Crane Operations

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Hand Signal Charts
1. **PURPOSE**
   a. Overhead cranes, hoists, and rigging equipment are used by THE HILLIS GROUP, LLC employees for lifting and moving materials. In order to maintain a safe workplace for its employees and comply with new regulations, only qualified individuals shall operate these devices. This program outlines the procedures for safe operations and the training requirements regarding overhead cranes, hoists and rigging equipment.

2. **SCOPE**
   a. Applies to all THE HILLIS GROUP, LLC employees who operate overhead cranes, hoists, and rigging equipment in the scope of their job duties and assignments. When work is performed on a non-owned or operated site, the operator’s program shall take precedence, however, this document covers THE HILLIS GROUP, LLC employees and shall be used on owned premises, or when an operator’s program doesn’t exist or is less stringent.

3. **RESPONSIBILITIES**
   a. Managers and Supervisors
      i. Are responsible to ensure that employees and contractors are trained and qualified on the proper operations and have been trained in crane and hoist safety.
      ii. Shall ensure modifications or additions that may affect the capacity or safe operation of the equipment must not be made without written approval from the manufacturer or approval from a registered professional engineer. The manufacturer must approve all modifications/additions in writing. A registered professional engineer must be qualified with respect to the equipment involved and must ensure the original safety factor of the equipment is not reduced.
      iii. Shall ensure all manufacturer procedures applicable to the operational function of equipment must be complied with. All manufacturer procedures applicable to the operational functions of equipment, including its use with attachments, must be readily available in the cab at all times.
      iv. Are responsible to see that all provisions of this program are followed and that crane inspections are performed and the equipment is in safe operating condition.
      v. Are responsible for identifying hazard areas by marking the boundaries of the crane swing radius with warning lines, railings or similar barriers or other safety measures to be used when the equipment has the potential to strike and injure an employee or pinch/crush an employee against any other object.
   b. Employees
      i. Employee operators are responsible to follow the requirements of this program and report any damage or needed repairs immediately to their supervisor.
      ii. Operators must meet the physical qualifications, pass a physical, a written examination, understand and be able to use a load chart as well as calculate loads for the crane type operated.
      iii. Employees designated as crane operators are responsible for the entire lift.
      iv. In addition, crane operators are responsible to:
         1. Make the required inspections,
         2. Ensure that the crane is maintained,
         3. Ensure that all personnel working in the area around the crane are kept clear of all hazards related to crane operations.
         4. Determine the weights, and correct rigging required for loads to be lifted.
v. Crane Operator Certification/Qualification

1. Operators must be determined to be qualified before they are permitted to operate any crane. Only those employees licensed and qualified by training or experience shall be allowed to operate equipment and machinery.

2. THE HILLIS GROUP, LLC will ensure all operators are qualified/certified by one of the following methods:
   a. Certification by an Accredited Crane Operator Testing Organization
      i. Accredited by a nationally recognized accrediting agency
      ii. Certification is portable
      iii. Valid for five years
      iv. Program must be reviewed by a nationally recognized accrediting agency every three years
   b. Qualification by an Audited Employer Program
      i. Developed or approved by an auditor certified by an accredited crane operator testing organization
      ii. Auditor is not an employee of THE HILLIS GROUP, LLC
      iii. Tests should be administered per nationally recognized test administration standards
      iv. Program shall be audited within the first three months, then once every three years
      v. Qualification is not portable and valid for five years
   c. Certification/Qualification Criteria
      i. Pass written test that include:
         1. Controls and operational performance
         2. Ability to calculate the load/capacity
         3. Knows Procedures for power line contact
         4. Site preparation
         5. Ability to read manuals/charts relevant to the equipment being operated
         6. Pass practical examination
         7. Ability to perform a pre-shift inspection
         8. Operational and maneuvering skills
         9. Application of load chart information
         10. Application of safe shut down and securing procedures
   d. Administrative Criteria
      i. THE HILLIS GROUP, LLC will revoke operator’s certification if they have reason to believe the employee is not qualified to operate.
      ii. The current training records must be on file during the operator’s employment.

vi. Rigger Qualifications

1. Riggers assemble, rig, hook and unhook, guide, and disassemble crane equipment and materials. Riggers must meet the requirements of a qualified person. A qualified rigger is a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrates the ability to resolve problems relating to the subject matter, the work, or the project.

2. Riggers must be trained in all the requirements of the regulations that apply to their respective roles. For example, riggers must be trained and qualified
to perform assembly and disassembly operations when their job tasks require them to perform such operations.

vii. Signal Person Qualification

1. All signal persons must be qualified to give signals. In order to be qualified, the signal person must:
   a. Know and understand the type of signals used; if hand signals are used, the signal person must know and understand the Standard Method for hand signals.
   b. Be competent in the application of the type of signals used.
   c. Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.
   d. Know and understand the regulatory requirements for signals (29 CFR 1926.1419 to 1926.1422) and the signal person qualifications (29 CFR 1926.1428).
   e. Demonstrate that he or she meets the qualification requirements for signalers through an oral or written test and through a practical test.

viii. Signal Person Evaluations

1. The qualification of signal persons must be evaluated and documented by either:
   a. A third party qualified evaluator, or
   b. The employer's qualified evaluator (i.e., an employee competent in accurately assessing whether the signaler has met the qualification requirements)

ix. Signal Person Refresher Training

1. If subsequent actions by the signal person indicate that the individual does not meet the Qualification Requirements, THE HILLIS GROUP, LLC will not allow the individual to continue working as a signal person until retraining is provided and a reassessment is made that confirms that the individual meets the Qualification Requirements.

x. Documentation of Signal Qualification

1. THE HILLIS GROUP, LLC must make the documentation for whichever option is used available at the site while the signal person is employed by THE HILLIS GROUP, LLC. The documentation must specify each type of signaling (e.g. hand signals, radio signals) for which the signal person meets the requirements of the rule.

xi. Authority to Stop Operations

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

4. GROUND CONDITIONS

a. Cranes must not be used unless ground conditions are able to support the equipment and any supporting materials per the manufacturer's specifications. THE HILLIS GROUP, LLC (controlling entity) will ensure that equipment must not be assembled or used unless ground conditions are firm, drained and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer’s specifications for adequate support and degree of level of the equipment are met.
5. **HAZARDS**
   a. THE HILLIS GROUP, LLC will locate all hazards that are identified in all available documents and inform the crane user of them.

6. **POWER LINES**
   a. No part of a crane, line or load may be able to reach within 20 feet of a power line during setup. Exceptions: de-energized and grounded power lines or use of a dedicated spotter or proximity alarms.
   b. Assembly/disassembly below power lines is prohibited, unless line is de-energized and grounded.
   c. All power lines are presumed to be energized unless confirmed to be de-energized by the utility owner/operator and visibly grounded at the worksite.
   d. All power lines are presumed to be un-insulated.
   e. Employees shall understand limitations of insulating links, proximity alarms and range control devices, if used.
   f. Dedicated spotters shall be trained.
   g. There must be at least one electrocution hazard warning sticker conspicuously placed in the cab of the crane.
   h. A pre-operation hazard assessment will be performed to identify the work zone and determine if any part of the equipment could reach closer than 20 feet to a power line. The work zone shall be identified by demarcating boundaries such as flag and range limiting devices, or defining the work zone as 360 degrees around the equipment up to the maximum working radius. The hazard assessment must determine if any part of the equipment could get closer than 20 feet to a power line.
   i. Measures must be taken if it is determined that any part of the equipment, load line or load could get closer than 20 feet to a power line. If it is determined that any part of the equipment, load line or load could get closer than 20 feet to a power line then at least one of the following measures must be taken:
      i. Ensure the power lines have been de-energized and visibly grounded
      ii. Ensure no part of the equipment, load line or load gets closer than 20 feet to the power line
      iii. Determine the line's voltage and minimum approach distance permitted in Table A (below).

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>Minimum Clearance Distance(feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 50</td>
<td>10</td>
</tr>
<tr>
<td>50 to 200</td>
<td>15</td>
</tr>
<tr>
<td>200 to 350</td>
<td>20</td>
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<tr>
<td>350 to 500</td>
<td>25</td>
</tr>
<tr>
<td>500 to 750</td>
<td>35</td>
</tr>
<tr>
<td>750 to 1000</td>
<td>45</td>
</tr>
<tr>
<td>Over 1000</td>
<td>As established by the line owner</td>
</tr>
</tbody>
</table>

j. Some special requirements for working below power lines include training of operators and crew on:
   i. Procedures to follow after power line contact
ii. Danger of a potential energized zone
iii. Operator’s emergency procedures
iv. Safest means to evacuate equipment
v. Need for employees to avoid approach
vi. Safe clearance from power lines

7. REQUIRED EQUIPMENT
   a. Mandatory Safety Devices Equipment
      i. All safety devices must be in proper working order before operation begins.
         1. Safety devices are required to be on all equipment and must be in proper
            working order before operations begin. If any of the devices are not in
            proper working order the equipment must be taken out of service and
            operations must not resume until the device is working properly again. The
            following is mandatory equipment:
               a. Crane level indicator
               b. Boom stops
               c. Jib stops
               d. Locks for foot pedal brakes
               e. Horns
               f. Integral check valves for hydraulic outriggers
               g. Rail clamps and stops for equipment on rails
      ii. The following required equipment must be in service except where specified
          temporary alternative measures are met:
         1. Boom hoist limiting device
         2. Luffing jib limiting device
         3. Anti two-block device (cranes manufactured after 2/28/92) Exception:
            lattice booms used for dragline, clam shell, scrap magnet, drop ball,
            marine operations and pile driving work
         4. Boom angle or radius indicator
         5. Jib angle indicator (luffing jibs)
         6. Boom length indicator (telescopic booms)
         7. Load weighing devices (load moment indicators, rated capacity indicators or
            rated capacity limiters –cranes manufactured after 3/29/03
         8. Outrigger position indicators (cranes manufactured after 1/1/08)
         9. Hoist drum rotation indicator (if drum is not visible to operator)
      10. An accessible fire extinguisher of 5BC rating, or higher, shall be available at all
          operator stations or cabs of equipment.
      11. Procedures applicable to the operation of the equipment must be readily
          available in the cab at all times. The operator shall have access to procedures
          applicable to the operation of the equipment. Procedures include rated
          capacities (load charts), recommended operating speeds, special hazard
          warnings, instructions and operator’s manual.
      12. If the crane has more than one hoisting unit, each hoist shall have its rated
          load marked on it or its load block and this marking shall be clearly legible
          from the ground floor.
      13. Whenever internal combustion engine powered equipment exhausts in
          enclosed spaces, test shall be made and recorded to see that employees are
          not exposed to unsafe concentrations of toxic gases or oxygen deficient
          atmospheres.
8. MATERIAL HOISTS, PERSONAL HOISTS AND ELEVATORS
   a. General Requirements
      i. Hoist Specifications
         1. All material hoists must conform to the requirements of ANSI/ASME A10.5-1969, Safety Requirements for Material Hoists. Note: ANSI/ASME have updated this standard; however, OSHA allows THE HILLIS GROUP, LLC to follow the updated consensus standard without penalty when it provides equal or greater employee protection.
         2. THE HILLIS GROUP, LLC must comply with the manufacturer's specifications and limitations for the operation of all hoists and elevators. Where manufacturer's specifications are not available, a professional engineer competent in the field must determine the limitations assigned to the equipment.
         3. Rated load capacities, recommended operating speeds, and special hazard warnings or instructions must be posted on cars and platforms.
      ii. Wire Rope
         1. Hoisting ropes must be installed in accordance with the wire rope manufacturer's recommendations. Wire rope must be removed from service when any of the following conditions exists:
            a. In hoisting ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay
            b. Abrasion, scrubbing, flattening, or peening, causing loss of more than one-third of the original diameter of the outside wires
            c. Evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires
            d. Reduction from nominal diameter of more than three sixty-fourths in. for diameters up to and including three-fourths in.; one-sixteenth in. for diameters seven-eighths to 11/8 in.; and three thirty-seconds in. for diameters one and one-quarter in. to one and one-half in.
   b. PROHIBITED OPERATIONS
      a. The installation of live booms on hoists and the use of endless belt-type man lifts are prohibited.
      b. The manufacturer's instructions, procedures and prohibitions must be followed and complied with when assembling and/or disassembling equipment.
      c. Material Hoists
         i. Operating rules must be established and posted at the operator's station of the hoist. Such rules must include signal system and allowable line speed for various loads. Rules and notices must be posted on the car frame or crosshead in a conspicuous location, including the statement "No Riders Allowed." No person must be allowed to ride on material hoists except for the purposes of inspection and maintenance.
      d. Protective Gates, Bars, and Coverings
         i. All entrances of the hoistways must be protected by substantial gates or bars, which must guard the full width of the landing entrance. All hoistway entrance bars and
gates must be painted with diagonal contrasting colors, such as black and yellow stripes.

ii. Bars must be not less than 2- by 4-in. wooden bars or the equivalent, located 2 ft. from the hoistway line. Bars must be located neither less than 36 in. nor more than 42 in. above the floor. Gates or bars protecting the entrances to hoistways must be equipped with a latching device.

iii. Overhead protective covering of 2-in. planking, 3/4-inch plywood, or other solid material of equivalent strength must be provided on the top of every material hoist cage or platform.

iv. The operator's station of a hoisting machine must be provided with

v. overhead protection equivalent to tight planking not less than 2 in. thick. The support for the overhead protection must be of equal strength.

e. Material Hoist Towers

i. All material hoist towers must be designed by a licensed professional engineer. Hoist towers may be used with or without an enclosure on all sides. Whichever alternative is chosen, the following applicable conditions must be met:

1. When a hoist tower is enclosed, it must be enclosed on all sides for its entire height with a screen enclosure of 1/2-in. mesh, No. 18 U.S. gauge wire or equivalent, except for landing access.

2. When a hoist tower is not enclosed, the hoist platform or car must be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with 1/2-in. mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure must include the required gates for loading and unloading. A 6-ft- high enclosure must be provided on the unused sides of the hoist tower at ground level.

3. Car-arresting devices must be installed to function in case of rope failure.

f. Personnel Hoists

i. Specifications

1. All personnel hoists used by employees must be constructed of materials and components that meet the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in the ANSI/ASME A10.4-1963, Safety Requirements for Workmen’s Hoists. ANSI/ASME have updated this standard; however, OSHA allows THE HILLIS GROUP, LLC to follow the updated consensus standard without penalty when it provides equal or greater employee protection.

ii. Personnel Hoist Towers

1. Hoist towers outside the structure must be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure must be enclosed to a height of at least 10 ft. Other sides of the tower adjacent to floors or scaffold platforms must be enclosed to a height of 10 ft. above the level of such floors or scaffolds. Towers inside of structures must be enclosed on all four sides throughout the full height.

2. Towers must be anchored to the structure at intervals not exceeding 25 ft. In addition to tie-ins, a series of guys must be installed. Where tie-ins are not practical, the tower must be anchored by means of guys made of wire rope at least one-half in. in diameter, securely fastened to anchorage to ensure stability.

iii. Hoistway - Doors and Gates
1. Hoistway doors or gates must be not less than 6 ft. 6 in. high and must be provided with mechanical locks that cannot be operated from the landing side, and must be accessible only to persons on the car. A door or gate must be provided at each entrance to the car, which must protect the full width and height of the car entrance. Doors or gates must be provided with electrical contacts that do not allow movement of the hoist when door or gate is open.

iv. Cars

1. Cars must be permanently enclosed on all sides and the top, except sides used for entrance and exit that have car gates or doors. Safeties must be capable of stopping and holding the car and rated load when traveling at governor tripping speed. Cars must be provided with a capacity and data plate secured in a conspicuous place on the car or crosshead. An emergency stop switch must be provided in the car and marked "Stop."

2. Covering
   a. Overhead protective covering of 2-in. planking, 3/4-in. plywood, or other solid material or equivalent strength must be provided on the top of every personnel hoist.

3. Engine Prohibition
   a. Internal combustion engines must not be permitted for direct drive.

4. Stopping Device
   a. Normal and final terminal stopping devices must be provided.

5. Ropes
   a. The minimum number of hoisting ropes used must be three for traction hoists and two for drum-type hoists. The minimum diameter of hoisting and counterweight wire ropes must be 1/2 in. Following are the minimum safety factors for suspension wire ropes:

<table>
<thead>
<tr>
<th>Rope speed (feet per minute)</th>
<th>Minimum factor of safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>7.60</td>
</tr>
<tr>
<td>7</td>
<td>7.75</td>
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<tr>
<td>8</td>
<td>7.95</td>
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<td>9</td>
<td>8.10</td>
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<tr>
<td>10</td>
<td>8.25</td>
</tr>
<tr>
<td>11</td>
<td>10.70</td>
</tr>
</tbody>
</table>

See the chart at 29 CFR 1926.552(c)(14) for additional safety factors.

v. Personnel Hoists Used in Bridge Tower Construction

1. Such hoists must be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.

2. When a hoist tower is not enclosed, the hoist platform or car must be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with 3/4-in. mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure must include the required gates for loading and unloading.

3. These hoists must be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding 35 miles per hour, it must be inspected and put in operable condition before reuse.

4. Wire rope must be taken out of service when any of the following conditions exist:
a. In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay

b. Wear of one-third the original diameter of outside individual wires
c. Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure

5. Evidence of any heat damage from any cause
6. Reductions from nominal diameter of more than three sixty-fourths in. for diameters to and including three-fourths in., one-sixteenth in. for diameters seven-eights in. to 11/8 in. inclusive, three thirty-seconds in. for diameters 11/4 to 11/2 in. inclusive
7. In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

g. Elevators
   i. Permanent elevators under the care and custody of THE HILLIS GROUP, LLC and used by employees for work covered by this Act must comply with the requirements of ANSI/ASME A17.1-1965 with addenda A17.1a-1967, A17.1b-1968, A17.1c-1969, A17.1d-1970, and inspected in accordance with A17.2-1960 with addenda A17.2a-1965 and A17.2b-1967. ANSI/ASME have updated these standards; however, OSHA allows THE HILLIS GROUP, LLC to follow the updated consensus standards without penalty when they provide equal or greater employee protection.

h. Base-Mounted Drum Hoists
   i. Specifications
      1. All base-mounted drum hoists in use must meet the applicable requirements for design, construction, installation, testing, inspection, maintenance, and operations, as prescribed by the manufacturer.
      2. THE HILLIS GROUP, LLC must ensure that exposed moving parts such as gears, projecting screws, setscrews, chain, cables, chain sprockets, and reciprocating or rotating parts that constitute a hazard are guarded.
      3. All controls used during the normal operation cycle must be located within easy reach of the operator’s station.

i. Electric Motor-Operated Hoists
   i. Electric motor-operated hoists must be provided with:
      1. A device to disconnect all motors from the line upon power failure and not permit any motor to be restarted until the controller handle is brought to the "off" position
      2. Where applicable, an over-speed preventive device
      3. A means whereby remotely operated hoists stop when any control is ineffective

j. Overhead Hoists
   i. All overhead hoists in use must meet the applicable requirements for construction, design, installation, testing, inspection, maintenance, and operation, as prescribed by the manufacturer.
   ii. The safe working load of the overhead hoist, as determined by the manufacturer, must be indicated on the hoist, and this safe working load must not be exceeded.
   iii. The supporting structure to which the hoist is attached must have a safe working load equal to that of the hoist. The support must be arranged so as to provide for free movement of the hoist and must not restrict the hoist from lining itself up with the load.
iv. The hoist must be installed only in locations that will permit the operator to stand clear of the load at all times.

v. Air hoists must be connected to an air supply of sufficient capacity and pressure to safely operate the hoist. All air hoses supplying air must be positively connected to prevent disconnected during use.

k. Conveyors

i. Specifications

1. All conveyors in use must meet the applicable requirements for design, construction, inspection, testing, maintenance, and operation, as prescribed in the ANSI/ASME B20.1-1957, Safety Code for Conveyors, Cableways, and Related Equipment. ANSI/ASME have updated this standard; however, OSHA allows THE HILLIS GROUP, LLC to follow updated consensus standards without penalty when they provide equal or greater employee protection.

2. Means for stopping the motor or engine must be provided at the operator's station. Conveyor systems must be equipped with an audible warning signal to be sounded immediately before starting up the conveyor. If the operator's station is at a remote point, similar provisions for stopping the motor or engine must be provided at the motor or engine location.

3. Emergency stop switches must be arranged so that the conveyor cannot be started again until the actuating stop switch has been reset to running or "on" position.

4. Guards

   a. Screw conveyors must be guarded to prevent employee contact with turning flights. Where a conveyor passes over work areas, aisles, or thoroughfares, suitable guards must be provided to protect employees required to work below the conveyors.

ii. Marking and Lockout/Tagout

1. All crossovers, aisles, and passageways must be conspicuously marked by suitable signs (see 29 CFR 1926.200). Conveyors must be locked out, or otherwise rendered inoperable, and tagged out with a "Do Not Operate" tag during repairs and when operation is hazardous to employees performing maintenance work.

l. Rigging Practices

i. Major incidents involving rigging operations are caused by:

   1. the failure of equipment from overloading, incorrect assembly or disassembly, or lack of proper maintenance;
   2. dropped or falling loads, usually as a result of the misuse or malfunction of hoisting lines and rigging; and
   3. lack of safeguards, especially in proximity to high-voltage lines. Training is key in minimizing the risk of incidents

ii. An important element of the THE HILLIS GROUP, LLC material handling program is proper rigging practices. Rigging of loads must be done with relative precision and performed by trained, experienced personnel. To ensure that safe practices are followed, a competent and qualified person must direct the assembly/disassembly of equipment. The assembly/disassembly of equipment must be directed by a competent and qualified person to see that:

   1. Rigging equipment that has the necessary capacity to do the job is available.
   2. Rigging equipment is in a safe working condition.
   3. Loads are rigged correctly.
4. Safety of the rigging crew and other potentially exposed personnel is maintained.

5. Rigging and Sling Inspections and Safety Requirements

6. Only select rigging equipment that is in good condition.

7. All rigging equipment shall be inspected annually; defective equipment is to be removed from service and destroyed to prevent inadvertent reuse.

8. The load capacity limits shall be stamped or affixed to all rigging components.

9. All devices shall be visually inspected prior to use and removed from service for any of the following conditions:
   a. Nylon slings with:
      i. Abnormal wear.
      ii. Torn stitching.
      iii. Broken or cut fibers.
      iv. Discoloration or deterioration.
   b. Wire rope slings (see Wire Rope Inspection) with:
      i. Kinking, crushing, bird caging, or other distortions.
      ii. Evidence of heat damage.
      iii. Cracks, deformation, or worn end attachments.
      iv. Six randomly broken wires in a single rope lay.
      v. Three broken wires in one strand of rope.
      vi. Hooks opened more than 15% at the throat.
      vii. Hooks twisted sideways more than 10 degrees from the plane of the unbent hook.
   c. Alloy steel chain slings with:
      i. Cracked, bent, or elongated links or components.
      ii. Cracked hooks.
      iii. Shackles, eye bolts, turnbuckles, or other components that are damaged or deformed.

m. Rigging a Load
   i. Determine the weight of the load - do not guess.
   ii. Determine the proper size for slings and components.
   iii. Do not use manila rope for rigging.
   iv. Ensure that shackle pins and shouldered eyebolts are installed in accordance with the manufacturer’s recommendations.
   v. Ensure that ordinary (shoulderless) eyebolts are threaded in at least 1.5 times the bolt diameter.
   vi. Use safety hoist rings (swivel eyes) as a preferred substitute for eye bolts wherever possible.
   vii. Pad sharp edges to protect slings.
   viii. Remember that machinery foundations or angle-iron edges may not feel sharp to the touch but could cut into rigging when under several tons of load.
   ix. Wood, tire rubber, or other pliable materials may be suitable for padding.
   x. Do not use slings, eyebolts, shackles, or hooks that have been cut, welded, or brazed.
   xi. Install wire-rope clips with the base only on the live end and the U-bolt only on the dead end.
   xii. Follow the manufacturer’s recommendations for the spacing for each specific wire size.
   xiii. Determine the center of gravity and balance the load before moving it.
   xiv. Initially lift the load only a few inches to test the rigging and balance.
10. **INSPECTIONS**
   
   a. All Inspections shall be conducted by a competent person.
   
   b. Following assembly and erection of hoists, and before being put in service, an inspection and test of all functions and safety devices must be made under the supervision of a competent person.
      
      i. A similar inspection and test are required following major alteration of an existing installation.
      
      ii. All hoists must be inspected and tested at not more than 3-month intervals. THE HILLIS GROUP, LLC must prepare a certification record, which includes the date the inspection and test of all functions and safety devices was performed; the signature of the person who performed the inspection and test; and a serial number, or other identifier, for the hoist that was inspected and tested. The most recent certification record must be maintained on file.
      
      iii. Cranes shall be inspected on the following schedule:
           1. After Modification
           2. After Repair Or Adjustment
           3. Post Assembly
           4. Each Shift
           5. Monthly
           6. Annual Comprehensive
      
      iv. Additional inspections will occur for the following situations:
           1. Severe Service
           2. Shock load, corrosive atmosphere, etc.
           3. Inspect exposed items/conditions
           4. Not In Regular Use
           5. Idle more than three months
      
      v. Cranes and hoists that have been overloaded shall be inspected prior to being returned to service. The inspection and testing requirements are included.
      
      vi. Initial inspection and test shall be performed by a qualified third party.
      
      vii. Prior to initial use all new and altered cranes shall be inspected and tested to ensure compliance with the provisions of 29 CFR1910.179 and ABSI B30.2.
      
      viii. Only after determining, by this inspection, testing and proper documentation, that the crane is in safe operating condition, shall it be put into service.
      
      ix. THE HILLIS GROUP, LLC shall designate a competent person who shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use. Daily pre-use inspections shall be performed by the crane operator (designated as THE HILLIS GROUP, LLC’s designated competent person) prior to beginning shift and through observation during normal operation. Daily inspections shall include:
           1. Any deficiencies shall be repaired, or defective parts replaced, before continued use.
           2. All functional operating mechanisms for maladjustment interfering with proper operation.
           3. Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems.
           4. Hooks, if deformations or cracks are found the hook shall be tagged out of service until repaired and tested by qualified personnel.
5. Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer’s recommendations.

c. **Severe Service Inspection**
   i. Severe service inspections shall be conducted to inspect exposed items and conditions resulting from a shock load, corrosive atmosphere, etc. Inspections shall be documented.

d. **Not in Regular Use Inspection**
   i. If equipment is idle for more than three months an inspection shall be performed before being placed in service. The same criteria for monthly inspections shall be followed.

e. **Monthly Inspection**
   i. Monthly inspections of equipment by a competent person are documented. Equipment must be inspected monthly by a competent person and documented. Documentation must include the following:
      1. Items checked,
      2. Results of inspection, and
      3. Name and signature of the inspector.
   ii. Documentation must be retained for 3 months. Documented monthly inspection not required if the daily inspection is documented and records are retained for 3 months.
   iii. If safety hazards are found during inspections, the equipment in question shall be tagged out and not used until repairs are made. Any deficiencies constituting a safety hazard shall cause the equipment to be tagged out of service until repairs are made.

f. **Annual Inspection**
   i. A thorough, annual inspection and functioning testing of the hoisting machinery shall be documented made by a qualified person, or by a government or private agency recognized by the U.S. Department of Labor using the detail inspection criteria per regulation. THE HILLIS GROUP, LLC shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment and kept on file for 12 months or until the next annual inspection.

g. **Wire Rope Inspection**
   i. Wire rope will be inspected on the following schedule:
      1. Shift Inspection – Before each shift.
   ii. Monthly Inspection - All wire ropes, including running ropes and the inspection shall be documented.
   iii. Annual Inspection – At least every 12 months, unless not feasible due to set up. This will be a more detailed inspection including wire rope that is normally hidden during daily or monthly inspections and the inspection shall be documented.
   iv. THE HILLIS GROUP, LLC competent person will conduct visual inspections before each shift, monthly and annually for wire rope and categorize deficiencies in:
      1. Category I Deficiencies
         a. Significant distortion of the wire rope structure such as kinking, crushing, un-stranding, bird caging, signs of core failure, or steel core protrusion between the outer strands.
         b. Significant corrosion.
         c. Electric arc (from a source other than power lines) or heat damage.
         d. Improperly applied end connections.
         e. Significantly corroded, cracked, bent, or worn end connections (such as from severe service).
f. If a Category I deficiency is identified, an immediate determination shall be made by the qualified person as to replacement of the wire rope, or if the deficiency is localized, the wire rope may be severed at the bad spot and may be continued to be used.

2. Category II Deficiencies
   a. Visible broken wires as follows:
      i. In running wire ropes: six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay.
      ii. In rotation resistant ropes: two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters.
      iii. In pendants or standing wire rope more than two broken wires in one rope lay located in rope beyond end connections and / or one or more broken wire in a rope lay located at an end connection.
   b. If a category II deficiency is identified an immediate determination shall be made by the qualified person as to, based on manufacturer recommendations, either remove or monitor the wire rope for continued deterioration.
   c. The qualified person determines when to replace the wire rope (no more than 30 days after the deficiency is identified).
   d. A qualified person assesses the deficiency in light of the load and other conditions of use and determines it is safe for continued use.
   e. A qualified person establishes the parameters of use.
   f. All workers who conduct shift inspections are notified.
   g. The qualified person’s findings and procedures are documented.

3. Category III Deficiencies
   a. Electrical contact to power line
   b. Core protrusion or other distortion indicating core failure in rotation resistant wire rope
   c. Broken strand
   d. If a category III deficiency is identified, operations involving use of the wire rope shall be prohibited until the:
      i. Wire rope is replaced (ALWAYS with power line contact).
      ii. Deficiency is localized and problem corrected.

11. OPERATIONAL PROCEDURES
   a. Only qualified personnel shall operate cranes and equipment covered by this program.
      Operators shall comply with the following safety rules while operating cranes and hoists:
      i. Employees shall not be exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres when internal combustion engine powered equipment is used. Tests shall be conducted and documented.
      ii. Do not engage in any practice that will divert your attention while operating the crane.
      iii. Respond to signals only from the person who is directing the lift or any appointed signal person.
      iv. Obey a stop signal at all times, no matter who gives it.
      v. Do not move a load over people.
      vi. People shall not be placed in jeopardy by being under a suspended load.
vii. Do not work under a suspended load unless the load is supported by blocks, jacks, or a solid footing that will safely support the entire weight.

viii. Have a crane or hoist operator remain at the controls or lock open and tag the main electrical disconnect switch.

ix. Ensure that the rated load capacity of a crane’s bridge, individual hoist, or any sling or fitting is not exceeded.

x. Know the weight of the object being lifted.

xi. Check that all controls are in the OFF position before closing the main line disconnect switch.

xii. If spring-loaded reels are provided to lift pendants clear off the work area, ease the pendant up into the stop to prevent damaging the wire.

xiii. Avoid side pulls. These can cause the hoist rope to slip out of the drum groove, damaging the rope or destabilizing the crane or hoist.

xiv. To prevent shock loading, avoid sudden stops or starts. Shock loading can occur when a suspended load is accelerated or decelerated, and can overload the crane or hoist. When completing an upward or downward motion, ease the load slowly to a stop.

b. A visual inspection of the equipment will be conducted by a competent person prior to each shift. The inspection must consist of observation for apparent deficiencies. Some of the inspection items include control mechanisms, pressurized lines, hooks and latches, wire rope, electrical apparatus, tires (when used), and ground conditions. The designated competent person shall do the following steps before making lifts with any crane or hoist:

i. Test the upper-limit switch and slowly raise the unloaded hook block until the limit switch trips.

ii. Visually inspect the hook, load lines, trolley, and bridge as much as possible from the operator’s station; in most instances, this will be the floor of the building.

iii. If provided, test the lower-limit switch.

iv. Test all direction and speed controls for both bridge and trolley travel.

v. Test all bridge and trolley limit switches, where provided, if operation will bring the equipment in close proximity to the limit switches.

vi. Test the pendant emergency stop.

vii. Test the hoist brake to verify there is no drift without a load.

viii. If provided, test the bridge movement alarm.

ix. Lock out and tag for repair any crane or hoist that fails any of the above tests.

x. Any deficiencies shall be repaired, or defective parts replaced, before continued use.

c. Moving a Load

i. Center the hook over the load to keep the cables from slipping out of the drum grooves and overlapping, and to prevent the load from swinging when it is lifted.

ii. Inspect the drum to verify that the cable is in the grooves.

iii. Use a tag line when loads must traverse long distances or must otherwise be controlled.

iv. Manila rope may be used for tag lines.

v. Plan and check the travel path to avoid personnel and obstructions.

vi. Lift the load only high enough to clear the tallest obstruction in the travel path.

vii. Start and stop slowly.

viii. Land the load when the move is finished.

ix. Never leave suspended loads unattended

1. In an emergency where the crane or hoist has become inoperative, if a load must be left suspended, barricade and post signs in the surrounding area, under the load, and on all four sides.

2. Lock open and tag the crane or hoist’s main electrical disconnect switch.
d. Parking a Crane or Hoist
   1. Remove all slings and accessories from the hook.
   2. Return the rigging device to the designated storage racks.
   3. Place the emergency stop switch (or push button) in the OFF position.

e. Cranes or hoists shall not be loaded beyond their rated capacity for normal operations.
   i. Any crane or hoist suspected of having been overloaded shall be removed from service
      by locking open and tagging the main disconnect switch. Overloaded cranes shall be
      inspected, repaired, load tested, and approved for use before being returned to
      service.

f. Fall Protection
   i. Anyone conducting non-assembly/disassembly work, maintenance or repair on cranes
      or hoists at heights greater than 6 ft (1.8 m) shall use fall protection. Fall protection
      includes safety harnesses that are fitted with a lifeline and securely attached to a
      structural member of the crane or building. Anchorages must be any substantial part of
      the boom or to any substantial piece on the equipment (using correct fall protection
      equipment). A fall arrest system is permitted to be anchored to the crane/derrick’s
      hook or other part of the load line where the following requirements are met:
      1. A qualified person has determined the set-up and rated capacity meets or
         exceeds the anchorage requirements
      2. The operator is aware it is being used for this purpose
   ii. Exceptions to using fall protection involving non-assembly/disassembly work:
       1. While at a work station or going to and from a work station.
       2. When walking point to point along a horizontal lattice boom that has been
          lowered to the ground and supported.
       3. In the cab or on the deck
   iii. Fall protection must be used when working over 15 feet during the
        assembly/disassembly process, except when the employee is:
        1. At or near the draw-works
        2. In the cab, or on the deck

g. Signalling
   i. A signal person must be provided if the operator’s view is obstructed, if site specific
      safety concerns require it or if the operator determines that it is necessary. A signal
      person must be provided for the following situations:
      1. The point of operation is not in full view of the operator
      2. The view is obstructed when the equipment is traveling
      3. The operator or the person handling the load determines it is necessary due
         to site specific concerns.
   ii. Signals to the operator shall be in accordance with the standard hand signals
       prescribed by the applicable ANSI standard for the type of crane in use unless voice
       communications equipment (telephone, radio, or equivalent) is used. (See Section 10)
   iii. Signalers must be qualified.
   iv. Signals shall be discernible or audible at all times.
   v. Some special operations may require addition to or modification of the basic signals.
   vi. For all such cases, these special signals shall be agreed upon and thoroughly
       understood by both the person giving the signals and the operator, and shall not be in
       conflict with the standard signals. (See APPRNDIX A)

12. TRAINING
   a. Mandatory training is required for:
      i. Overhead power lines
ii. Signal persons
iii. Competent/qualified persons
iv. Operators
v. Crush/pinch points
vi. Tag-out

b. Training Costs
   i. THE HILLIS GROUP, LLC must provide all training required under the crane and derrick rules at no cost to the employee.

   c. Refresher Training
      i. THE HILLIS GROUP, LLC must provide refresher training in relevant topics for each employee when there is an indication that retraining is necessary on the basis of THE HILLIS GROUP, LLC actions or an evaluation of the employee’s knowledge.

   d. Training Evaluation
      i. THE HILLIS GROUP, LLC must evaluate each employee who has been trained in crane and derrick operations to verify that he or she understands the information provided in training. The rule allows THE HILLIS GROUP, LLC to determine the most appropriate method of evaluation.

      ii. Note: The crane operator training applies only in states that do not have their own licensing and certification requirements. All other training and qualification requirements apply to all personnel.

   e. Crane Operator Training
      i. THE HILLIS GROUP, LLC must comply with federal requirements to train crane operators employed by them. During the certification phase-in period (i.e., November 2010 to November 2014) in states without operator licensing laws, THE HILLIS GROUP, LLC must ensure that crane and derrick operators covered by the rules are competent to operate the equipment safely. Where an employee assigned to operate machinery does not have the required knowledge or ability to operate the equipment safely, THE HILLIS GROUP, LLC must train that employee before operating the equipment. THE HILLIS GROUP, LLC must ensure that each operator is evaluated to confirm that he or she understands the information provided in the training.

      ii. Operator-in-training requirement effective November 10, 2014

      iii. The rules for operator-in-training (e.g., prequalification/certification training, operator’s trainer monitoring, multiple-lift rigging operations) in states without operator licensing rules are applicable on November 10, 2014. Until that date, operators must comply with the minimum training requirements required under the transition period from November 8, 2010 to November 10, 2014.

      iv. Minimum Training Requirements
         1. Before operating crane equipment, each crane operator must be trained to know how to safely operate the specific type of equipment he or she will operate, including all of the following:
            a. Safe practices for testing the boom hoist brake on friction equipment and all other equipment with a boom (see 29 CFR 1926.1430(c)(4)(i) for the specific safe practices);
            b. The manufacturer’s emergency procedures for stopping unintended equipment movement, where available;
            c. The controls and operational/performance characteristics;
            d. Use of, and the ability to calculate (manually or with a calculator), load and capacity information on a variety of configurations of the equipment;
            e. Procedures to prevent and respond to power line contact;
f. Technical knowledge of the regulations applicable to the specific equipment (such as general technical information about wire ropes and rigging devices, site information, operations for carrying loads and multi-crane lifts, and use of load charts);

g. Technical knowledge applicable to the suitability of the supporting ground and surface to handle expected loads, to site hazards, and to site access;

h. The applicable manuals, consensus standards, and other materials incorporated into the regulation.

i. The operator must be able to read and locate relevant information in the equipment manual and other materials containing information about the safe operation of equipment.

f. Operator Skills Demonstration

i. THE HILLIS GROUP, LLC must ensure that the operator has demonstrated the skills necessary for safe operation of the equipment, including:

1. The ability to recognize, from visual and auditory observation, the items listed in the regulation for shift inspection (29 CFR 1926.1412(d));
2. Operational and maneuvering skills;
3. Application of load chart information;
4. Application of safe shutdown and securing procedures.

g. Overhead Power Line Training

i. In cases where crane equipment is expected to come closer to live power lines than the minimum clearance distance permitted under the rules for power line safety THE HILLIS GROUP, LLC must train each crane operator and crew member assigned to work with equipment the procedures to be followed in the event of electrical contact with a power line. Such training must include:

1. Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.
2. The importance to the operator’s safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
3. The safest means of evacuating from equipment that may be energized.
4. The danger of the potentially energized zone around the equipment (step potential).
5. The need for crew in the area to avoid approaching or touching the equipment and the load.
6. Safe clearance distance from power lines.
7. Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
8. Power lines are presumed to be uninsulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.
9. The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.
10. The procedures to be followed to properly ground equipment and the limitations of grounding.
11. Employees working as dedicated spotters must be trained to enable them to effectively perform their task, including training on the applicable requirements of this section.
Tag Out and Start-up Procedures Training

i. Each operator must be trained in the tagout and start-up procedures specified in the rule for crane and derrick equipment that is out of service (see Operation rule at 29 CFR 1926.1417(f) and (g)).

i. Operators of Derricks, Sideboom Cranes and equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 lb. or less

i. Such operators are exempt from the detailed training requirements for other cranes. However, before operating such equipment, they must be trained in the safe operation of the type of equipment they will be operating.

j. Assembly/disassembly (A/D) Director

i. The A/D director is a person who supervises equipment assembly and disassembly operations and must understand the applicable A/D procedures.
ii. The A/D director must meet the criteria for a competent and qualified person under the following conditions:

iii. Where the assembly and disassembly is performed by only one person, that person is considered the A/D director and must meet the training criteria for both a competent person and a qualified person;

iv. Where the A/D director is assisted by one or more qualified persons, he or she must meet the criteria for a competent person and is not required to be a qualified person.

k. Authorized Personnel

i. Each employee assigned to work on or near the equipment (i.e., authorized personnel) must be trained to:

1. Recognize swing radius hazards;
2. Recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure;
3. Keep clear of holes and crush/pinch points.

l. Competent Person

i. The competent person (i.e., one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them) must be trained in any additional requirements of his or her role and responsibility under the new rules. For example, a competent person assigned to conduct a visual inspection of equipment during each shift the equipment is used must be trained in the required elements of a shift inspection.

m. Crew Member

i. Assembly and Disassembly Operations

1. Before commencing assembly/disassembly operations, the A/D director must ensure that the crew members understand:

   a. Their tasks and the hazards associated with their tasks;
   b. The hazardous positions and locations that they need to avoid.

ii. Work Near Power Lines

1. Crew members assigned to work with crane and derrick equipment must receive the same overhead power line training as required for crane operators, regardless of the distance from the power lines. See the Crane Operator Training subsection for more information.

n. Dedicated Spotter

i. The dedicated spotter must meet the qualifications for a signal person and complete the training requirements for crew member.
ii. The dedicated spotter’s sole responsibility is to watch the separation between power lines and the crane or derrick equipment, load line and load (including rigging and lifting accessories) and ensure through communication with the operator that the applicable minimum approach distance is not breached.

o. Maintenance and Repair Employee
   i. Maintenance and repair personnel must be trained to operate the equipment under limited conditions necessary to perform the maintenance or repair. The operation is limited to those functions necessary to perform maintenance, inspect the equipment or verify its performance. Such personnel may operate the equipment under the direct supervision of a qualified or certified crane operator, or if they are familiar with the operation, limitations, characteristics, and hazards associated with the type of equipment.
   ii. Maintenance Qualified Person
      1. A maintenance and repair employee must be a qualified person (i.e., a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrates the ability to solve/resolve problems relating to the subject matter, the work, or the project). Maintenance and repair workers are not considered “operators” and are therefore not required to be trained in all of the areas required for crane operators.

p. Tagout and Start-up Procedures Training
   i. Each maintenance and repair person must be trained in tagout and start-up procedures specified in the rule (see Operation rule at 29 CFR 1926.1417(f) and 29 CFR 1926.1417(g)). (Ref. THG_0008 LockOut/TagOut Procedure)

q. Qualified Person
   i. Qualified person is an employee by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrates the ability to solve/resolve problems relating to the subject matter, the work, or the project. Riggers and signalers are examples of personnel that must meet the requirements for qualified person.
   ii. THE HILLIS GROUP, LLC must train each qualified person regarding the requirements of the crane and derrick regulations applicable to their respective roles.

r. Fall Protection
   i. THE HILLIS GROUP, LLC must train each employee who may be exposed to fall hazards while on or hoisted by crane equipment on all of the fall protection requirements in the rule (29 CFR 1926.1423(a) to 1926.1423(j)), and the applicable criteria and practices in the fall protection rule for construction at 29 CFR 1926.502. (Ref. The Hillis Group, LLC Fall Protection Procedure THG_0003.)

13. DEFINITIONS

A/D director (Assembly/Disassembly director) means an individual who meets this subpart’s requirements for an A/D director, irrespective of the person’s formal job title or whether the person is non-management or management personnel.

Articulating crane means a crane whose boom consists of a series of folding, pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders.

Assembly/Disassembly means the assembly and/or disassembly of equipment covered under this standard. With regard to tower cranes, “erecting and climbing” replaces the term “assembly,” and “dismantling”
replaces the term “disassembly.” Regardless of whether the crane is initially erected to its full height or is climbed in stages, the process of increasing the height of the crane is an erection process.

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

**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.

**Blocking** (also referred to as “cribbing”) is wood or other material used to support equipment or a component and distribute loads to the ground. It is typically used to support lattice boom sections during assembly/disassembly and under outrigger and stabilizer floats.

**Boatswain’s chair** means a single-point adjustable suspension scaffold consisting of a seat or sling (which may be incorporated into a full body harness) designed to support one employee in a sitting position.

**Bogie** means “travel bogie,” which is defined below.

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

**Boom (tower cranes)**: On tower cranes, if the “boom” (i.e., principal horizontal structure) is fixed, it is referred to as a jib; if it is moveable up and down, it is referred to as a boom.

**Boom angle indicator** means a device which measures the angle of the boom relative to horizontal.

**Boom hoist limiting device** includes boom hoist disengaging device, boom hoist shutoff, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, or derricking limiter. This type of device disengages boom hoist power when the boom reaches a predetermined operating angle. It also sets brakes or closes valves to prevent the boom from lowering after power is disengaged.

**Boom length indicator** indicates the length of the permanent part of the boom (such as ruled markings on the boom) or, as in some computerized systems, the length of the boom with extensions/attachments.

**Boom stop** includes boom stops, (belly straps with struts/standoff), telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward.

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

Builder means the builder/constructor of equipment.

**Center of gravity**: The center of gravity of any object is the point in the object around which its weight is evenly distributed. If you could put a support under that point, you could balance the object on the support.

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

**Climbing** means 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).

**Come-a-long** means a mechanical device typically consisting of a chain or cable attached at each end that is used to facilitate movement of materials through leverage.

**Competent person** means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

**Controlled load lowering** means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.
Controlling entity means an employer that is a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project – its planning, quality and completion.

Counterweight means a 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 subpart.

Crossover points means locations on a wire rope which is spooled on a drum where one layer of rope climbs up on and crosses over the previous layer. This takes place at each flange of the drum as the rope is spooled onto the drum, reaches the flange, and begins to wrap back in the opposite direction.

Dedicated channel means a line of communication assigned by the employer who controls the communication system to only one signal person and crane/derrick or to a coordinated group of cranes/derricks/signal person(s).

Dedicated pile-driver is a machine that is designed to function exclusively as a pile driver. These machines typically have the ability to both hoist the material that will be pile-driven and to pile-drive that material.

Dedicated spotter (power lines): To be considered a dedicated spotter, the requirements of § 1926.1428 (Signal person qualifications) must be met and his/her sole responsibility is to watch the separation between the power line and: the equipment, load line and load (including rigging and lifting accessories), and ensure through communication with the operator that the applicable minimum approach distance is not breached.

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 means 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 occurs when a person, object, or equipment makes contact or comes in close proximity with an energized conductor or equipment that allows the passage of current.

Employer-made equipment means floating cranes/derricks designed and built by an employer for the employer’s own use.

Encroachment is where any part of the crane, load line or load (including rigging and lifting accessories) breaches a minimum clearance distance that this subpart requires to be maintained from a power line.

Equipment means equipment covered by this subpart.

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.

Fall restraint system means a fall protection system that prevents the user from falling any distance. The system is comprised of either a body belt or body harness, along with an anchorage, connectors and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devices.

Fall zone means the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall in the event of an accident.

Flange points are points 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.

For example means “one example, although there are others.”

Free fall (of the load line) means that only the brake is used to regulate the descent of the load line (the drive mechanism is not used to drive the load down faster or retard its lowering).

Free surface effect is the uncontrolled transverse movement of liquids in compartments which reduce a vessel’s transverse stability.
Hoist means a mechanical device for lifting and lowering loads by winding a line onto or off a drum.

Hoisting is 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.

Include/including means “including, but not limited to.”

Insulating link/device means an insulating device listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7.

Jib stop (also referred to as a jib backstop), is the same type of device as a boom stop but is for a fixed or luffing jib.

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

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

Load refers to the object(s) being hoisted and/or the weight of the object(s); both uses refer to the object(s) and the load-attaching equipment, such as, the load block, ropes, slings, shackles, and any other ancillary attachment.

Load moment (or rated capacity) indicator means a system which aids the equipment operator by sensing (directly or indirectly) the overturning moment on the equipment, i.e., load multiplied by radius. It compares this lifting condition to the equipment’s rated capacity, and indicates to the operator the percentage of capacity at which the equipment is working. Lights, bells, or buzzers may be incorporated as a warning of an approaching overload condition.

Load moment (or rated capacity) limiter means a system which aids the equipment operator by sensing (directly or indirectly) the overturning moment on the equipment, i.e., load multiplied by 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, telescopin out, or luffing out. Typically, those functions which decrease the severity of loading on the equipment remain operational, e.g., lowering, telescopin in, or luffing in.

Locomotive crane means 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.

Marine hoisted personnel transfer device means a device, such as a “transfer net,” that is designed to protect the employees being hoisted during a marine transfer and to facilitate rapid entry into and exit from the device. Such devices do not include boatswain’s chairs when hoisted by equipment covered by this standard.

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

Mobile crane means a lifting device incorporating a cable suspended latticed boom or hydraulic telescopic boom designed to be moved between operating locations by transport over the road.

Moving point-to-point means the times during which an employee is in the process of going to or from a work station.

Multi-purpose machine means a machine that is designed to be configured in various ways, at least one of which allows it to hoist (by means of a winch or hook) and horizontally move a suspended load. For example, a machine that can rotate and can be configured with removable forks/tongs (for use as a forklift) or with a winch pack, jib (with a hook at the end) or jib used in conjunction with a winch. When configured with the forks/tongs, it is not covered by this subpart. When configured with a winch pack, jib (with a hook at the end) or jib used in conjunction with a winch, it is covered by this subpart.

Nationally recognized accrediting agency is an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations. Examples of such accrediting agencies include, but are not limited to, the National Commission for Certifying Agencies and the American National Standards Institute.
Nonconductive means that, because of the nature and condition of the materials used, and the conditions of use (including environmental conditions and condition of the material), the object in question has the property of not becoming energized (that is, it has high dielectric properties offering a high resistance to the passage of current under the conditions of use).

Operational aids are devices that assist the operator in the safe operation of the crane by providing information or automatically taking control of a crane function. These include, but are not limited to, the devices listed in § 1926.1416 (“listed operational aids”).

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

Operator means 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.

Paragraph refers to a paragraph in the same section of this subpart that the word “paragraph” is used, unless otherwise specified.

Pendants includes both wire and bar types. Wire type: a fixed length of wire rope with mechanical fittings at both ends for pinning segments of wire rope together. Bar type: instead of wire rope, a bar is used. Pendants are typically used in a latticed boom crane system to easily change the length of the boom suspension system without completely changing the rope on the drum when the boom length is increased or decreased.

Personal fall arrest system means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these.

Portal crane is a type of crane consisting of a rotating upperstructure, hoist machinery, and boom mounted on top of a structural gantry which may be fixed in one location or have travel capability. The gantry legs or columns usually have portal openings in between to allow passage of traffic beneath the gantry.

Power lines means electric transmission and distribution lines.

Procedures include, but are not limited to: instructions, diagrams, recommendations, warnings, specifications, protocols and limitations.

Proximity alarm is a device that provides a warning of proximity to a power line and that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7.

Qualified evaluator (not a third party) means a person employed by the signal person’s employer who has demonstrated that he/she is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person.

Qualified evaluator (third party) means an entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the Qualification Requirements in this subpart for a signal person.

Qualified person means a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.

Qualified rigger is a rigger who meets the criteria for a qualified person.

Range control limit device is a device that can be set by an equipment operator to limit movement of the boom or jib tip to a plane or multiple planes.

Range control warning device is a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes.

Rated capacity means the maximum working load permitted by the manufacturer under specified working conditions. Such working conditions typically include a specific combination of factors such as equipment configuration, radii, boom length, and other parameters of use.

Rated capacity indicator: See load moment indicator.

Rated capacity limiter: See load moment limiter.

Repetitive pickup points refer to, when operating on a short cycle operation, the rope being used on a single layer and being spooled repetitively over a short portion of the drum.
Running wire rope means a wire rope that moves over sheaves or drums.
Runway means a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane suspended platform. An existing surface may be used as long as it meets these criteria.
Section means a section of this subpart, unless otherwise specified.
Sideboom crane means a track-type or wheel-type tractor having a boom mounted on the side of the tractor, used for lifting, lowering or transporting a load suspended on the load hook. The boom or hook can be lifted or lowered in a vertical direction only.
Special hazard warnings means warnings of site-specific hazards (for example, proximity of power lines).
Stability (flotation device) means the tendency of a barge, pontoons, vessel or other means of flotation to return to an upright position after having been inclined by an external force.
Such as means “such as, but not limited to.”
Superstructure: See Upperworks.
Tagline means a rope (usually fiber) attached to a lifted load for purposes of controlling load spinning and pendular motions or used to stabilize a bucket or magnet during material handling operations.
Tender means an individual responsible for monitoring and communicating with a diver.
Tilt up or tilt down operation means raising/lowering a load from the horizontal to vertical or vertical to horizontal.
Tower crane is a type of lifting structure which utilizes a vertical mast or tower to support a working boom (jib) in an elevated position. Loads are suspended from the working boom. While the working boom may be of the fixed type (horizontal or angled) or have luffing capability, it can always rotate to swing loads, either by rotating on the top of the tower (top slewing) or by the rotation of the tower (bottom slewing). The tower base may be fixed in one location or ballasted and moveable between locations. Mobile cranes that are configured with luffing jib and/or tower attachments are not considered tower cranes under this section.
Travel bogie (tower cranes) is an assembly of two or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels.
Trim means angle of inclination about the transverse axis of a barge, pontoons, vessel or other means of floatation.
Two blocking means a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component.
Unavailable procedures means procedures that are no longer available from the manufacturer, or have never been available, from the manufacturer.
Upperstructure: See Upperworks.
Upperworks means the revolving frame of equipment on which the operating machinery (and many cases the engine) are mounted along with the operator’s cab. The counterweight is typically supported on the rear of the upperstructure and the boom or other front end attachment is mounted on the front.
Up to means “up to and including.”
Wire rope means a flexible rope constructed by laying steel wires into various patterns of multi-wired strands around a core system to produce a helically wound rope.
What is Not Defined as a Crane
<table>
<thead>
<tr>
<th>Gesture</th>
<th>Description</th>
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<tbody>
<tr>
<td>STOP</td>
<td>With arm extended horizontally to the side, palm down, arm is swung back and forth.</td>
</tr>
<tr>
<td>EMERGENCY STOP</td>
<td>With both arms extended horizontally to the side, palms down, arms are swung back and forth.</td>
</tr>
<tr>
<td>HOIST</td>
<td>With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.</td>
</tr>
<tr>
<td>RAISE BOOM</td>
<td>With arm extended horizontally to the side, thumb points up with other fingers closed.</td>
</tr>
<tr>
<td>SWING</td>
<td>With arm extended horizontally, index finger points in direction that boom is to swing.</td>
</tr>
<tr>
<td>RETRACT TELESCOPING BOOM</td>
<td>With hands to the front at waist level, thumbs point at each other with other fingers closed.</td>
</tr>
<tr>
<td>RAISE THE BOOM AND LOWER THE LOAD</td>
<td>With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.</td>
</tr>
<tr>
<td>DOG EVERYTHING</td>
<td>Hands held together at waist level.</td>
</tr>
<tr>
<td>LOWER</td>
<td>With arm and index finger pointing down, hand and finger make small circles.</td>
</tr>
<tr>
<td>LOWER BOOM</td>
<td>With arm extended horizontally to the side, thumb points down with other fingers closed.</td>
</tr>
<tr>
<td>EXTEND TELESCOPING BOOM</td>
<td>With hands to the front at waist level, thumbs point outward with other fingers closed.</td>
</tr>
<tr>
<td>TRAVEL/TOWER TRAVEL</td>
<td>With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.</td>
</tr>
<tr>
<td><strong>LOWER THE BOOM AND RAISE THE LOAD</strong> – With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.</td>
<td></td>
</tr>
<tr>
<td><strong>MOVE SLOWLY</strong> – A hand is placed in front of the hand that is giving the action signal.</td>
<td></td>
</tr>
<tr>
<td><strong>USE AUXILIARY HOIST</strong> (whipline) – With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.</td>
<td></td>
</tr>
<tr>
<td><strong>CRAWLER CRANE TRAVEL, BOTH TRACKS</strong> – Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.</td>
<td></td>
</tr>
<tr>
<td><strong>USE MAIN HOIST</strong> – A hand taps on top of the head. Then regular signal is given to indicate desired action.</td>
<td></td>
</tr>
<tr>
<td><strong>CRAWLER CRANE TRAVEL, ONE TRACK</strong> – Indicate track to be locked by raising fist on that side. Rotate other fist in front of body in direction that other track is to travel.</td>
<td></td>
</tr>
<tr>
<td><strong>TROLLEY TRAVEL</strong> – With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.</td>
<td></td>
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</tbody>
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Controlled Document

Procedure Number THG_0036 Revision 2

Originator: S.C. Brockman

Safety Committee Review Date:_______________________

Chairman: ________________________________

History

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<td>5/13/15</td>
<td>27-28</td>
<td>Added Hand Signaling Charts (Appendix A)</td>
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<td>2</td>
<td>10/22/2015</td>
<td>All</td>
<td>Revised Procedure Format</td>
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