14XX Tower Cranes - Hoisting Capacity Over 2000 Pounds

Sections 14XX – 14XX (and the sections they refer to) apply to all Tower Cranes except equipment with a manufacturer-rated hoisting/lifting capacity of 2000 pounds or less.

1410 Erecting, Climbing and Dismantling – Selection of Manufacturer or Employer Procedures

When erecting, climbing and dismantling equipment, the employer shall comply with either:

(a) all manufacturer procedures applicable to erecting, climbing and dismantling, or

(b) employer procedures for safe erecting, climbing and dismantling. Employer procedures may be used instead of manufacturer procedures only where the employer can demonstrate that the procedures used meet the requirements in section 14XX through 14XX.

14XX Erecting Climbing and Dismantling – General Requirements (applies to all erecting, climbing and dismantling operations)

(a) *Supervision – Competent-qualified person.* Erecting, climbing and dismantling must be supervised by a person who meets the criteria for both a competent person and a qualified person ("competent-qualified person"), or by a competent person who is assisted by one or more qualified persons ("supervision team").

(b) *Knowledge of procedures.* The competent-qualified person/supervision team supervising the erecting, climbing and dismantling operation must understand the erecting, climbing and dismantling procedures.

(c) *Review of procedures.* The competent-qualified person/supervision team supervising the erecting, climbing and dismantling operation must review the erecting, climbing and dismantling procedures immediately prior to the commencement of erecting, climbing and dismantling unless the competent-qualified person/ supervision team has applied them to the same type and configuration of equipment (including accessories, if any) with sufficient frequency, or sufficiently recently, so that they are already known and understood.

(d) *Crew instructions.*

(1) Before commencing erecting, climbing and dismantling operations, the competent-qualified person supervising the erecting, climbing and dismantling operation must determine that the crew members understand all of the following:

(i) Their tasks.

ii) The hazards associated with their tasks.

(iii) The hazardous positions/locations that they need to avoid.

(2) During erecting, climbing and dismantling, before a crew member takes on a different task, or when adding new personnel during the operations, the requirements in paragraph (1)(i) through (iii) must be met with respect to the crew member's understanding regarding that task.

(e) *Protecting* erecting, climbing and dismantling *crew members out of operator view.*

(1) Before a crew member goes to a location that is out of view of the operator and is either: in, on or under the equipment, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member must inform the operator that he/she is going to that location.

(2) Where the operator knows that a crew member went to a location covered by paragraph (1), the operator shall not move any ~~aspect~~ part of the equipment (or load) until the operator:

~~(1) Knows where the employees working on the assembly/disassembly operation are located.~~

(i) Gives a warning that is understood by the crew member as a signal that the equipment (or load) is about to be moved and allows time for the crew member to get to a safe position, or

(ii) Is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position.

(f) *Working under the boom, jib or other components.* When pins (or similar devices) are being removed, employees must not be under the boom, jib or other components, except for: in-the-air erecting and dismantling operations. For in-the-air erecting and dismantling operations, the A/D supervisor must implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom. [see Non-Mandatory Appendix __ for an example].

(g)*Capacity limits.* During all phases of erecting, climbing and dismantling, manufacturer recommendations, specifications and limitations for maximum loads imposed on the equipment, equipment components (including rigging), and lifting lugs and equipment accessories must be met for the equipment being erecting, climbed or dismantling.

(h) *Self erecting cranes.* Employees must not be in or under the tower, jib, or rotating portion of the crane during erecting, climbing and dismantling operations until the crane is secured in a locked position and the competent person in charge indicates it is safe to enter this area.

(11) *Capacity limits.* During all phases of erecting, climbing and dismantling, manufacturer recommendations, specifications and limitations for maximum loads imposed on the equipment, equipment components (including rigging), and lifting lugs and equipment accessories must be met for the equipment being erecting, climbed or dismantling.

(i) *Addressing specific hazards.* The competent-qualified person/ supervision team supervising the erecting, climbing and dismantling operation must address the hazards associated with the operation with methods to protect the employees from them, including, but not limited to, the following:

(1) *Site and ground bearing conditions.* Site and ground conditions must be adequate for safe erecting, climbing and dismantling operations and to support the equipment during erecting, climbing and dismantling.

(2) *Foundations and structural supports.* Tower crane Foundations and structural supports shall be designed by the manufacturer or a registered professional engineer.

(3) *Blocking material.* The size, amount, and method of stacking blocking must be sufficient to sustain the loads and maintain stability.

(4) *Proper location of blocking.* Blocking must be appropriately placed to:

(i) Protect the structural integrity of the equipment, and

(ii) Prevent dangerous movement and collapse.

(5) *Calculating assist crane loads.* Assist crane loads that will be imposed on the assist crane (if used) at each phase of erecting, climbing and dismantling must be calculated before erecting, climbing and dismantling begins in order to prevent exceeding manufacturer instructions, recommendations, specifications and limitations for the assist crane.

(6) *Component pick points.* The point(s) of attachment of rigging to components must be suitable for preventing structural damage and facilitating safe handling of these components.

(7) *Center of gravity.*

(i) The center of gravity of the load must be identified unless that is unnecessary for the method used for maintaining stability.

(ii) Where there is insufficient information to accurately identify the center of gravity, measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity must be used. (See Non-mandatory AppendixXX for examples of techniques).

(8) *Snagging*. Suspension ropes and pendants must not be allowed to catch on the jib or boom connection pins or cotter pins.

(9) *Loss of backward stability*. Backward stability must be considered before swinging self erect cranes or cranes on travelling or static undercarriages.

(10) *Wind velocity*. Wind velocity must not exceed that recommended by the manufacturer or, in the absence of the manufacturer's information, a qualified person, during the erecting, climbing and dismantling procedure.

(j) *Secondary braking device*. If the equipment has a boom hoist pawl or secondary brake, the pawl or secondary brake must be activated while the boom is being held during an assembly/disassembly operation.

(k) [Reserved]

(l) [Reserved]

(m) *Weight of components*. The weight of the components must be readily available.

(n) [Reserved]

Components and Configuration

(1) The selection of ~~[structural?]~~ components and configuration of the equipment [that affect the capacity or safe operation of the equipment], must be in accordance with:

(i) Manufacturer instructions, recommendations, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or

(ii) Approved modifications that meet the requirements of section 1416 Equipment Modifications.

(2) *Post erection inspection*. Upon completion of erecting, climbing and dismantling must be inspected to ensure compliance with paragraph (x) (see section 14xx(x) for post-erection inspection requirements _____)

(o) *Manufacturer prohibitions*. The employer must comply with all manufacturer prohibitions.

(p) *Signage*. The size and location of signs installed on tower cranes must be in accordance with manufacturer instructions, recommendations, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve in writing the size and location of any signs.

(q) Plumb tolerance. Towers shall be erected plumb to the manufacturer's tolerance and verified by a qualified person. In the absence of the manufacturer's specifications, a qualified person shall determine the crane tower is plumb to a tolerance of at least 1:500 (approximately 1 inch – 40 feet).

(r) Multiple tower crane jobsites. On jobsites where more than one fixed jib (hammerhead) tower crane is installed, the location of the cranes shall be so that no crane may come in contact with the structure of another crane. Cranes are permitted to pass over one another.

(s) *Climbing procedures*. Prior to, and during, all climbing procedures (inside climbing and top climbing) the employer shall;

1. Comply with all manufacturer prohibitions.
2. Have a registered professional engineer verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages or supporting floors.
3. Wind velocity must not exceed that recommended by the manufacturer or, in the absence of the manufacturer's information, a qualified person, during the entire climbing procedure.

14XX Erecting Climbing and Dismantling – Employer Procedures – General Requirements

(a) When using employer procedures instead of manufacturer procedures for erecting, climbing and dismantling, the employer shall ensure that the procedures are designed to:

(1) Prevent unintended dangerous movement, and to prevent collapse, of part or all of the equipment.

(2) Provide adequate support and stability of all parts of the equipment during the erecting, climbing and dismantling process.

(3) Position employees involved in the erecting, climbing and dismantling operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.

(4) Incorporate all manufacturer prohibitions.

(b) *Qualified person.* Employer procedures must be developed by a qualified person. [still under discussion]

(c) *Documentation.* Employer procedures must be documented and signed by a qualified person.
[still under discussion]

1406 Operation – Procedures (Same as Mobile cranes)

(a) The employer shall comply with all manufacturer procedures applicable to the operation of equipment, including its use with attachments.

(b) *Unavailable operation procedures.*

(1) Where the manufacturer procedures are unavailable, the employer shall develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(2) Procedures for the operational controls must be developed by a qualified person.

(3) Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

(d) *Accessibility.*

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

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

(e) *Posting of electrocution warnings.* In addition to the requirements in paragraph (d), electrocution hazard warnings must be conspicuously posted in the cab so that it is in view of the operator. In addition, except for tower cranes and overhead gantry cranes, such warnings must be posted on all sides of the outside of the equipment.] [We will move to electrical hazards section]

[Do we need to have a requirement for a maintenance program?]

[Need to review 5-3.1.3; 5-3.2; 5-3.2.1.3; 5-3.2.1.4; 5-3.4.2; 5-3.4.3; 5-3.4.4]

[Need to consider lockout/tag out]

1407 Authority to stop operation (Same as Mobile cranes)

~~The operator shall be responsible for those operations under the operator's direct control.~~ Whenever there is ~~any doubt~~ a concern as to safety, the operator shall have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.

1408 Signals – General Requirements [changes from Feb meeting not yet made] **(Same as Mobile cranes)**

(a) A signal person must be provided when:

(1) point of operation, meaning the load travel or the area near or at load placement is not in full view of the operator, or

(2) due to site specific safety concerns, either the operator or the person handling the load determines that it is necessary.

[NOTE: Section on Operation will deal with whether/when signals must be obeyed].

(b) *Types of signals.* Signals to crane operators must be by hand, voice, audible, or new signals.

(c) Hand, voice, or audible signals.

(1) The Standard Method must be used (see Appendix __ for hand; __ for voice; __ for audible).

(2) *Exception*: where use of the Standard Method for the type of signal selected is infeasible, or where an operation or use of an attachment is not covered in the Standard Method, Non-standard hand, voice or audible signals may be used [See Appendix A for examples]. The following requirements apply to the use of non-standard signals:

(i) *Non-standard signals.* The signal person, crane operator, and lift supervisor (where there is one) shall contact each other prior to the operation and agree on non-standard hand, voice or audible signals.

(c) New signals. Signals other than hand, voice or audible signals may be used where the employer demonstrates that the following requirements are met:

(1) Provides at least equally effective communication as Standard Method signals, or

(2) There is an industry consensus standard for the new signal.

(d) *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.

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

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

(g) Only one person gives signals to a crane/derrick at a time, except in circumstances covered by paragraph (h).

(h) Anyone who becomes aware of a problem with a lift must alert the operator or signal person by giving the stop or emergency stop signal.

(i) All directions given to the crane operator by the signal person shall be given from the operator's direction perspective.

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

(i) for each signal, prior to giving the direction function, the signal person shall identify the crane/derrick the signal is for, or

(ii) an equally effective method of identifying which crane/derrick the signal is for must be used.

1409 Radio, telephone or other electronic transmission of signals. (Same as Mobile cranes)

(1) The equipment used to transmit signals shall be tested before beginning operations to ensure that the signal transmission is clear and reliable.
(2) Signal transmission must be through a dedicated channel.
(3) The operator's reception of signals must be by a hands-free system.

1410 Voice signals – additional requirements (Same as Mobile cranes)

(1) Prior to beginning operations, the crane operator, signal person and lift supervisor (if there is one), shall contact each other and review the Standard Voice Signals (see Appendix __).

(2) Each voice signal shall contain the following three elements, given in the following order:

(i) Function (such as hoist, boom, etc.).
(ii) Direction.
(iii) Distance and/or speed.
(iv) Stop command.

1411 Hand signal chart. (Same as Mobile cranes)

Hand signal charts must be either posted on the equipment or readily available at the site.

1412 Signal Person Qualifications (Same as Mobile cranes)

(a) The employer [which employer?] shall ensure that each signal person meets the Qualification Requirements in paragraph (e) prior to giving any signals.

(b) *Documented qualifications.* The requirement in paragraph (a) is met where the employer has documentation from a qualified evaluator showing that the signal person meets the Qualification Requirements (see paragraph (e)).

(c) Where the employer does not have documentation showing that the signal person meets the Qualifications Requirements in paragraph (e), the employer is prohibited from using the individual as a signal person unless a comprehensive assessment demonstrates that the Qualification Requirements have been met. That assessment must include:

(1) A verbal or written examination of the individual to determine if they know, understand and are competent in the application of the Standard Method for the signals used.

(2) Observation of the individual giving signals during trial lifts.

(d) If subsequent actions by the signal person indicate that the individual may not meet the Qualification Requirements, the employer must not allow the individual to continue working

as a signal person until a comprehensive assessment (or re-assessment) is made in accordance with paragraph (c) that confirms that the individual meets the Qualification Requirements.

(e) *Qualification Requirements*. Each signal person must:

(1) Know and understand the Standard Method (see Appendices __, __, and __) for the type of signals used.
(2) Be competent in the application of the Standard Method for the type of signals used, in light of the equipment and conditions at the site.
(3) Know and understand the requirements of sections 1408 -- 1412 [signaling sections].

(a) The employer shall comply with all manufacturer procedures applicable to the operation of equipment, including its use with attachments.

(b) *Unavailable operation procedures*.

(1) Where the manufacturer procedures are unavailable, the employer shall ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(2) Procedures for the controls must be developed by a qualified person.

(3) Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

(d) *Accessibility*.

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

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

14XX Authority to stop operation (See chapter 14XX [same as mobile cranes]

14XX Radio, telephone or other electronic transmission of signals. (See chapter 14XX [same as mobile cranes]

(1) The equipment used to transmit signals shall be tested before beginning [the lift] [lift operations] [crane/derrick operations] to ensure that the signal transmission is clear and reliable.
(2) Signal transmission must be through a dedicated channel.

14XX Voice signals – additional requirements (See chapter 14XX [same as mobile cranes]

(1) Prior to beginning [lift operations], the lift supervisor (if there is one), crane operator, and signal person, shall contact each other and review the Standard Voice Signals (see Appendix __).

(2) Each voice signal shall contain the following three elements, given in the following order:

(i) Direction.
(ii) Distance and/or speed.
(iii) Stop command.

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

(i) for each voice signal, prior to giving the direction, the signal person shall identify the crane/derrick the signal is for, or

(ii) an equally effective method of identifying the crane/derrick the signal is for must be used.

[Should (3) apply to all types of signal communication, or just voice?]

14XX Hand signal chart. Hand signal charts must be either posted on the equipment or readily available at the site.

14XX Signal Person Qualifications (See chapter 14XX [same as mobile cranes]

(a) The employer [which employer?] shall ensure that each signal person meets the Qualification Requirements in paragraph (e) prior to giving any signals.

(b) *Documented qualifications.* The requirement in paragraph (a) is met where the employer has documentation from a qualified evaluator showing that the signal person meets the Qualification Requirements (see paragraph (e)).

(c) Where the employer does not have documentation showing that the signal person meets the Qualifications Requirements in paragraph (e), the employer is prohibited from using the

individual as a signal person unless a comprehensive assessment demonstrates that the Qualification Requirements have been met. That assessment must include:

(1) A verbal or written examination of the individual to determine if they know, understand and are competent in the application of the Standard Method for the signals used.

(2) Observation of the individual giving signals during trial lifts.

(d) If subsequent actions by the signal person indicate that the individual may not meet the Qualification Requirements, the employer must not allow the individual to continue working as a signal person until a comprehensive assessment (or re-assessment) is made in accordance with paragraph (c) that confirms that the individual meets the Qualification Requirements.

(e) *Qualification Requirements.* Each signal person must:

(1) Know and understand the Standard Method (see Appendices __, __, and __) for the type of signals used.
(2) *Be competent in the application of the Standard Method for the type of signals used, in light of the equipment and conditions at the site.*

14XX . **Requirements for equipment with a manufacturer-rated *hoisting/lifting capacity* below 2000 pounds.**

____
____

14XX Safety Devices Tower cranes

(a) *Safety devices.* The following safety devices are required on all ~~equipment~~ *tower cranes* covered by this Subpart, unless otherwise specified:

(1) Boom stops *on luffing boom type cranes*

(2) ~~Jib stops (if a jib is attached).~~ *Trolley end stops at both ends of jib*

(3) ~~*Foot pedal brakes shall have locks.*~~ *Travel rail stops at both ends of travel rail*

(4) ~~Hydraulic outriggers shall have a primary and secondary lock.~~ *Travel rail clamps on all travel bogies*

(5) ~~Equipment on rails shall have rail clamps [to prevent derailment?]~~ *Integrally mounted check valves on all load supporting hydraulic cylinders*

(6) ~~Floating cranes/derricks and cranes on pontoons or barges/vessels shall have a pontoon or barge/vessel list device~~. Hydraulic system pressure limiting device.

(7) Hoist brake that automatically sets in the event of pressure loss or power failure

(8) Boom hoist brake that automatically sets in the event of pressure loss or power failure

(9) Swing brake that automatically sets in the event of pressure loss or power failure

(10) Trolley brake that automatically sets in the event of pressure loss or power failure

(11) Rail travel brake that automatically sets in the event of pressure loss or power failure

(12) Deadman control or forced neutral return control levers

(13) Emergency stop switch at operator's station

(b) *Proper operation required.* Operations shall not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations. Operations shall not resume until the device is again working properly. Alternative measures are not permitted to be used as a substitute for a ~~properly~~ non working device.

14XX Operational Aids ***Tower cranes***

(a) The devices listed in this section ("operational aids") are required on all ~~equipment~~ *tower cranes* covered by this Subpart, unless otherwise specified.

(b) Operations shall not begin unless the operational aids are in proper working order, except where the employer meets the specified temporary alternative measures. Additional measures specified by the crane/derrick manufacturer shall also be followed.

(c) If an operational aid stops working properly during operations, the operator shall safely stop operations until the temporary alternative measures are implemented or the device is again working properly.

(d) Operational aids that are not working properly shall be repaired by no later than the completion of the next [monthly] inspection.

(e) *Operational aids and temporary alternative measures.* The equipment shall have the following:

(1) *Boom angle or hook radius indicator.*

(i) The equipment shall have a boom angle or *hook* radius indicator readable from the operator's station.

(ii) If the equipment has a boom angle or *hook* radius indicator of the electronic type, it shall also have one of the mechanical type if the crane/derrick can be operated when the electronic systems are not functional.

(iii) Temporary alternative measures: *Hook r*adii or boom angle shall be determined by measuring the *hook* radii or boom angle with a measuring device.

(2) ~~Jib angle indicator if the equipment has a luffing jib. Temporary alternative measures: [?].~~ *Trolley travel deceleration device to reduce the trolley speed prior to end limit in both directions*

(3) ~~Boom hoist limiting device. Temporary alternative measures: [?]~~*Trolley travel limiting device at both ends of jib*

(4) ~~Limiting device for jib luffing if the equipment has a luffing jib. Temporary alternative measures are the same as in paragraph (2), except to limit the movement of the luffing jib.~~ *Boom hoist deceleration device to reduce the boom speed prior to maximum and minimum radius*

(5) ~~Boom length indicator if the equipment has a telescopic boom, [except where the load rating is independent of the boom length] [do we need to add this?]. Temporary alternative measures: A qualified person shall [?] [ANSI just refers to 5-3.2.2 (1?).1 a,b,c — just that the procedures must ensure that load capacities are not exceeded. This doesn't say anything about the nature of those procedures]~~
Boom hoist limiting device to limit boom travel at maximum and minimum radius

(6) ~~Crane level indicator. Temporary alternative measures: [What are some examples of manually assessing degree of level?].~~ *Boom hoist drum positive locking device*

(7) Hoist speed deceleration device to reduce the hoist speed prior to two block limit in the hoisting direction

(8) *Anti two-blocking* *that automatically deactivates the hoisting action before damage occurs in the event of a two-blocking situation.*

~~(i) Telescopic/cantilever boom cranes manufactured after February 28, 1992, shall be equipped with a device that automatically prevents two-blocking at each point where two-blocking could occur. Examples of such devices include:~~

~~(A) A positive acting device (anti-two-blocking device) which automatically prevents contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component).~~

~~(B) A system that automatically deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage prevention feature).~~

~~(ii) Lattice boom cranes manufactured after (___,2000) [why not Feb 28, 1992?], shall be equipped with a device that, at each point where two-blocking could occur, either automatically prevents two-blocking or warns the operator in time for the operator to prevent two-blocking. [Why permit the warning device instead of an automatic device?] *Exception:* this requirement does not apply to such lattice boom equipment when used for dragline, clamshell, magnet, drop ball, container handling, & concrete bucket work.~~

~~(iii) Temporary alternative measures. [_____]~~

~~(8) For equipment manufactured after [March 29, 2003] [effective date of this standard], at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. [For all equipment, equipment w/ capacity over 2,000 lbs, or w/ capacity over 6,000 lbs?] Temporary alternative measures: the weight of the load shall be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means.~~

(9) ~~The following devices are required on equipment manufactured after January 1, 2008:~~

~~(i) Outrigger position sensor/monitor if the equipment has outriggers. Temporary alternative measures: the operator shall visually check the position of the outriggers before beginning operations requiring outrigger deployment and before moving the equipment to another location.~~

~~(ii) Drum rotation indicator. Temporary alternative measures: [?]~~

~~(iii) Counterweight sensor. Temporary alternative measures: [?]~~

Hoist drum lowering device to prevent last 2 wraps of cable from being spooled off the drum

(9) ~~[Should we include wind speed measuring device?]~~ *Load moment limit device*

(10) *Hoist line pull limiting device*

(11) *Wind speed indicator mounted above the upper rotating structure of the crane*

(12) *Load indicator to display the magnitude of the load on the hook*

Boom stop	~~Includes boom stops, telescoping boom stops, attachment boom stops, and backstops.~~ These devices restrict the boom from moving above a certain maximum angle and toppling over backward. This includes devices that combine the function of disengaging the boom hoist power along with physically stopping the boom as it reaches a predetermined maximum angle.
~~Jib stop~~	~~also referred to as a jib backstop, is the same type of device as a boom stop, but is for a jib.~~
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, derricking limiter. This type of device disengages boom hoist power when the boom reaches a predetermined maximum [and minimum? If not minimum, then do we need a separate definition for a limiting device for a luffing jib?] operating angle. It also sets brakes or closes valves to prevent the boom from lowering after power is disengaged.
~~Boom length indicator~~	~~[Do these indicate just the length of the permanent part of the boom (i.e., without attachments/extensions)?]~~

14XX Inspections

(a) *New~~, modified and repaired~~ equipment.*

(1) Prior to initial use, new equipment shall be inspected by a qualified person to assure that it meets manufacturer equipment criteria (instructions, recommendations, limitations and specifications) that relate to safe operation. Such inspection shall include functional testing.

(2) New equipment shall not be used until an inspection under this paragraph demonstrates that it meets manufacturer equipment criteria that relate to safe operation.

(b) *Modified equipment.*

(1) Equipment that has had modifications or additions which affect the capacity or safe operation of the equipment shall be inspected after such modifications/additions have been completed, prior to initial use. The inspection shall meet the following requirements:

(i) The inspection shall assure that the equipment meets manufacturer equipment criteria (where applicable and available) that relate to safe operation.

(ii) Where manufacturer equipment criteria are unavailable or inapplicable, the inspection shall assure that the equipment meets the equipment criteria established in accordance with the requirements in section 1416(a) (2) and (a)(3).

(iii) The inspection shall include functional testing.

(2) Equipment shall not be used until an inspection under this paragraph demonstrates that the modification/addition meets the applicable equipment criteria.

(c) *Repaired/adjusted equipment.*

(1) 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, ~~equipment structure~~ structural components, load hook, or in-use operating mechanism), shall be inspected after such a repair or adjustment has been completed, prior to initial use. The inspection shall meet the following requirements:

(i) The inspection shall assure that the repair/adjustment meets manufacturer equipment criteria (where applicable and available).

(ii) Where manufacturer equipment criteria are unavailable or inapplicable, the inspection shall assure that the repair/adjustment meets equipment criteria approved by a ~~registered professional engineer~~ qualified person familiar with the type of equipment involved.

(iii) The inspection shall include functional testing.

(4) Equipment shall not be used until an inspection under this paragraph demonstrates that the repair/adjustment meets the applicable equipment criteria.

(d) *Post-erection.*

(1) Upon completion of erection, the equipment must be inspected by a qualified person to assure if it is configured in accordance with manufacturer instructions, recommendations, limitations, and specifications. Where these are unavailable, the competent person must determine if it is configured in accordance with the instructions, recommendations, limitations, and specifications of a registered professional engineer familiar with the type of equipment involved.

(2) Any aspect of the configuration that fails to meet the requirements in Paragraph (1) shall be corrected prior to using the equipment.

(3) A load test *using certified weights or scaled weights using a certified scale with a current certificate of calibration* shall be conducted after each erection in accordance with the manufacturer's instructions.. Where these are unavailable a registered professional engineer familiar with the type of equipment involved shall provide written procedures.

(e) *Pre-shift.*

(1) Equipment shall be visually inspected prior to each shift by a competent person. The inspection shall ~~include~~ consist of observation for apparent deficiencies. Disassembly is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating disassembly is needed. Determinations made in conducting the inspection shall be reassessed in light of observations made during operation. At a minimum the inspection shall include the following:

(i) All control mechanisms for maladjustments [interfering with proper operation?]

(ii) All control [and drive?] mechanisms for excessive wear of components and contamination by lubricants, water or other foreign matter.

(iii) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.

(iv) Hooks and latches for deformation, chemical damage, cracks, or wear.

(v) Wire rope reeving for compliance with the manufacturer's specifications.

(vi) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt or moisture accumulation.

(vii) Hydraulic system for proper fluid level.

(viii) Tires (when in use) for proper inflation and pressure.

(ix) Ground conditions around the equipment for proper support, including ground settling under and around outriggers or supporting foundations, ground water accumulation, or similar conditions.

(x) The equipment for level position when on outriggers or static undercarriage.

(xi) Rails, *rail stops, rail clamps* and supporting surfaces when the crane is equipped with rail travelling.

(xii) Safety devices and operational aids including, but not limited to, boom angle indicators, boom or trolley travel limiting devices, load moment limit devices, anti-two block devices, and load moment indicators where required.

(xii) Tower (mast) bolts and other structural bolts.

(xiv) Tie-ins, braces, floor supports and floor wedges where the crane is supported by the structure for loose or dislodged components.

(xv) Operator cab windows for lack of significant cracks, breaks, or other deficiencies affecting safe operation.

(xvi) Safety devices and operational aids for ~~malfunction~~ proper operation.

(2) If any deficiency in (i) through (xi) is identified, an immediate determination shall be made by the [competent person] as to whether the deficiency constitutes a hazard. If the deficiency is determined to constitute a hazard, the equipment shall be removed from service until the deficiency has been corrected.

(3) If any deficiency in (xvi)(safety devices/operational aids) is identified, [this will then refer to section on safety devices/operational aids].

(4) Pre-shift inspections of the equipment's wire rope shall be done in accordance with section _____ .

(5) A qualified rigger (a rigger who is also a qualified person) shall inspect the rigging prior to each shift in accordance with 1926.251.

[Paragraph on operator authority to stop moved into separate section]

(f) *Monthly.*

(1) Each month the equipment is in service it shall be inspected in accordance with paragraph 14xx(x) (pre-shift inspections).

(2) Equipment shall not be used until an inspection under this paragraph demonstrates that no corrective action under paragraphs (e)(2) and (3) is required.

(3) *Documentation.*

(i) The following information shall be documented:

(A) The items checked and the results of the inspection.

(B) The name and signature of the person who conducted the inspection and the date.

(ii) This document shall be retained for a minimum of three months.

(g) *Annual/comprehensive.*

(1) At least every 12 months the equipment shall be inspected by a qualified person in accordance with paragraph 1415(e) (pre-shift inspections).

(2) In addition, at least every 12 months, the equipment shall be inspected by a qualified person for the following:

(i) Equipment structure (including the boom and, if equipped, the jib):

(A) Structural members: ~~bent or otherwise~~ deformed, cracked, or significantly corroded.

(B) Bolts, ~~and~~ rivets and other fasteners: loose, failed or significantly corroded.

(C) Welds for cracks.

(ii) Sheaves and drums for cracks or significant wear.

(iii) Parts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear.

(iv) Brake and clutch system parts, linings, pawls and ratchets for excessive wear.

(v) Safety devices and operational aids for ~~significant inaccuracies~~ proper operation (including significant inaccuracies). ~~(see section 1414 [operational aids]).~~

(vi) Gasoline, diesel, electric, or other power plants for ~~compliance with~~ safety-related problems (such as leaking exhaust and emergency shut-down feature), condition and proper operation.

(vii) Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch.

(viii) Travel steering, brakes, and locking devices, for proper operation.

(ix) Tires for damage or excessive wear.

(x) 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 that persist after ~~normal~~ tightening ~~to manufacturer specifications or use of manufacturer procedures.~~

(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.

(xi) 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.

(xiv) Hydraulic and pneumatic valves, as follows:

(A) Spools: sticking, improper return to neutral, and leaks.

(B) Leaks.

(C) Valve housing cracks.

(D) Relief valves: failure to reach correct pressure ~~and setting~~ (if there is a manufacturer procedure for checking pressure, it must be followed).

(xv) Hydraulic and pneumatic cylinders, as follows:

(A) Drifting caused by fluid leaking across the piston.

(B) Rod seals and welded joints for leaks.

(D) Cylinder rods for scores, nicks, or dents.

(E) Case (barrel) for dents.

(F) Rod eyes and connecting joints: loose or deformed.

(xvi) Outrigger pads/floats and slider pads for excessive wear.

(xvii) Electrical components and wiring for ~~indications of failure/impending failure.~~ Cracked or split insulation.

(xix) Warning labels and decals: missing or unreadable.

(xx) Operator seat: missing or unusable.

(xxi) Originally equipped steps, ladders, handrails, guards: missing or in unusable/unsafe condition.

(xxii) Additional inspection items for _____[crane category] [Do we need additional items for any specific types of equipment?]

(3) This inspection shall include functional testing.

(4) If any deficiency is identified, an immediate determination shall be made by the qualified person as to whether:

(i) The deficiency constitutes a hazard.

(ii) Though not presently a hazard, there is a reasonable probablility that it could become a hazard in the next 12 months if left uncorrected.

(5) If the qualified person determines that a deficiency is a hazard, the equipment shall be removed from service until it has been corrected.

(6) If the qualified person determines that, though not presently a hazard, there is a reasonable probability that a deficiency could become one within the next 12 months if left uncorrected, the employer shall either:

(i) Remove the equipment from service until the deficiency has been corrected, or

(ii) Take the following steps:

(A) Implement a written schedule for inspecting the deficiency that ensures that it is checked and corrected before it becomes a hazard.

(B) Document the inspections done under this schedule (including the date, items checked, results, and name of the person who conducted the inspection). The schedule and inspection record shall be retained until the deficiency is corrected.

(7) *Documentation of annual/comprehensive inspection.* The following information shall be documented:

(i) The items checked and the results of the inspection.

(ii) The name and signature of the person who conducted the inspection and the date.

(iii) This document shall be retained for a minimum of twelve months.

~~(5) *Heavy Service*~~

~~The inspection in (e)(2) must be done monthly where the equipment is operated at 85-100% of the rated load capacity as a regular specified procedure, or in excess of 10 lift cycles per hour. [From Dept. of Energy]~~

(h) *Severe Service.* 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 shall stop using the equipment and a qualified person shall:

(1) Inspect the equipment for structural damage.

(2) Determine whether any items/conditions listed in paragraph (g) need to be inspected; if so, the qualified person shall inspect those items/conditions.

(3) If a deficiency is found, the employer shall follow the requirements in paragraphs (g)(4)-(6).

~~(4) Inspections under this paragraph shall be documented and contain the information specified in paragraph (g)(7)(i) (ii). The document shall be retained for at least 12 months.~~

(j) *Equipment not in regular use.*

(1) Equipment that has been idle for ~~1~~ 3 months or more, ~~but less than 6 months,~~ shall be inspected by a qualified person in accordance with the requirements of paragraph (f)(Monthly) before ~~being placed in service~~ initial use.

~~(2) Equipment that has been idle for 6 months or more shall be inspected by a qualified person in accordance with paragraph (g) (annual/comprehensive inspection) before being placed in service initial use.~~

(k) Any part of a manufacturer's procedures regarding inspections that is more comprehensive or has a more frequent schedule than the requirements of this section shall be followed.

DEFINITIONS

Attachments means any device that expands the range of tasks that can be done by the equipment. These include, but are not limited to: an auger, drill, magnet, pile-driver, and 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.

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.

Chainfall see come-a-long.

Climbing The process where the crane is raised to an new working height, either by adding additional tower sections to the top of the crane (top climbing) or the entire crane is raised inside the structure (inside climbing).

Crew Leader A worker who is both a competent person and a qualified person, who oversees an erecting/dismantling operation.

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 Channel A line of communication [assigned to] [used by] only one signal person and crane/derrick.

In-the-air assembly operations [Need definition]

Operation _____

Operational aids [Need definition]

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

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

Qualified

Evaluator means an entity that 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.

Section means a section of this Subpart unless otherwise specified.

Standard means this Subpart unless otherwise specified.

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

Standard Methods means the protocols in Appendices for hand, voice and audible signals.

Unavailable procedures means procedures that are no longer available from the manufacturer or have not been supplied by the manufacturer.

Equipment means equipment covered by this subpart.