

Chapter 21 CRANE SAFETY

Sign Designs, Inc. operates commercial truck-mounted telescoping cranes and boom truck cranes.

Sign Designs, Inc. shall permit only those employees qualified by training or experience to operate equipment and machinery.

Where provisions of this standard direct an operator, crewmember, or other employee to take certain actions, Sign Designs, Inc. will establish, effectively communicate to the relevant persons, and enforce, work rules to ensure compliance with such provisions.

Sign Designs, Inc. does not use assembled cranes, nor does it use its cranes to assist in the assembling or disassembling a crane. Critical and engineered lifts, and lifts beyond the capacity of our cranes, are performed by qualified crane services who are properly trained, experienced and qualified to make the lift.

DEFINITIONS

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.

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.

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

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

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

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.

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.

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 spotter (power lines): To be considered a dedicated spotter, 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.

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 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.

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).

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.

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.

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, telescoping out, or luffing out. Typically, those functions which decrease the severity of loading on the equipment remain operational, *e.g.*, lowering, telescoping in, or luffing in.

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

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.

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

Operator means a person who is operating the equipment.

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.

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.

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.

Special hazard warnings means warnings of site-specific hazards (for example, proximity of power lines).

Standard Method means the protocol in for hand signals. (see hand signal chart later in this policy)

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.

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.

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.

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.

EVALUATING GROUND CONDITIONS

"Ground conditions" means the ability of the ground to support the equipment (including slope, compaction, and firmness).

"Supporting materials" means blocking, mats, cribbing, marsh buggies (in marshes/wetlands), or similar supporting materials or devices.

The 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.

The controlling entity (See Definitions) must:

1. Ensure that ground preparations necessary for safe crane operation are provided.
2. Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.
3. If there is no controlling entity for the project, the requirement of this section must be met by the employer that has authority at the site to make or arrange for ground preparations needed.
4. If the controlling entity for the project, or the operator determines that ground conditions do not meet the requirements for safe crane operation, that person's employer must have a discussion with the controlling entity regarding the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary) provide a safe base for crane operation.

When assembling or disassembling equipment (or attachments), the employer must comply with all applicable manufacturer prohibitions and must comply with either:

1. Manufacturer procedures applicable to assembly and disassembly, or
2. Employer procedures for assembly and disassembly. Employer procedures may be used only where the employer can demonstrate that the procedures used meet the requirements in OSHA § 1926.1406. **Note:** The employer must follow manufacturer procedures when an employer uses synthetic slings during assembly or disassembly rigging.

Assembly/disassembly must be directed by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons ("A/D director").

HAZARD ASSESSMENTS AND PRECAUTIONS INSIDE THE WORK ZONE

Before beginning equipment operations, the employer, operator and ground crew must perform a hazard assessment to identify potential hazards in the work zone. This assessment must include the following:

1. Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibiting the operator from operating the equipment past those boundaries, or defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius
2. Determine 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 close to a power line. If so, the operator must meet the requirements in Option (1) or Option (2) as follows:
 - a. *Option (1)--Deenergize and ground.* Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.
 - b. *Option (2)--Table A clearance.*

TABLE A—MINIMUM CLEARANCE DISTANCES

Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

For power lines over 1000 kV, the minimum clearance distance must be established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

3. Determine the line's voltage and the minimum approach distance permitted under Table A above.
4. Determine if any part of the equipment, load line or load (including rigging and lifting accessories), while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Table A. If so, then the operator must follow the requirements in the next section "Preventing Encroachment/Electrocution" to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum approach distance, but never less than 10 feet.

PREVENTING ENCROACHMENT/ELECTROCUTION

Where encroachment precautions are required all of the following requirements must be met:

1. Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.
2. If tag lines are used, they must be non-conductive.
3. Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at the appropriate footage according to Table A above, but never less than 10 feet from the power line. If the operator is unable to see the elevated warning line, a dedicated spotter must be used in addition to implementing one of the following measures:
 - a. A proximity alarm set to give the operator sufficient warning to prevent encroachment.
 - b. A dedicated spotter who is in continuous contact with the operator. Where this measure is selected, the dedicated spotter must:
 - i. Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).
 - ii. Be positioned to effectively gauge the clearance distance.
 - iii. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - iv. Give timely information to the operator so that the required clearance distance can be maintained.
 - c. A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.
 - d. A device that automatically limits range of movement, set to prevent encroachment.
 - e. An insulating link/device, installed at a point between the end of the load line (or below) and the load.

Voltage information. Where Option (3) of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of the employer's request.

OPERATIONS BELOW POWER LINES.

No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line, except where one of the exceptions:

1. For equipment with non-extensible booms: The uppermost part of the equipment, with the boom at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.
2. For equipment with articulating or extensible booms: The uppermost part of the equipment, with the boom in the fully extended position, at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

Power lines are always to be presumed to be energized. The employer must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter must be deenergized or the following precautions must be taken:

1. The equipment must be provided with an electrical ground.
2. If tag lines are used, they must be non-conductive.

TRAINING.

Sign Designs crane operators must be Crane Operation Certified by an OSHA approved certification company. In addition, Sign Designs, Inc. will train each operator and crew member assigned to work with the equipment on all of the following:

1. The procedures to be followed in the event of electrical contact with a power line. Such training will include:
 - a. Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.
 - b. 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.
 - c. The safest means of evacuating from equipment that may be energized.
 - d. The danger of the potentially energized zone around the equipment (step potential).
 - e. The need for crew in the area to avoid approaching or touching the equipment and the load.
 - f. Safe clearance distance from power lines.

- g. Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.
 - h. 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.
 - i. The limitations of an insulating link/device, proximity alarm, and range control (and similar) device.
 - j. The procedures to be followed to properly ground equipment and the limitations of grounding.
2. 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.

If Sign Designs, Inc. determines that it is infeasible to do the work without breaching the minimum approach distance under Table A above, and after consultation with the utility owner/operator, it is infeasible to deenergize and ground the power line or relocate the power line, then the power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution determines the minimum clearance distance that must be maintained to prevent electrical contact in light of the on-site conditions. The factors that must be considered in making this determination include, but are not limited to: Conditions affecting atmospheric conductivity; time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions, and other conditions affecting the ability to prevent electrical contact.

A planning meeting with Sign Designs, Inc. and utility owner/operator (or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution) will be held to determine the procedures that will be followed to prevent electrical contact and electrocution. At a minimum these procedures must include:

1. If the power line is equipped with a device that automatically reenergizes the circuit in the event of a power line contact, before the work begins, the automatic reclosing feature of the circuit interrupting device must be made inoperative if the design of the device permits.
2. A dedicated spotter who is in continuous contact with the operator. The dedicated spotter must:
 - a. Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).
 - b. Be positioned to effectively gauge the clearance distance.
 - c. Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.
 - d. Give timely information to the operator so that the required clearance distance can be maintained.

3. An elevated warning line, or barricade (not attached to the crane), in view of the operator (either directly or through video equipment), equipped with flags or similar high-visibility markings, to prevent electrical contact.
4. An insulating link/device installed at a point between the end of the load line (or below) and the load. All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load. Insulating gloves rated for the voltage involved are adequate insulation.
5. Nonconductive rigging if the rigging may be within the Table A of § 1926.1408 distance during the operation.
6. If the equipment is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the equipment, load line, or load (including rigging and lifting accessories) from breaching the minimum approach distance.
7. If a tag line is used, it must be of the nonconductive type.
8. Barricades forming a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade must be as far from the equipment as feasible.
9. Workers other than the operator must be prohibited from touching the load line above the insulating link/device and crane. Operators remotely operating the equipment from the ground must use either wireless controls that isolate the operator from the equipment or insulating mats that insulate the operator from the ground.
10. Only personnel essential to the operation are permitted to be in the area of the crane and load.
11. The equipment must be properly grounded.
12. Insulating line hose or cover-up must be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved.
13. The procedures developed to comply with this section are documented and immediately available on-site.
14. The equipment user and utility owner/operator (or registered professional engineer) meet with the equipment operator and the other workers who will be in the area of the equipment or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established, and to prevent electrocution.
15. The utility owner/operator (or registered professional engineer) and all employers of employees involved in the work must identify one person who will direct the implementation of the procedures. The person identified in accordance with this paragraph must direct the implementation of the procedures and must have the authority to stop work at any time to ensure safety.

If a problem occurs implementing the procedures being used, or indicating that those procedures are inadequate to prevent electrocution, Sign Designs, Inc., the operator or any ground crew member must safely stop operations and either develop new procedures, or have the utility owner/operator deenergize and visibly ground or relocate the power line before resuming work.

Devices originally designed by the manufacturer for use as a safety device operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must comply with the manufacturer's procedures for use and conditions of use.

TRAVELING WITH NO LOAD

It is the policy of Sign Designs, Inc. that when a crane truck is traveling with no load, the boom must be completely lowered, and secured for travel. Load lines are to be retracted and secured for travel. Under no circumstances is a truck to travel with the boom and load line not fully retracted and secured for travel. Trucks are equipped with back-up alarms. When no back-up warning alarm is available a spotter must be used to assist in the backing up of the truck.

MODIFIED EQUIPMENT

Equipment that has had modifications or additions which affect the safe operation of the equipment (such as modifications or additions involving a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity must be inspected by a qualified person after such modifications/additions have been completed, prior to initial use. The inspection must meet all of the following requirements:

1. The inspection must assure that the modifications or additions have been done in accordance with the approval obtained pursuant to OSHA § 1926.1434 (Equipment modifications).
2. The inspection must include functional testing of the equipment.
3. Equipment must not be used until an inspection pursuant to item 1 is complete.

Modifications or additions which affect the capacity or safe operation of the equipment are prohibited except where:

1. The manufacturer approves the modifications/additions in writing.
2. The load charts, procedures, instruction manuals and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
3. The original safety factor of the equipment is not reduced.

Manufacturer refusal to review request. The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/addition, but it declines to review the technical merits of the proposal or fails, within 30 days, to acknowledge the request or initiate the review, and all of the following are met:

1. A registered professional engineer who is a qualified person with respect to the equipment involved:
2. Approves the modification/addition and specifies the equipment configurations to which that approval applies, and
3. Modifies load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition.
4. The original safety factor of the equipment is not reduced.

Unavailable manufacturer. The manufacturer is unavailable and the requirements of paragraphs (a)(2)(i) and (ii) of this section are met.

Manufacturer does not complete the review within 120 days of the request. The manufacturer is provided a detailed description of the proposed modification/addition, is asked to approve the modification/addition, agrees to review the technical merits of the proposal, but fails to complete the review of the proposal within 120 days of the date it was provided the detailed description of the proposed modification/addition 2/23/16 22-13

Multiple manufacturers of equipment designed for use on marine work sites. The equipment is designed for marine work sites, contains major structural components from more than one manufacturer.

Modifications or additions which affect the capacity or safe operation of the equipment are prohibited where the manufacturer, after a review of the technical safety merits of the proposed modification/addition, rejects the proposal and explains the reasons for the rejection in a written response. If the manufacturer rejects the proposal but does not explain the reasons for the rejection in writing, the employer may treat this as a manufacturer refusal to review the request under paragraph (a)(2) of this section.

REPAIRED/ADJUSTED EQUIPMENT.

Equipment that has had a repair or adjustment that relates to safe operation (such as: A repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism), must be inspected by a qualified person after such a repair or adjustment has been completed, prior to initial use. The inspection must meet all of the following requirements:

1. The qualified person must determine if the repair/adjustment meets manufacturer equipment criteria (where applicable and available).
2. Where manufacturer equipment criteria are unavailable or inapplicable, the qualified person must:
 - a. Determine if a registered professional engineer (RPE) is needed to develop criteria for the repair/adjustment. If an RPE is not needed, Sign Designs, Inc. will ensure that the criteria are developed by the qualified person. If an RPE is needed, Sign Designs, Inc. must ensure that they are developed by an RPE.
 - b. Determine if the repair/adjustment meets the criteria developed in accordance with paragraph (b)(1)(ii)(A) of this section.
3. The inspection must include functional testing of the repaired/adjusted parts and other components that may be affected by the repair/adjustment.
4. Equipment must not be used until an inspection demonstrates that the repair/adjustment is proper.

INSPECTION EACH SHIFT

A competent person must begin a visual inspection prior to each shift the equipment will be used, which must be completed before or during that shift. The inspection must consist of observation for apparent deficiencies. Taking apart equipment components and booming down is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating taking apart equipment components or booming down is needed. Determinations made in

conducting the inspection must be reassessed in light of observations made during operation. At a minimum the inspection must include all of the following:

1. Control mechanisms for maladjustments interfering with proper operation.
2. Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.
3. Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.
4. Hydraulic system for proper fluid level.
5. Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.
6. Wire rope reeving for compliance with the manufacturer's specifications.
7. Wire rope, in accordance with OSHA § 1926.1413(a).
8. Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.
9. Tires (when in use) for proper inflation and condition.
10. Ground conditions around the equipment for proper support, including ground settling under and around outriggers/stabilizers and supporting foundations, ground water accumulation, or similar conditions.
11. The equipment for level position within the tolerances specified by the equipment manufacturer's recommendations, both before each shift and after each move and setup.
12. Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.
13. Safety devices and operational aids for proper operation.
14. Brakes and operating systems are in proper working condition.

If any deficiency is noted (or in additional inspection items required to be checked for specific types of equipment in accordance with other sections of this standard) is identified, an immediate determination must be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the equipment must be taken out of service until it has been corrected.

INSPECTION MONTHLY

Each month the equipment is in service it must be inspected in accordance with the requirements under Inspection Each Shift. Equipment must not be used until an inspection under this paragraph demonstrates that no corrective action is required.

The following information must be documented and maintained by the employee that conducts the inspection:

1. The items checked and the results of the inspection.
2. The name and signature of the person who conducted the inspection and the date.

This document must be retained for a minimum of three months.

ANNUAL/COMPREHENSIVE.

At least every 12 months the equipment must be inspected by a qualified person in accordance with the requirements under Inspection Each Shift except that the corrective action set must apply in place of the corrective action required.

In addition, at least every 12 months, the equipment must be inspected by a qualified person. Disassembly is required, as necessary, to complete the inspection. The equipment must be inspected for all of the following:

1. Equipment structure (including the boom and, if equipped, the jib):
2. Structural members: Deformed, cracked, or significantly corroded.
3. Bolts, rivets and other fasteners: loose, failed or significantly corroded.
4. Welds for cracks.
5. Sheaves and drums for cracks or significant wear.
6. Parts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear.
7. Brake and clutch system parts, linings, pawls and ratchets for excessive wear.
8. Safety devices and operational aids for proper operation (including significant inaccuracies).
9. Gasoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature) and conditions, and proper operation.
10. Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch.
11. Travel steering, brakes, and locking devices, for proper operation.
12. Tires for damage or excessive wear.
13. Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:
 - a. Flexible hose or its junction with the fittings for indications of leaks.
 - b. Threaded or clamped joints for leaks.
 - c. Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.
 - d. Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing.
14. Hydraulic and pneumatic pumps and motors, as follows:
 - a. Performance indicators: Unusual noises or vibration, low operating speed, excessive heating of the fluid, low pressure.
 - b. Loose bolts or fasteners.
 - c. Shaft seals and joints between pump sections for leaks.
15. Hydraulic and pneumatic valves, as follows:
 - a. Spools: Sticking, improper return to neutral, and leaks.

- b. Leaks.
 - c. Valve housing cracks.
16. Relief valves: Failure to reach correct pressure (if there is a manufacturer procedure for checking pressure, it must be followed).
17. Hydraulic and pneumatic cylinders, as follows:
- a. Drifting caused by fluid leaking across the piston.
 - b. Rod seals and welded joints for leaks.
 - c. Cylinder rods for scores, nicks, or dents.
 - d. Case (barrel) for significant dents.
 - e. Rod eyes and connecting joints: Loose or deformed.
18. Outrigger or stabilizer pads/floats for excessive wear or cracks.
19. Slider pads for excessive wear or cracks.
20. Electrical components and wiring for cracked or split insulation and loose or corroded terminations.
21. Warning labels and decals originally supplied with the equipment by the manufacturer or otherwise required under this standard: Missing or unreadable.
22. Originally equipped operator seat (or equivalent): Missing.
23. Operator seat: Unserviceable.
24. Originally equipped steps, ladders, handrails, guards: Missing.
25. Steps, ladders, handrails, guards: In unusable/unsafe condition.

This inspection must include functional testing to determine that the equipment as configured in the inspection is functioning properly.

If any deficiency is identified, an immediate determination must be made by the qualified person as to whether the deficiency constitutes a safety hazard or, though not yet a safety hazard, needs to be monitored in the monthly inspections.

If the qualified person determines that a deficiency is a safety hazard, the equipment must be taken out of service until it has been corrected, except when temporary alternative measures are implemented.

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

DOCUMENTATION OF ANNUAL/COMPREHENSIVE INSPECTION

The following information must be documented, maintained, and retained for a minimum of 12 months, by the employer that conducts the inspection:

1. The items checked and the results of the inspection.

2. The name and signature of the person who conducted the inspection and the date.

Where the severity of use/conditions is such that there is a reasonable probability of damage or excessive wear (such as loading that may have exceeded rated capacity, shock loading that may have exceeded rated capacity, prolonged exposure to a corrosive atmosphere), the employer must stop using the equipment and a qualified person must:

1. Inspect the equipment for structural damage to determine if the equipment can continue to be used safely.
2. In light of the use/conditions determine whether any items/conditions listed in paragraph (f) of this section need to be inspected; if so, the qualified person must inspect those items/conditions.
3. If a deficiency is found, the employer must follow the requirements in paragraphs (f)(4) through (6) of this section.

Equipment that has been idle for 3 months or more must be inspected by a qualified person before initial use.

Any part of a manufacturer's procedures regarding inspections that relate to safe operation (such as to a safety device or operational aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule of inspection than the requirements of this section must be followed.

WIRE ROPE—INSPECTION

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

Apparent deficiencies.

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

1. Significant distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the outer strands.
2. Significant corrosion.
3. Electric arc damage (from a source other than power lines) or heat damage.
4. Improperly applied end connections.
5. Significantly corroded, cracked, bent, or worn end connections (such as from severe service).

Category II. Apparent deficiencies in this category are:

1. Visible broken wires, as follows:

- a. In running wire ropes: Six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope.
 - b. In rotation resistant ropes: Two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters.
 - c. In pendants or standing wire ropes: More than two broken wires in one rope lay located in rope beyond end connections and/or more than one broken wire in a rope lay located at an end connection.
2. A diameter reduction of more than 5% from nominal diameter.

Category III. Apparent deficiencies in this category include the following:

1. In rotation resistant wire rope, core protrusion or other distortion indicating core failure.
2. Prior electrical contact with a power line.
3. A broken strand.

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

1. Rotation resistant wire rope in use.
2. Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.
3. Wire rope at flange points, crossover points and repetitive pickup points on drums.
4. Wire rope at or near terminal ends.
5. Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.

Removal from service.

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

The wire rope is replaced, or

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

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

The employer complies with the wire rope manufacturer's established criterion for removal from service or a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope.

The wire rope is replaced, or

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

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

The wire rope is replaced, or

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

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

Monthly inspection.

Each month an inspection must be conducted in accordance with shift inspection of this section.

The inspection must include any deficiencies that the qualified person who conducts the annual inspection determines must be monitored.

Wire ropes on equipment must not be used until an inspection demonstrates that no corrective action is required.

The inspection must be.

Annual/comprehensive.

At least every 12 months, wire ropes in use on equipment must be inspected by a qualified person in accordance shift inspection.

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

1. The inspection must be for deficiencies of the types listed in paragraph (a)(2) of this section.
2. The inspection must be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to all of the following:
 - a. Critical review items listed in paragraph (a)(3) of this section.
 - b. Those sections that are normally hidden during shift and monthly inspections.
 - c. Wire rope subject to reverse bends.
 - d. Wire rope passing over sheaves.

Exception: In the event an inspection is not feasible due to existing set-up and configuration of the equipment (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting), such inspections must be conducted as soon as it becomes feasible, but no longer than an additional 6 months for running ropes and, for standing ropes, at the time of disassembly.

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

If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question must be prohibited until:

The wire rope is replaced, or

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

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

The inspection must be

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

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

WIRE ROPE--SELECTION AND INSTALLATION CRITERIA.

Selection of replacement wire rope must be in accordance with the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.

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

Option (1). Wire rope must comply with section 5-1.7.1 of ASME B30.5-2004

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

Wire rope must be compatible with the safe functioning of the equipment.

Fiber core ropes must not be used for boom hoist reeving, except for derricks.

Rotation resistant ropes must be used for boom hoist reeving only where the requirements of paragraph (e)(4)(ii) of this section are met.

Rotation resistant ropes.

Definitions.

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

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

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

Requirements.

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

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

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

Types II and III must have an operating design factor of no less than 5, except when Types II and III with an operating design factor of less than 5 are used (for non-duty cycle, non-repetitive lifts), the following requirements must be met for each lifting operation:

1. A qualified person must inspect the rope. The rope must be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any one rope lay must be considered a hazard.
2. Operations must be conducted in such a manner and at such speeds as to minimize dynamic effects.
3. Each lift must be recorded in the monthly and annual inspection documents. Such prior uses must be considered by the qualified person in determining whether to use the rope again.

ADDITIONAL REQUIREMENTS FOR ROTATION RESISTANT ROPES FOR BOOM HOIST REEVING.

Rotation resistant ropes must not be used for boom hoist reeving, except that rotation resistant ropes may be used as boom hoist reeving when load hoists are used as boom hoists for attachments such as luffing

attachments or boom and mast attachment systems. Under these conditions, all of the following requirements must be met:

1. The drum must provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.
2. The requirements in ASME B30.5-2004 sections 5-1.3.2(a), (a)(2) through (a)(4), (b) and (d) except that the minimum pitch diameter for sheaves used in multiple rope reeving is 18 times the nominal diameter of the rope used (instead of the value of 16 specified in section 5-1.3.2(d)).
3. All sheaves used in the boom hoist reeving system must have a rope pitch diameter of not less than 18 times the nominal diameter of the rope used.
4. The operating design factor for the boom hoist reeving system must be not less than five.
5. The operating design factor for these ropes must be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure and the load within the equipment's rated capacity.
6. When provided, a power-controlled lowering system must be capable of handling rated capacities and speeds as specified by the manufacturer.

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

Socketing must be done in the manner specified by the manufacturer of the wire rope or fitting.

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

RIGGING

Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service.

Rigging equipment must have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load;

Rigging equipment must not be loaded in excess of its recommended safe working load as prescribed on the identification markings by the manufacturer; and not be used without affixed, legible identification markings.

Rigging equipment, when not in use, shall be removed from the immediate work area so as not to present a hazard to employees.

Tag lines may be used to control the load unless use of the tag lines creates an unsafe condition.

Special custom design grabs, hooks, clamps, or other lifting accessories, shall be marked to indicate the safe working loads and shall be proof-tested prior to use to 125 percent of their rated load.

HOOKS AND OTHER DETACHABLE DEVICES.

Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul ball assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) must be of a type that can be closed and locked, eliminating the throat opening, and closed and locked when attached.

Employees are never to be under the load, and must be clear of the load prior to the lift. Employees are to maintain a safe work area, and never allow unauthorized

SAFETY DEVICES

The equipment must have a crane level indicator that is either built into the equipment or is available on the equipment. If a built-in crane level indicator is not working properly, it must be tagged-out or removed. If a removable crane level indicator is not working properly, it must be removed.

This requirement does not apply to portal cranes, derricks, floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation.

Equipment with foot pedal brakes must have locks.

Hydraulic outrigger jacks and hydraulic stabilizer jacks must have an integral holding device/check valve.

Equipment on rails must have rail clamps and rail stops, except for portal cranes.

The equipment must have a horn that is either built into the equipment or is on the equipment and immediately available to the operator.

If a built-in horn is not working properly, it must be tagged-out or removed. If a removable horn is not working properly, it must be removed.

Proper operation required. Operations must not begin unless all of the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator must safely stop operations. If any of the devices listed in this section are not in proper working order, the equipment must be taken out of service and operations must not resume until the device is again working properly.

OPERATIONAL AIDS

Operations must not begin unless the listed operational aids are in proper working order, except where an operational aid is being repaired the employer uses the specified temporary alternative measures. More protective alternative measures specified by the crane/derrick manufacturer, if any, must be followed.

If a listed operational aid stops working properly during operations, the operator must safely stop operations until the temporary alternative measures are implemented or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted and is not considered a modification.

Category I operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly must be repaired no later than 7 calendar days after the deficiency occurs.

Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair must be completed within 7 calendar days of receipt of the parts.

1926.1416(d)(1)

Boom hoist limiting device. For equipment manufactured after December 16, 1969, a boom hoist limiting device is required.

Temporary alternative measures (use at least one). One or more of the following methods must be used:

1. Use a boom angle indicator.
2. Clearly mark the boom hoist cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.
3. Clearly mark the boom hoist cable (so that it can easily be seen by a spotter) at a point that will give the spotter sufficient time to signal the operator and have the operator stop the hoist to keep the boom within the minimum allowable radius.

If the equipment was manufactured on or before December 16, 1969, and is not equipped with a boom hoist limiting device, at least one of the measures must be used.

Luffing jib limiting device. Equipment with a luffing jib must have a luffing jib limiting device.

Temporary alternative measures are the same as above **1926.1416(d)(3)**

Anti two-blocking device. Telescopic boom cranes manufactured after February 28, 1992, must be equipped with a device which automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) must prevent such damage at all points where two-blocking could occur.

Temporary alternative measures: Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

Lattice boom cranes. Sign Designs, Inc. currently does not use lattice boom cranes or articulating cranes.

Category II operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly must be repaired no later than 30 calendar days after the deficiency occurs.

Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 calendar days, the repair must be completed within 7 calendar days of receipt of the parts.

Boom angle or radius indicator. The equipment must have a boom angle or radius indicator readable from the operator's station. *Temporary alternative measures:* Radii or boom angle must be determined by measuring the radii or boom angle with a measuring device.

Jib angle indicator if the equipment has a luffing jib. **Temporary alternative measures:** Radii or jib angle must be determined by ascertaining the main boom angle and then measuring the radii or jib angle with a measuring device.

Boom length indicator if the equipment has a telescopic boom, except where the rated capacity is independent of the boom length. **Temporary alternative measures.** One or more of the following methods must be used:

1. Mark the boom with measured marks to calculate boom length
2. Calculate boom length from boom angle and radius measurements
3. Measure the boom with a measuring device.

Load weighing and similar devices.

Equipment (other than derricks and articulating cranes) manufactured after March 29, 2003 with a rated capacity over 6,000 pounds must have at least one of the following: load weighing device, load moment (or rated capacity) indicator, or load moment (or rated capacity) limiter. **Temporary alternative measures:** The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer) or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight). This information must be provided to the operator prior to the lift.

The following devices are required on equipment manufactured after November 8, 2011:

1. Outrigger/stabilizer position (horizontal beam extension) sensor/monitor if the equipment has outriggers or stabilizers. **Temporary alternative measures:** The operator must verify that the position of the outriggers or stabilizers is correct (in accordance with manufacturer procedures) before beginning operations requiring outrigger or stabilizer deployment.
2. Hoist drum rotation indicator if the equipment has a hoist drum not visible from the operator's station. **Temporary alternative measures:** Mark the drum to indicate the rotation of the drum. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

OPERATIONS

Sign Designs, Inc. will comply with all manufacturer procedures applicable to the operational functions of equipment, including its use with attachments. Where the manufacturer procedures are unavailable, Sign Designs, Inc. must develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments. Procedures for the operational controls must be developed by a qualified person. Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

Accessibility of procedures.

The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, must be readily available in the cab at all times for use by the operator.

Where rated capacities are available in the cab only in electronic form: In the event of a failure which makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities (in electronic or other form) are available.

The operator must not engage in any practice or activity that diverts his/her attention while actually engaged in operating the equipment, such as the use of cellular phones (other than when used for signal communications).

Leaving the equipment unattended.

The operator must not leave the controls while the load is suspended, except where all of the following are met:

1. The operator remains adjacent to the equipment and is not engaged in any other duties.
2. The load is to be held suspended for a period of time exceeding normal lifting operations.
3. The competent person determines that it is safe to do so and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.
4. Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees are permitted in the fall zone.

Tagging out of service equipment/functions. Where the employer has taken the equipment out of service, a tag must be placed in the cab stating that the equipment is out of service and is not to be used. Where the employer has taken a function(s) out of service, a tag must be placed in a conspicuous position stating that the function is out of service and is not to be used.

Response to "do not operate"/tag-out signs. If there is a warning (tag-out or maintenance/do not operate) sign on the equipment or starting control, the operator must not activate the switch or start the equipment until the sign has been removed by a person authorized to remove it, or until the operator has verified that:

1. No one is servicing, working on, or otherwise in a dangerous position on the machine.
2. The equipment has been repaired and is working properly.

If there is a warning (tag-out or maintenance/do not operate) sign on any other switch or control, the operator must not activate that switch or control until the sign has been removed by a person authorized to remove it, or until the operator has verified that the equipment has been released for operation by a competent person.

Before starting the engine, the operator must verify that all controls are in the proper starting position and that all personnel are in the clear.

Storm warning. When a local storm warning has been issued, the competent person must determine whether it is necessary to implement manufacturer recommendations for securing the equipment.

If equipment adjustments or repairs are necessary:

1. The operator must, in writing, promptly inform the person designated by the employer to receive such information and, where there are successive shifts, to the next operator; and
2. The employer must notify all affected employees, at the beginning of each shift, of the necessary adjustments or repairs and all alternative measures.

Safety devices and operational aids must not be used as a substitute for the exercise of professional judgment by the operator.

If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it must be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.

The competent person must adjust the equipment and/or operations to address the effect of wind, ice, and snow on equipment stability and rated capacity.

COMPLIANCE WITH RATED CAPACITY.

The equipment must not be operated in excess of its rated capacity. The operator must not be required to operate the equipment in a manner that would violate rated capacity.

Load weight. The operator must verify that the load is within the rated capacity of the equipment by at least one of the following methods:

1. The weight of the load must be determined from a source recognized by the industry (such as the load's manufacturer), or by a calculation method recognized by the industry (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. In addition, when requested by the operator, this information must be provided to the operator prior to the lift; or
2. The operator must begin hoisting the load to determine, using a load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter, if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation. If it does, the operator must not proceed with the lift until he/she verifies the weight of the load.

The boom or other parts of the equipment must not contact any obstruction.

The equipment must not be used to drag or pull loads sideways.

On wheel-mounted equipment, no loads must be lifted over the front area, except as permitted by the manufacturer.

The operator must test the brakes each time a load that is 90% or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90% or more of the maximum line pull, this requirement applies to the first lift but not to successive lifts.

Neither the load nor the boom must be lowered below the point where less than two full wraps of rope remain on their respective drums.

TRAVELING WITH A LOAD.

Traveling with a load is prohibited if the practice is prohibited by the manufacturer.

Where traveling with a load, the employer must ensure that:

1. A competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.
2. The determinations of the competent person required in paragraph (u)(2)(i) of this section are implemented.
3. For equipment with tires, tire pressure specified by the manufacturer is maintained.
4. Rotational speed of the equipment must be such that the load does not swing out beyond the radius at which it can be controlled.
5. A tag or restraint line must be used if necessary to prevent rotation of the load that would be hazardous.
6. The brakes must be adjusted in accordance with manufacturer procedures to prevent unintended movement.
7. The operator must obey a stop (or emergency stop) signal, irrespective of who gives it.

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

SIGNALS

A signal person must be provided in each of the following situations:

1. The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.
2. When the equipment is traveling, the view in the direction of travel is obstructed.
3. Due to site specific safety concerns, either the operator or the person handling the load determines that it is necessary.

Types of signals. Signals to operators must be by hand, voice, audible, or new signals.

Hand signals. When using hand signals, the Standard Method must be used. **(See The Standard Hand Signal Chart At The End Of This Section) Exception:** Where use of the Standard Method for hand signals is infeasible, or where an operation or use of an attachment is not covered in the Standard Method, non-standard hand signals may be used.

Non-standard hand signals. When using non-standard hand signals, the signal person, operator, and lift director (where there is one) must contact each other prior to the operation and agree on the non-standard hand signals that will be used.

New signals. Signals other than hand, voice, or audible signals may be used where the employer demonstrates that:

1. The new signals provide at least equally effective communication as voice, audible, or Standard Method hand signals, or
2. The new signals comply with a national consensus standard that provides at least equally effective communication as voice, audible, or Standard Method hand signals.

Suitability. The signals used (hand, voice, audible, or new), and means of transmitting the signals to the operator (such as direct line of sight, video, radio, *etc.*), must be appropriate for the site conditions.

During operations requiring signals, the ability to transmit signals between the operator and signal person must be maintained. If that ability is interrupted at any time, the operator must safely stop operations requiring signals until it is reestablished and a proper signal is given and understood.

If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator must safely stop operations. Operations must not resume until the operator and signal person agree that the problem has been resolved.

Only one person may give signals to a crane/derrick at a time, except That anyone who becomes aware of a safety problem must alert the operator or signal person by giving the stop or emergency stop signal. The operator to obey a stop or emergency stop signal.

All directions given to the operator by the signal person must be given from the operator's direction perspective.

Communication with multiple cranes. Where a signal person(s) is in communication with more than one crane/derrick, a system must be used for identifying the crane/derrick each signal is for, as follows:

1. for each signal, prior to giving the function/direction, the signal person must identify the crane/derrick the signal is for, or
2. must use an equally effective method of identifying which crane/derrick the signal is for.

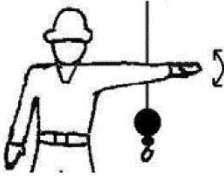

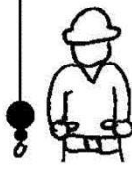
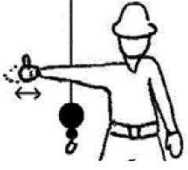
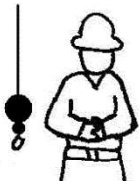
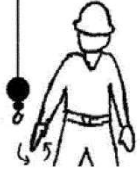
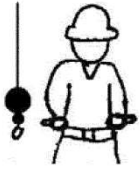
Signals--radio, telephone or other electronic transmission of signals. The device(s) used to transmit signals must be tested on site before beginning operations to ensure that the signal transmission is effective, clear, and reliable. Signal transmission must be through a dedicated channel, except that multiple cranes and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.

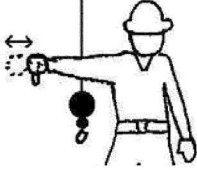
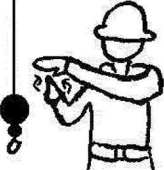
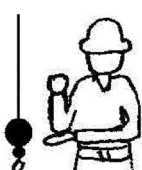
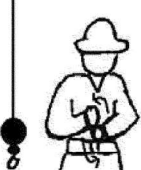
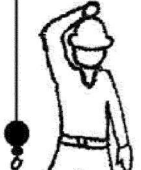
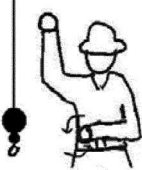
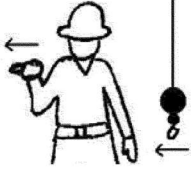
Where a crane is being operated on or adjacent to railroad tracks, and the actions of the crane operator need to be coordinated with the movement of other equipment or trains on the same or adjacent tracks the operator's reception of signals must be by a hands-free system.

Signals--voice signals--additional requirements. Prior to beginning operations, the operator, signal person and lift director (if there is one), must contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is added or substituted, there is confusion about the voice signals, or a voice signal is to be changed. Each voice signal must contain the following three elements, given in the following order: function (such as hoist, boom, *etc.*), direction; distance and/or speed; function, stop command. The operator, signal person and lift director (if there is one), must be able to effectively communicate in the language used.

Hand signal charts must be either posted on the equipment or conspicuously posted in the vicinity of the hoisting operations.

STANDARD HAND SIGNALS

 <p>STOP – With arm extended horizontally to the side, palm down, arm is swung back and forth.</p>	 <p>EMERGENCY STOP – With both arms extended horizontally to the side, palms down, arms are swung back and forth.</p>	 <p>HOIST – With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.</p>
 <p>RAISE BOOM – With arm extended horizontally to the side, thumb points up with other fingers closed.</p>	 <p>SWING – With arm extended horizontally, index finger points in direction that boom is to swing.</p>	 <p>RETRACT TELESCOPING BOOM – With hands to the front at waist level, thumbs point at each other with other fingers closed.</p>
 <p>RAISE THE BOOM AND LOWER THE LOAD – With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.</p>	 <p>DOG EVERYTHING – Hands held together at waist level.</p>	 <p>LOWER – With arm and index finger pointing down, hand and finger make small circles.</p>
 <p>LOWER BOOM – With arm extended horizontally to the side, thumb points down with other fingers closed.</p>	 <p>EXTEND TELESCOPING BOOM – With hands to the front at waist level, thumbs point outward with other fingers closed.</p>	 <p>TRAVEL/TOWER TRAVEL – With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.</p>

 <p>LOWER THE BOOM AND RAISE THE LOAD – With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.</p>	 <p>MOVE SLOWLY – A hand is placed in front of the hand that is giving the action signal.</p>	 <p>USE AUXILIARY HOIST (whipline) – With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.</p>
 <p>CRAWLER CRANE TRAVEL, BOTH TRACKS – Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.</p>	 <p>USE MAIN HOIST – A hand taps on top of the head. Then regular signal is given to indicate desired action.</p>	 <p>CRAWLER CRANE TRAVEL, ONE TRACK – 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.</p>
 <p>TROLLEY TRAVEL – With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.</p>		