit signals between the operator and signal person shall be maintained. If that ability is interrupted the operator shall stop operations requiring signals until communication is reestablished.
- Devices used to transmit audible signals shall be tested onsite before beginning operations to assure that the signal transmission is clear and reliable.
- Signal transmission must be through a dedicated channel.
- The operator's receipt of signals must be by a hands-free system.
- Standard audible signals shall be agreed to by all signal persons and operators before an operation is started.
- The operator and signal person must be able to effectively communicate in the language used.
- Each voice signal shall contain the following three elements, given in the following order:
  + function (such as hoist, boom, etc.) direction
  + distance and/or speed

+ function, stop command

EXHIBIT 3.D.002

Common Mobile Crane Hand Signals



CRANE MAINTENANCE

- Cranes shall be maintained in accordance with the manufacturer's recommendations.

CRANE INSPECTION

- This section applies to Company-owned, leased, and/or operated equipment.
- OSHA and other regulatory agencies require that periodic inspections of all cranes be made by a Competent Person. Each crane should be equipped with a crane inspection checklist. Alternatively, the checklist may be found in the Company Safety Management System. If the Crane Operator cannot locate the crane inspection checklist, contact the Safety Manager; additional items may need to be checked depending upon individual job requirements, and a copy should be kept in the crane and in the jobsite files.
- The operator shall on a daily basis inspect sheaves, rigging hardware, etc. These daily inspections on crawler and mobile cranes can be documented on the Daily Crawler/Mobile Crane Inspection Log. At the start of each shift, the operator should inspect and check the box that corresponds to the day of the month and initial at the bottom. Keep this list in the crane for the entire month, replace it with a new list and file the old.

In addition to the periodic inspections mentioned above, an annual inspection is required. These are to be kept on file as well. If the crane is being leased/rented from an outside vendor, a copy of the latest annual inspection shall be requested and kept on file.