

May 26, 2004

NOTE:

[Text in brackets and highlighted] are questions, information, options or new material.

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## 1400 Scope

(a) This standard applies to power-operated equipment used in construction that can hoist, lower and horizontally move a suspended load. Such equipment includes, but is not limited to: articulating cranes (such as knuckle-boom cranes); crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial (such as carry-deck cranes); dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as fixed jib ("hammerhead boom"), luffing boom and self-erecting); pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment. However, items listed in paragraph (c) are excluded from the scope of this standard.

(b) *Attachments.* This standard applies to equipment included in paragraph (a) when used with attachments. Such attachments, whether crane-attached or suspended include, but are not limited to: hooks, magnets, grapples, clamshell buckets, orange peel buckets, concrete buckets, drag lines, personnel platforms, augers or drills and pile driving equipment.

(c) *Exclusions.* This Subpart does not cover:

(1) Equipment included in paragraph (a) that has been converted or adapted for a non-hoisting/lifting use. Such conversions/adaptations include, but are not limited to, power shovels, excavators and concrete pumps.

(2) Power shovels, backhoes and excavators.

(3) Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles.

(4) Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries, such as digger derricks (radial boom derricks), when used in these industries for auguring holes to set power and utility poles, or handling associated materials to be installed or removed from utility poles.

(5) Equipment originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms.

(6) ~~Electric gantry cranes~~, including telescopic/hydraulic gantries [We need a picture/drawing of this].

(7) Stacker cranes.

- (8) Powered industrial trucks (forklifts).
- (9) Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair.
- (10) Equipment that hoists by using a come-a-long or chainfall.
- (11) Dedicated drilling rigs.
- (12) Gin poles used for the erection of communication towers.
- (13) Tree trimming and tree removal work.

(d) *Limited requirements.* The only requirements under this standard that apply to the equipment listed in this paragraph are as follows:

- (1) For equipment with a manufacturer-rated hoisting/lifting capacity of 2000 pounds or less: Section 1413.
- (2) For dedicated pile drivers: Sections \_\_\_\_\_.
- (3) For overhead and gantry cranes used in construction that are permanently installed in a facility: Section 1439(a).

1401 [Reserved]

**1402 Assembly/Disassembly – Selection of Manufacturer or Employer Procedures**

When assembling and disassembling equipment (or attachments), the employer shall comply with either:

- (a) all manufacturer procedures applicable to erecting and dismantling, or
- (b) employer procedures for erecting 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 1405.

**1403 Assembly/Disassembly – General Requirements (applies to all assembly and disassembly operations)**

(a) *Supervision – Competent-qualified person.*

- (1) Assembly/disassembly must be supervised 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 supervisor”).

(2) Where the assembly/disassembly is being performed by only one person, that person must meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D supervisor.

(b) *Knowledge of procedures.* The A/D supervisor must understand the applicable assembly/disassembly procedures.

(c) *Review of procedures.* The A/D supervisor must review the applicable assembly/disassembly procedures immediately prior to the commencement of erecting/dismantling unless the A/D supervisor has applied them to the same type and configuration of equipment (including accessories, if any) so that they are already known and understood.

(d) *Crew instructions.*

(1) Before commencing assembly/disassembly operations, the A/D supervisor must determine that the crew members understand the following:

(i) Their tasks.

(ii) The hazards associated with their tasks.

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

(2) During assembly/disassembly operations, 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 assembly/disassembly 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 ensure that the operator is informed 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 part of the equipment (or load) until the operator:

(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 or other components.* When pins (or similar devices) are being removed, employees must not be under the boom or other components, except where site constraints require them to do so. In such instances, 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 assembly/disassembly, 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 assembled/disassembled.

(h) *Addressing specific hazards.* The A/D supervisor supervising the assembly/disassembly 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 assembly/disassembly operations and to support the equipment during assembly/disassembly (see the requirements in Section 1428).

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

(3) *Proper location of blocking.* When used to support lattice booms or components, blocking must be appropriately placed to:

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

(ii) Prevent dangerous movement and collapse.

(4) *Verifying assist crane loads.* When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly must be verified before assembly/disassembly begins in order to prevent exceeding manufacturer instructions, recommendations, specifications and limitations for the assist crane.

(5) *Lattice boom and jib pick points.* The point(s) of attachment of rigging to a lattice boom (or lattice boom sections or jib or jib sections) must be suitable for preventing structural damage and facilitating safe handling of these components.

(6) *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 Appendix XX for examples of techniques).

(7) *Stability upon pin removal.* The boom sections, boom suspension systems (such as gantry A-frames and jibstruts) or components must be rigged or supported to maintain stability upon the removal of the pins.

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

(9) *Loss of backward stability.* Backward stability must be considered before swinging the upperworks and when attaching or removing equipment components.

[Insert illustration (without text) from pg 191 of Ontario Handbook]

(10) *Wind velocity.* Wind velocity must be considered so that the safe assembly/disassembly of the equipment is not compromised.

(11) *Boom hoist brake failure.* Where reliance is placed on the boom hoist brake to prevent boom movement during assembly/disassembly, the brake shall be tested to determine if it sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or an assist crane) from a boom hoist brake failure shall be used.

(12) *Struck by counterweights.* The potential for unexpected movement from inadequately supported counterweights and from hoisting counterweights.

(i) [Reserved]

(j) *Cantilevered boom sections.* Manufacturer instructions, recommendations and limitations on the maximum amount of boom supported only by cantilevering shall not be exceeded.

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

(l) [Reserved]

(m) *Components and Configuration.*

(1) The selection of 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-assembly inspection.* Upon completion of assembly, the equipment must be inspected to ensure compliance with paragraph (1) (see section 1415(b) for post-assembly inspection requirements).

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

(o) *Shipping pins.* Reusable shipping pins, straps, links, and similar equipment must be removed and stowed in accordance with manufacturer instructions.

**1404 Disassembly – Additional requirements for disassembly of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).**

*Dismantling (including dismantling for changing the length of) booms and jibs.*

(a) None of the pins in the pendants are to be removed (partly or completely) when the pendants are in tension.

[Insert new diagram]

(b) None of the pins (top and bottom) on boom sections located between the pendant attachment points and the crane/derrick body are to be removed (partly or completely) when the pendants are in tension.

[Insert Diagrams A, B and C].

(c) None of the top pins on boom sections located on the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) are to be removed (partly or completely) until the cantilevered section to be removed is fully supported.

[Insert diagrams D and E]

**1405 Assembly/Disassembly – Employer Procedures – General Requirements**

(a) When using employer procedures instead of manufacturer procedures for assembling or disassembling, 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 assembly/disassembly process.

(3) Position employees involved in the assembly/disassembly 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.

#### 1406 Operation – Procedures

(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.

(c) *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.

1. The employer shall ensure that the operator is trained and qualified to operate the equipment.

2. The employer shall ensure that the operator is provided with adequate training and supervision.

3. The employer shall ensure that the operator is provided with adequate information.

( ) Safety devices and operational aids shall not be used as a substitute for the exercise of professional judgement by the operator.

( ) ~~[We were going to consider adding this to the Operations section.]~~ Where reliance is placed on the boom hoist brake to prevent boom movement, the brake shall be tested to determine if it sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or an assist crane) from a boom hoist brake failure shall be used.

#### 1407 Authority to stop operation

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

(a) 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 travelling, 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.

[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 signals.*

- (1) When using hand signals, the Standard Method must be used (see Appendix \_\_ ). *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 [See Appendix A for examples] in accordance with paragraph (2). The following requirements apply to the use of non-standard hand signals:

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

(d) *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) There is an industry consensus standard for the new signals.

(e) *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.

(f) 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.

(g) 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.

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

(i) [Reserved].

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

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

(l) [Reserved].

(m) *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 function/direction, 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.**

- (1) The equipment used to transmit signals shall be tested on site before beginning operations to ensure that the signal transmission is clear and reliable.
- (2) Signal transmission must be through a dedicated channel. *Exception:* Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.
- (3) The operator's reception of signals must be by a hands-free system.

**1410 Voice signals – additional requirements**

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

**1411 Hand signal chart.** Hand signal charts must be either posted on the equipment or readily available at the site.

**1412 Signal Person Qualifications**

- (a) The employer of the signal person shall ensure that each signal person meets the Qualification Requirements in paragraph (e) prior to giving any signals.
- (b) *Documented qualifications.*
  - (1) 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)).
  - (2) Documentation from a qualified evaluator showing that the signal person meets the Qualification Requirements (see paragraph (e)) is required for blind pick signal persons.
- (c) *Signal persons without documentation.*

(1) 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:

(i) A verbal or written examination of the individual to determine if he/she meets the requirements of paragraph (e).

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

(2) Paragraph (c) does not apply to blind pick signal persons (see paragraph (b)(2)).

(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 type of signals used. If hand signals are used, the signal person must know and understand the Standard Method for hand signals.

(2) Be competent in the application of the type of signals used, in light of the equipment and conditions at the site.

(3) Have a basic understanding of crane operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.

(4) Know and understand the requirements of sections 1408 -- 1412 [signaling sections].

**1413 Requirements for equipment with a manufacturer-rated hoisting/lifting capacity of 2000 pounds or less. [REDACTED]**

For equipment with a manufacturer-rated hoisting/lifting capacity of 2000 pounds or less:

(a) The following sections of this Subpart apply: 1400 (Scope); 1407 (Authority to Stop Operation); 1408 – 1412 (Signals); 1414 (Safety Devices); 1415 (Inspections); 1416 (Equipment Modifications); 1418 – 1421 (Wire Rope); 1423 (Keeping Clear of the Load); 1424 (Fall Protection) [?]; 1426 (Qualifications of Maintenance & Repair Workers); 1428 (Ground conditions); 1429 (Work Zone Control); 1430 – 14XX (Power line safety); 1431

(Derricks) [needs to be considered by derricks work group]; 1432 (Design, Construction and Testing); 1433 (Floating Cranes & Cranes on Barges); 1435 (Free Fall/Power Down); 1436 (Multiple Crane Lifts); 1437 (Tower Cranes); 1439 (Overhead & Gantry Cranes); 1440 (Definitions).

(b) *Assembly/disassembly.*

(1) Sections 1402 (Assembly/ Disassembly – Selection of Manufacturer or Employer Procedures) and 1405 (Assembly/ Disassembly – Employer Procedures) apply.

(2) *Components and Configuration.*

(i) The selection of components and configuration of the equipment that affect the capacity or safe operation of the equipment must be in accordance with:

(A) 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

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

(ii) *Post-assembly inspection.* Upon completion of assembly, the equipment must be inspected to ensure compliance with paragraph (2)(i) (see section 1415(b) for post-assembly inspection requirements).

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

(c) *Operation – Procedures*

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

(2) *Unavailable operation procedures.*

(i) 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.

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

(iii) Procedures related to the capacity of the equipment must be developed and signed by a qualified person familiar with the equipment.

(3) *Accessibility.*

(i) The load capacity chart shall be attached to the equipment at the control station.

(ii) Procedures applicable to the operation of the equipment, recommended operating speeds, special hazard warnings, instructions and operators manual, shall be readily available at the site for use by the operator.

(iii) Where load capacities are available at the control station 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.

(d) *Operational aids.* Section 14XX applies, except that:

(1) *Anti-two blocking.* The equipment shall have either an anti-two block device that meets the requirements of 14XX (d)(3), or shall be designed so that, in the event of a two-block situation, no damage will occur and there will be no load failure (such as where the power unit will stall in the event of a two-block).

(2) Paragraph 14XX (e)(5) does not apply.

(e) *Operator qualifications.* The employer shall ensure that:

(1) Prior to operating the equipment, the operator:

(i) Is trained on the safe operation of the type of equipment the operator will be using.

(ii) Demonstrates in a practical test that he/she is competent in the operation of the equipment.

(2) The training and testing required in paragraph (1) is documented.

(f) *Keeping clear of the load.* Section 1423 applies, except for paragraph (c)(3) [qualified rigger].

(g) *Hoisting personnel.* Hoisting personnel using equipment covered by this section is prohibited.

## 1414 Safety Devices

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

(1) *Crane level indicator.*

(i) The equipment shall have a crane level indicator that is either built into the equipment or is available on the equipment.

(ii) If a built-in crane level indicator is not working properly, it shall be tagged-out or removed.

(2) Boom stops (except for hydraulic booms).

(3) Jib stops (if a jib is attached).

(4) Foot pedal brakes shall have locks.

(5) Hydraulic outrigger jacks shall have an integral holding device/check valve.

(6) Equipment on rails shall have rail clamps.

(7) Floating cranes/derricks and cranes on pontoons or barges/vessels shall have a pontoon or barge/vessel list device.

(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.

## 14XX Operational Aids

(a) The devices listed in this section (“operational aids”) are required on all equipment 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 alternative 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) *Category I operational aids and alternative measures.* Operational aids listed in this paragraph that are not working properly shall be repaired no later than 7 days after the

deficiency occurs. *Exception:* if the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair shall be completed within 7 days of receipt of the parts.

(1) *Boom hoist limiting device.*

(i) If the equipment was manufactured with a boom hoist limiting device, the device is required. *Temporary alternative measures:* Clearly mark the cable (so that it can easily be seen by the operator) that is on the drum at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius.

(ii) If the equipment was not manufactured with the device, the cable on the drum shall be marked at a point that will give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius.

(2) *Luffing jib limiting device.*

(i) If the equipment was manufactured with a limiting device for jib luffing, the device is required. Temporary alternative measures are the same as in paragraph (1)(i), except to limit the movement of the luffing jib.

(ii) If the equipment has a luffing jib was not manufactured with the device, the cable on the drum shall be clearly marked at a point that will give the operator sufficient time to stop the hoist to keep the jib within the minimum allowable radius.

(3) *Anti two-blocking device.*

(i) Telescopic boom cranes manufactured after February 28, 1992, shall be equipped with a device which automatically prevents damage and load failure 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/failure at all points where two-blocking could occur.

(ii) *Lattice boom cranes.*

(A) Lattice boom cranes manufactured after Feb 28, 1992, shall be equipped with a device that either automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component), or warns the operator in time for the operator to prevent two-blocking. The device(s) must prevent such damage/failure or provide adequate warning for all points where two-blocking could occur.

(B) Lattice boom cranes manufactured 1 year after the effective date of this standard shall be equipped with a device which automatically prevents damage and load failure 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/failure at all points where two-blocking could occur.

(C) *Exception.* The requirements in subparagraphs (A) and (B) do not apply to such lattice boom equipment when used for dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket ~~with alternate operation~~ and pile driving work. ~~...~~

(iii) 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, or use a spotter.

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

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

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

(3) *Boom length indicator* if the equipment has a telescopic boom, except where the load rating is independent of the boom length. *Temporary alternative measures:* One of the following methods shall be used:

(i) Mark the boom with measured marks to calculate boom length; or

(ii) Calculate boom length from boom angle and radius measurements; or

(iii) Measure the boom with a measuring device.

(4) For equipment manufactured after March 29, 2003, equipment with a rated capacity over 6,000 pounds shall have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. *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. This information shall be provided to the operator prior to the lift.

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

(i) Outrigger position (beam extension) 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 if the drum is not visible from the operator's station. *Temporary alternative measures:* Mark the drum. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

(iii) Counterweight sensor. *Temporary alternative measures:* The operator shall visually verify that the configuration and weight of the counterweight(s) is correct. When using these measures, the weight of the counterweight(s) must be clearly marked.

#### **1415 Inspections** [Revisions completed]

##### **(a) Modified equipment.**

(1) Equipment that has had modifications or additions which affect the capacity or safe operation of the equipment shall be inspected by a qualified person 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 modifications have been done in accordance with the approval obtained pursuant to Section 1416 (Equipment Modifications).

(ii) 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, load-sustaining structural components, load hook, or in-use operating mechanism), shall be inspected by a qualified person

after such a repair or adjustment has been completed, prior to initial use. The inspection shall meet the following requirements:

(i) The qualified person shall determine if the repair/adjustment meets manufacturer equipment criteria (where applicable and available).

(ii) Where manufacturer equipment criteria are unavailable or inapplicable, the qualified person shall:

(A) Determine if a registered professional engineer (RPE) is needed to develop criteria for the repair/adjustment. If an RPE is not needed, the employer shall ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer shall ensure that they are developed by an RPE.

(B) Determine if the repair/adjustment meets the criteria developed in accordance with subparagraph (A).

(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-assembly.*

(1) Upon completion of assembly, the equipment shall be inspected by a qualified person to assure that it is configured in accordance with manufacturer equipment criteria.

(2) Where manufacturer equipment criteria are unavailable, a qualified person shall:

(i) Determine if a registered professional engineer (RPE) familiar with the type of equipment involved is needed to develop criteria for the equipment configuration. If an RPE is not needed, the employer shall ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer shall ensure that they are developed by an RPE.

(ii) Determine if the equipment meets the criteria developed in accordance with subparagraph (i).

(3) Equipment shall not be used until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria.

(e) *Each Shift.*

(1) A competent person shall begin a visual inspection prior to each shift, which shall be completed before or during that shift. The inspection shall 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) Control mechanisms for maladjustments interfering with proper operation.
- (ii) Control and drive mechanisms for apparent 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) Hydraulic system for proper fluid level.
- (v) Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.
- (vi) Wire rope reeving for compliance with the manufacturer's specifications.
- (vii) Wire rope, in accordance with section 1419\_\_ [shift inspection].
- (viii) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation.
- (ix) Tires (when in use) for proper inflation and condition.
- (x) Ground conditions around the equipment for proper support, including ground settling under and around outriggers and supporting foundations, ground water accumulation, or similar conditions.
- (xi) The equipment for level position, both pre-shift and after each move and setup.
- (xii) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.
- (xiii) Safety devices and operational aids for proper operation.

(2) If any deficiency in (i) through (xii) 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 it has been corrected.

(3) If any deficiency in (xiii)(safety devices/operational aids) is identified, the corrective action specified in section 1414 shall be taken prior to using the equipment.

(f) *Monthly.*

(1) Each month the equipment is in service it shall be inspected in accordance with paragraph 1415(e) (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) (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: deformed, cracked, or significantly corroded.

(B) Bolts, 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 proper operation (including significant inaccuracies).
- (vi) Gasoline, diesel, electric, or other power plants for 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.
  - (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 (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 significant dents.
  - (F) Rod eyes and connecting joints: loose or deformed.
- (xvi) Outrigger pads/floats and slider pads for excessive wear or cracks.
- (xvii) Electrical components and wiring for cracked or split insulation and loose or corroded terminations.
- (xviii) Warning labels and decals required under this standard: missing or unreadable.
- (xix) Operator seat: missing or unusable.
- (xx) Originally equipped steps, ladders, handrails, guards: missing or in unusable/unsafe condition.
- (xxi) Additional inspection items for \_\_\_\_\_ [crane category]  
[Derricks and floating cranes]
- (3) This inspection shall include functional testing to determine that the equipment as configured in the inspection is functioning properly.
- (4) If any deficiency is identified, an immediate determination shall be made by the qualified person as to whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly inspections.
- (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, the deficiency needs to be monitored, the employer shall ensure that the deficiency is checked in the monthly inspections.

(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 12 months.

(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).

(i) [Reserved]

(j) *Equipment not in regular use.* Equipment that has been idle for 3 months or more shall be inspected by a qualified person in accordance with the requirements of paragraph (f)(Monthly) before 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. Additional documentation requirements by the manufacturer are not required.

#### **1416 Equipment Modifications**

(a) Modifications or additions which affect the capacity or safe operation of the equipment are prohibited except where the requirements of paragraph (1), (2) or (3) are met.

- (1) *Manufacturer review and approval.* The manufacturer approves the modifications/additions in writing.
- (2) *Manufacturer refusal to review request.* The manufacturer is provided a detailed description of the proposed modification, is asked to approve the modification/

addition, but it declines to review the technical merits of the proposal, and all of the following are met:

(i) A registered professional engineer who is a qualified person with respect to the equipment involved:

(A) Approves the modification/addition and specifies the equipment configurations to which that approval applies, and

(B) Modifies load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition.

(ii) The original safety factor of the equipment is not reduced.

(3) *Unavailable manufacturer.* The manufacturer is unavailable and the requirements of paragraph (2)(i) and (2)(ii) are met.

(b) 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.

#### **1417 Training**

[Keeping limbs out of holes and crush/pinch points]

[Principles necessary for safe operation of a crane/derrick. Examples of sources that may be used to meet this include industry consensus standards regarding the equipment being used].

#### **1418 Wire Rope – Inspection**

(a) *Shift Inspection.*

(1) A competent person shall begin a visual inspection prior to each shift, which shall be completed before or during that shift. The inspection shall consist of observation of running wire ropes that are reasonably likely to be in use during the shift for apparent deficiencies, including those listed in paragraph (2). Untwisting of wire rope is not required as part of this inspection.

(2) *Apparent deficiencies.*

(i) *Category I.* Apparent deficiencies in this category include the following:

- (A) Significant distortion of the wire rope structure such as kinking, crushing, unstranding, birdcaging, or core protrusion.
- (B) Significant corrosion.
- (E) Visible reduction of rope diameter.
- (F) Electric arc (from a source other than power lines) or heat damage.
- (G) Improperly applied end connections.
- (H) Significantly corroded, cracked, bent, or worn end connections (such as from severe service).

(ii) *Category II.* Apparent deficiencies in this category are:

- (A) Broken or cut strands [what is the difference between a strand and a wire?].
- (B) Visible broken wires.

(iii) *Category III.* Apparent deficiencies in this category include the following:

- (A) In rotation resistant wire rope, core protrusion or other distortion indicating core failure.
- (B) Electrical contact with a power line.

(3) *Critical Review Items.* The competent person shall give particular attention to:

- (i) Rotation resistant wire rope in use.
- (ii) Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends [see diagram in Appendix \_\_\_].
- (iii) Wire rope at flange points, crossover points and repetitive pickup points on drums.
- (iv) Wire rope adjacent to end connections.
- (v) Wire rope at equalizer sheaves.

(4) *Removal from service.*

- (i) If a deficiency in Category I 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, operations involving use of the wire rope in question shall be prohibited until:

(A) The wire rope is replaced, or

(B) 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 ~~running~~ [what about pendants?] wire rope by splicing is prohibited.

(ii) If a deficiency in Category II is identified, the employer shall either:

(A) Consider the deficiency to constitute a hazard where the number of broken strands equals the wire rope manufacturer's established criterion for removal from service or equals a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope, or

(B) Institute the alternative measures specified in paragraph (4)(iii).

(iii) *Alternative measures for a Category II deficiency.* The wire rope may continue to be used if the employer ensures that the following measures are implemented:

(A) A qualified person assesses the deficiency in light of the load and other conditions of use and determines it is safe to continue to use the wire rope as long as the conditions established under this paragraph are met.

(B) A qualified person establishes the parameters for the use of the equipment with the deficiency, including maximum rated load, as well as required condition of the wire rope.

(C) A qualified person establishes a specific number of broken strands that, when reached, will require the equipment to be taken out of service until the wire rope is replaced or the damage is removed in accordance with paragraph (4)(i)(A) or (B).

(D) A qualified person sets a time limit, not to exceed 1 month, by which the wire rope must be replaced or the damage removed in accordance with paragraph (4)(i)(A) or (B).

(E) The workers who will conduct the shift inspections are informed of this deficiency and the measures taken under this paragraph.

(F) The qualified person's findings and procedures in paragraphs (A)–(D) are documented.

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

(A) The wire rope is replaced, or

(B) 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 running [what about pendants?] wire rope by splicing is prohibited.

(b) *Monthly inspection.*

- (1) Each month an inspection shall be inspected in accordance with paragraph (a) (wire rope shift inspection). [Should we also require pendant or standing ropes to be inspected in the monthly?]
- (2) Running wire ropes on equipment shall not be used until an inspection under this paragraph demonstrates that no corrective action under paragraph (a)(3) is required.
- (3) The inspection shall be documented according to paragraph 1415 (f)(3) (monthly inspection documentation).

(c) *Annual/comprehensive*

- (1) At least every 12 months, running wire ropes in use on equipment shall be inspected by a qualified person in accordance with paragraph (a) (shift inspection).
- (2) In addition, at least every 12 months, all wire ropes in use on equipment shall be inspected by a qualified person, as follows:
  - (i) The inspection shall be for deficiencies of the types listed in paragraph (a)(1)(i) – (ix).
  - (ii) The inspection shall be complete and thorough, covering the surface of the entire length of the wire rope, with particular attention given to:
    - (A) Critical review items listed in paragraph (a)(2).
    - (B) Those sections that are normally hidden during shift and monthly inspections.
    - (C) Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.
    - (D) Wire rope subject to reverse bends.
    - (E) Wire rope passing over sheaves.
    - (F) Wire rope at or near terminal ends.
  - (iii) *Exception:* In the event an inspection under paragraph (c)(2) is not feasible due to existing set-up and configuration of the equipment (such as \_\_\_\_\_) or due to site conditions (such as \_\_\_\_\_), [this exception

would need to be tightened-up] such inspections shall be conducted as soon as it becomes feasible, but no longer than an additional [3] [6] months.

(3) If a deficiency is identified, an immediate determination shall be made by the qualified person as to whether the deficiency constitutes a hazard.

(i) If the deficiency is determined to constitute a hazard, operations involving use of the wire rope in question shall be prohibited until:

(A) The wire rope is replaced, or

(B) 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 ~~running~~ [what about pendants?] wire rope by splicing is prohibited.

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

(4) The inspection shall be documented according to paragraph 1415 (g)(7) (annual/comprehensive inspection documentation).

[There may be some additional items to incorporate per most recent info from Larry]

#### **1419 Wire Rope – Selection and installation criteria**

(a) Selection of replacement wire rope shall be in accordance with the recommendations of the wire rope manufacturer, equipment manufacturer, or qualified wire rope specialist.

(b) Rotation resistant rope and fiber core ropes shall not be used for boom hoist reeving, [except as permitted in ANSI B30.5 -2004 ?].

(c) Wire rope clips used in conjunction with wedge sockets shall 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.

(d) Socketing shall be done in the manner specified by the manufacturer of the wire rope or fitting.

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

**1422 Operator Qualifications.** The employer must ensure that, prior to operating any equipment included in 1400 (a) and (b), the operator meets the physical examination and certification requirements in this section.

(a) *Physical examination.- Use of controlled substances.*

(1) Operators must pass a physical examination that meets the criteria of the U.S. Department of Transportation for operators of \_\_\_\_\_ (49 CFR 391.41 through 391.49) at least ~~[once every three years]~~. [Consider omitting a physical qualifications requirement].

[Discuss substance abuse provision – incorporation of DOT 49 CFR 382.105 and Part 40 of \_\_\_\_] [Discuss drug testing regarding both 3-yr physical and random testing]

[Should the physical be a separate requirement (as here) or a prerequisite for getting certification?]

(b) *Operator Certification.*

(1) Beginning [1 year after the effective date of this standard], the operator must be certified by either an accredited testing organization (in accordance with paragraph (d)), [by a government entity that administers certifications in accordance with paragraph (c)], or the employer (in accordance with paragraph (d)).

(2) From [4 years after the effective date of this standard], the operator must be certified by an accredited testing organization (in accordance with paragraph (e)) once the operator's certification under paragraph (1) expires.

(3) Certifications under paragraph (d) are valid for no more than [three years]. Certifications under paragraph (e) are valid for no more than [five years].

(4) *Re-certification:* [different tests than for initial certification?].

(c) *Certification criteria.* Certification must be based, at a minimum, on the following:

(1) A determination through a written test that:

(i) The individual knows the information necessary for safe operation of the specific type of equipment the individual will operate, including the following:

(A) The controls and operational/performance characteristics.

(B) Use of, and the ability to calculate (manually or with a calculator), load/capacity information on a variety of configurations of the equipment, including on configurations typically used by the employer.

(C) Procedures for responding to power line contact.

( ) [Technical knowledge applicable to the specific type of equipment the individual will operate – we will look at NCCCO's list].

( ) [Site preparation – we will look at NCCCO's list].

(D) This Subpart, including applicable incorporated materials.

(ii) The individual is able to read and locate relevant information in the equipment manual and other materials containing information referred to in paragraph (i).

(2) A determination through a practical test that the individual has the skills necessary for safe operation of the equipment, including the following:

(i) Ability to recognize, from visual and audible observation, the items listed in section 1415(c) (pre-shift inspection).

(ii) Operational and maneuvering skills.

(iii) Application of load chart information.

(iv) Application of safe shut-down and securing procedures.

(d) *Certification by the employer.*

(NOTE: From [date], operator certifications must be issued by an accredited testing organization).

(1) To certify an operator for the equipment, the employer must make the determinations specified in paragraph (c).

(2) *Use of another entity to administer tests.*

(i) Although the employer must make the determination as to whether to certify the operator for the equipment, the employer may use another entity to administer the tests in paragraphs (c) (1) and (2) if that entity is qualified to administer those tests.

(ii) The employer must base its determination on whether to certify the individual, at a minimum, on:

(A) A review of the test records from the entity that administered the tests.

(B) Observation of the employee operating the equipment in test lifts prior to determining whether to certify the individual.

(3) *Certification by another employer is not transferable.* The employer of the operator must make its own determination as to whether to certify the employee to operate the equipment, although it may use tests administered by another employer where the requirements of paragraph (d)(2) are met in assessing the operator.

(5) *Revocation.* If the employer has reason to believe that the operator may not be qualified to operate the equipment, the employer must [immediately] revoke the certification. The operator must not be permitted to operate the equipment unless he/she is recertified.

(6) *Records.* The employer must retain the current test records for each operator it has certified throughout that operator's employment with the employer. This requirement applies irrespective of whether the employer or another entity administers the tests.

NOTE: After [4 years after effective date of the standard], employers will no longer be permitted to meet the certification requirement by certifying operators themselves; at that point, certification must be by an accredited testing organization.

(e) *Certification by an accredited testing organization.*

(1) For a testing organization to be considered accredited to certify operators under this Subpart, it must:

(i) Be accredited by a nationally recognized accrediting agency based on that agency's determination that industry recognized criteria for written testing materials, practical examinations, grading, facilities/equipment and personnel have been met.

(ii) Administer written and practical tests that assess the operator applicant regarding, at a minimum, the knowledge and skills listed in (c)(1) and (2).

(2) For an operator to be considered certified by an accredited testing organization, the operator must have a current certification to operate the equipment from a testing organization that meets the requirements in paragraph (e)(1).

(3) ~~Where the employer is an accredited testing organization, the operator must have a current certification to operate the equipment from an accredited testing organization other than the employer. [Consider deleting]~~

(4) If the employer has reason to believe that the operator may not be qualified, the employer must prohibit the employee from operating the equipment unless he/she is recertified.

(5) *Records.* Documentation verifying the operator's certification from an accredited testing organization must be available to the Secretary.

(f) *Licensing by state or local governments.* Nothing in this section shall preempt a state or local government from enforcing operator licensing requirements that are more stringent than the requirements in this section. [Note that we are still examining the legal viability of this paragraph].

CDAC WORKING DRAFT

### 1423 Keeping Clear of the Load [Revised]

(a) Where available, hoisting routes that minimize the exposure of workers to hoisted loads shall be used, to the extent consistent with public safety.

(b) While the operator is not moving a suspended load, no employee shall be within the fall zone, except for employees:

- (1) Engaged in hooking, unhooking or guiding a load, or
- (2) Engaged in the initial attachment of the load to a component or structure, or
- (3) Operating a concrete hopper.

(c) When employees are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, the following criteria shall be met:

- (1) The materials being hoisted shall be rigged to prevent unintentional displacement.
- (2) Hooks with self-closing latches or their equivalent shall be used. *Exception:* "J" hooks are permitted to be used for setting wooden trusses.
- (3) The materials shall be rigged by a qualified rigger.

(d) *Receiving a load.* Only employees needed to receive a load shall be permitted to be within the fall zone when a load is being landed.

(e) During a tilt-up or tilt-down operation:

- (1) No employee shall be directly under the load.
- (2) Only employees essential to the operation shall be in the fall zone (but not directly under the load).

NOTE: Boom free fall is prohibited when an employee is in the fall zone of the boom or load, and load line free fall is prohibited when an employee is directly under the load; see Section 1435.

### 1424 Fall Protection [Revised]

(a) *Application.*

- (1) Paragraphs (b)-(d) apply to all equipment covered by this Subpart except tower cranes.

(2) Paragraph (e) applies to all equipment covered by this Subpart.

(3) Paragraph (f) applies only to tower cranes.

(b) *Boom walkways.*

(1) Equipment manufactured after January 1, 2008 with lattice booms shall be equipped with walkways on the boom(s) if the vertical profile of the boom is [six ] or more feet.

(2) *Boom walkway criteria.*

(a) The walkways shall be at least 12 inches wide.

(b) *Guardrails/railings and other permanent fall protection attachments along walkways are:*

(i) Not required.

(ii) Prohibited on booms supported by pendant ropes or bars if the ropes or bars could be snagged by the guardrails/railings/attachments.

(iii) Prohibited if of the removable type (designed to be installed and removed each time the boom is assembled/disassembled).

(iv) Where not prohibited, guardrails/railings may be of any height up to, but not more than, 45 inches.

(c) *Steps, handholds, grabrails and railings.*

(1) The employer shall maintain originally-equipped steps, handholds, ladders and guardrails/railings/grabrails in good condition.

(2) Equipment manufactured one year after the effective date of this standard shall be equipped so as to provide safe access and egress between the ground and the operator work station(s), including the forward and rear positions, by the provision of devices such as steps, handholds, ladders, and guardrails /railings/grabrails. These shall meet the following criteria:

(i) Steps, ladders and guardrails/railings/ grabrails shall meet the requirements of SAE J185 or ISO 1160-2, except where infeasible. [REDACTED]

(ii) Walking/stepping surfaces, except for crawler treads, shall have slip-resistant features/properties.

(d) The employer shall provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than [6] [15] feet above a lower level:

- (1) While on (including moving along) a boom that is not horizontal.
- (2) While moving along a boom that is horizontal, except where the employee is moving along a horizontal boom walkway, ~~on a horizontal boom walkway.~~
- (3) While at a work station on any part of the equipment, except when the employee is on the deck or at draw-works.
- (4) *Anchorage criteria.*

(i) *Anchorage for fall arrest and positioning device systems.* Anchorages, including the affected boom members, for personal fall arrest systems and positioning systems, shall meet the applicable criteria in 1926.502.

(ii) *Anchorage for restraint systems.*

(A) Anchorages, including the affected boom members, for restraint systems shall be capable of withstanding twice the maximum load that a worker may impose on it during reasonably anticipated conditions of use.

(B) A detachable anchor for a restraint system that does not meet the anchorage requirements for positioning devices or personal fall arrest systems shall not be used unless it is designed to prevent such devices from being attached to it.

(e) *Anchoring to the load line.* A fall arrest system is permitted to be anchored to the crane/derrick's load line where the load capacity for the crane/derrick (as used) meets or exceeds the requirements in 1926.502 (d)(15).

(f) *Tower cranes.* The employer shall provide and ensure the use of fall protection equipment for employees who are on a walking/working surface with an unprotected side or edge more than 6 feet above a lower level.

## 1425 Hoisting Personnel

The requirements of this section are supplemental to the other requirements in this Subpart and apply when one or more employees is hoisted.

(a) The use of equipment to hoist employees is prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions. This paragraph does not apply to work covered by Subpart R (Steel Erection).

(b) *Use of personnel platform.*

(1) When using equipment to hoist employees, the employees shall be in a personnel platform that meets the requirements of paragraph (e).

(2) *Exceptions:* A personnel platform is not required for hoisting employees:

(i) Into and out of drill shafts that are up to and including 8 feet in diameter (see paragraph (o) for requirements for hoisting drill shaft workers).

(ii) In pile driving operations (see paragraph (p) for requirements for hoisting these workers).

(iii) Solely for transfer to or from a marine worksite in a marine hoisted personnel transfer device (see paragraph (r) for requirements for hoisting these workers).

(c) *Equipment set-up.*

(1) The equipment shall be uniformly level, within one percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.

(2) Equipment with outriggers shall have them all extended and locked. The amount of extension shall be the same for all outriggers and in accordance with manufacturer procedures and load charts.

(d) *Equipment criteria.*

(1) *Capacity: use of suspended personnel platforms.* The total weight of the loaded personnel platform, load line and related rigging load (with the platform loaded, including load line and rigging) shall not exceed 50 percent of the rated capacity for the radius and configuration of the equipment (including load line and related rigging), except during proof testing.

(2) *Capacity: use of boom-attached personnel platforms.* The total weight of the loaded personnel platform shall not exceed 50 percent of the rated capacity for the radius and configuration of the equipment (except during proof testing).

(3) When the occupied personnel platform is in a stationary working position, the load and boom hoist brakes, swing brakes, and operator actuated secondary braking and locking features (such as pawls or dogs) or automatic secondary brakes shall be engaged.

(4) *Devices.*

(i) Equipment with a variable angle boom shall be equipped with:

(A) a boom angle indicator, readily visible to the operator.

(B) a boom hoist limiting device.

(ii) Equipment with a variable angle jib shall be equipped with:

(A) a jib angle indicator, readily visible to the operator.

(B) [a jib hoist limiting device?]

(iii) Equipment with telescoping booms shall be equipped with a device to indicate the boom's extended length clearly to the operator, or has measuring marks on the boom.

(iv) *Anti-two-block.* When using a suspended personnel platform, a device which automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component) shall be used. The device(s) must prevent such damage/failure at all points where two-blocking could occur. *Exception:* this device is not required when hoisting personnel in pile driving operations.

(v) *Controlled load lowering.* The load line hoist drum shall have a system, other than the load line hoist brake, which regulates the lowering rate of speed of the hoist mechanism. This system or device must be used when hoisting personnel.

(NOTE: free fall of the load line hoist is prohibited (see 1435(b)(2)); the use of equipment in which the boom hoist mechanism can free fall is also prohibited (see 1435(a)(1)).

(v) *Proper operation required.* Personnel hoisting operations shall not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator shall safely stop operations. Personnel hoisting operations shall not resume until the device is again working properly. Alternative measures are not permitted.

(5) Direct attachment of a personnel platform to a luffing jib is prohibited.

(e) *Personnel platform criteria.*

- (1) The personnel platform and attachment/suspension system shall be designed for hoisting personnel by a qualified person familiar with structural design.
- (2) The system used to connect the personnel platform to the equipment shall allow the platform to remain within 10 degrees of level, regardless of boom angle.
- (3) The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.
- (4) The personnel platform itself (excluding the guardrail system and personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
- (5) All welding of the personnel platform and its components shall be performed by a certified welder familiar with the weld grades, types and material specified in the platform design.
- (6) The personnel platform shall be equipped with a guardrail system which meets the requirements of 1926 Subpart M, and shall be enclosed at least from the toeboard to mid-rail with either solid construction material or expanded metal having openings no greater than ½ inch (1.27cm). Points to which personal fall arrest systems are attached must meet the anchorage requirements in 1926 subpart M.
- (7) A grab rail shall be installed inside the entire perimeter of the personnel platform except for access gates/doors.
- (8) *Access gates/doors.* If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) shall:
  - (i) Not swing outward.
  - (ii) Be equipped with a device that prevents accidental opening.
- (9) Headroom shall be sufficient to allow employees to stand upright in the platform.
- (10) In addition to the use of hard hats, employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects. The platform overhead protection shall not obscure the view of the operator or platform occupants (such as wire mesh that has up to ½ inch openings), unless full protection is necessary.
- (11) All edges exposed to employee contact shall be smooth enough to prevent injury.

(12) The weight of the platform and its rated load capacity shall be conspicuously posted on the platform with a plate or other permanent marking.

[Do we also need to have the maximum intended load posted also?]

(f) *Personnel platform loading.*

(1) The personnel platform shall not be loaded in excess of its rated load capacity.

(2) *Use.*

(i) Personnel platforms shall be used only for employees, their tools, and the materials necessary to do their work. Platforms shall not be used to hoist materials or tools when not hoisting personnel.

(ii) *Exception:* materials and tools to be used during the lift, if secured and distributed in accordance with (e)(3) and (e)(4), may be in the platform for trial lifts.

(3) Materials and tools shall be:

(i) Secured to prevent displacement.

(ii) Evenly distributed within the confines of the platform while it is suspended.

(4) The number of employees occupying the personnel platform shall not exceed the maximum number the platform was designed to hold or the number required to perform the work, whichever is less.

(g) *Attachment and rigging.*

(1) *Hooks and other detachable devices.*

(i) 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) shall be:

(A) Of a type that can be closed and locked, eliminating the throat opening.

(B) Closed and locked when attached.

(ii) Shackles used in place of hooks must of the alloy anchor type, with either:

(A) A bolt, nut and retaining pin, in place, or

(B) Of the screw type, with the screw pin secured from accidental removal.

(iii) Where other detachable devices are used, they must be of the type that can be closed and locked to the same extent as the devices addressed in paragraphs (i) and (ii). Such devices must be closed and locked when attached.

(2) *Rope bridle.* When a rope bridle is used to suspend the personnel platform, each bridle leg shall be connected to a master link or shackle (see paragraph (g)) in a manner that ensures that the load is evenly divided among the bridle legs.

(3) Rigging hardware (including wire rope, shackles, rings, master links, and other rigging hardware) and hooks must be capable of supporting, without failure, at least five times the [maximum intended load] [~~rated load capacity~~] applied or transmitted to that component. [~~When used with rotation resistant rope, the hardware must have a much higher rated load~~]. Where rotation resistant rope is used, the slings shall be capable of supporting without failure at least ten times the maximum intended load.

(4) Eyes in wire rope slings shall be fabricated with thimbles.

(5) Bridles and associated rigging for suspending the personnel platform shall be used only for the platform and the necessary employees, their tools and materials necessary to do their work, and shall not be used for any other purpose when not hoisting personnel.

(h) *Trial lift and inspection.*

(1) A trial lift with the unoccupied personnel platform loaded at least to the anticipated liftweight shall be made from ground level, or any other location where employees will enter the platform, to each location at which the platform is to be hoisted and positioned. Where there is more than one location to be reached from a single set-up position, either individual trial lifts for each location, or a single trial lift for all locations, shall be performed.

(2) The trial lift shall be performed immediately prior to each shift in which personnel will be hoisted. In addition, the trial lift shall be repeated prior to hoisting employees in each of the following circumstances:

(i) The equipment is moved and set up in a new location or returned to a previously used location.

(ii) The lift route is changed, unless the competent person determines that the new route presents no new factors affecting safety.

(3) The competent person shall determine that:

(i) Safety devices and operational aids required by this section are activated and functioning properly. Other safety devices and operational aids must meet the requirements of section 1414\_\_.

(ii) Nothing interferes with the equipment or the personnel platform in the course of the trial lift.

(iii) The lift will not exceed 50 percent of the equipment's rated capacity at any time during the lift.

(iv) The load radius to be used during the lift has been accurately determined.

(4) Immediately after the trial lift, the competent person shall:

(i) Conduct a visual inspection of the equipment, base support or ground, and personnel platform, to determine whether the trial lift has exposed any defect or problem or produced any adverse effect.

(ii) Confirm that, upon the completion of the trial lift process, the test weight has been removed.

(5) Immediately prior to each lift:

(i) The platform shall be hoisted a few inches and inspected by a competent person to ensure that it is secure and properly balanced.

(ii) The following conditions must be determined by a competent person to exist before the lift of personnel proceeds:

(A) Hoist ropes shall be free of kinks.

(B) Multiple part lines shall not be twisted around each other.

(C) The primary attachment shall be centered over the platform.

(D) If the load rope is slack, the hoisting system shall be inspected to ensure that all ropes are properly seated on drums and in sheaves.

(6) Any condition found during the trial lift and subsequent inspection(s) that fails to meet a requirement of this standard or otherwise creates a safety hazard shall be corrected before hoisting personnel.

(i) [Reserved]

(j) *Proof testing.*

(1) At each jobsite, prior to hoisting employees on the personnel platform, and after any repair or modification, the platform and rigging shall be proof tested to 125 percent of the platform's rated capacity. The proof test may be done concurrently with the trial lift.

(2) The platform shall be lowered by controlled load lowering, braked and held in a suspended position for a minimum of five minutes with the test load evenly distributed on the platform.

(3) After proof testing, a competent person shall inspect the platform and rigging to determine if the test has been passed. If any deficiencies are found that pose a safety hazard, the platform and rigging shall not be used to hoist personnel unless the deficiencies are corrected, the test is repeated, and a competent person determines that the test has been passed.

(4) Personnel hoisting shall not be conducted until the competent person determines that the platform and rigging have successfully passed the proof test.

(k) *Work practices.*

(1) Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.

(2) Platform occupants shall:

(i) Keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.

(ii) Not stand, sit on, or work from the top or intermediate rail or toeboard, or use any other means/device to raise their working height.

(iii) Not pull the platform out of plumb in relation to the hoisting equipment.

(3) Before employees exit or enter a hoisted personnel platform that is not landed, the platform shall be secured to the structure where the work is to be performed, unless securing to the structure would create a greater hazard.

(4) If the platform is tied to the structure, the operator shall not move the platform until the operator receives confirmation that it is freely suspended.

(5) Tag lines shall be used when necessary to control the platform.

(6) *Platforms without controls.* Where the platform is not equipped with controls, the equipment operator shall remain at the equipment controls at all times while the platform is occupied.

(7) *Platforms with controls.* Where the platform is equipped with controls, the following must be met at all times while the platform is occupied:

(i) The occupant using the controls in the platform must be a qualified person with respect to their use, including the safe limitations of the equipment and hazards associated with its operation.

(ii) The equipment operator must be at the equipment controls, or in the personnel platform, or on site and in view of the equipment.

(iii) The platform operating manual must be in the platform or on the equipment.

(8) *Environmental conditions.*

(i) *Wind.* When wind velocity (sustained or gusts) exceeds 20 mph at the personnel platform, a qualified person shall:

(A) Reassess whether lifting personnel is the safest means of performing the work. If it is not, the lifting operation shall not begin (or, if already in progress, shall be terminated).

(B) Determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation shall not begin (or, if already in progress, shall be terminated).

(ii) *Other weather and environmental conditions.* A qualified person shall consider indications of dangerous weather conditions, or other impending or existing danger, in determining whether lifting personnel is the safest means available and whether work needs to be stopped.

(9) Employees being hoisted shall remain in direct communication with the signal person (where used), or the operator.

(10) *Fall protection.*

(i) Except over water, employees occupying the personnel platform shall be provided and use a personal fall arrest system. The system shall be attached to a structural member within the personnel platform.

(ii) The fall arrest system, including the attachment point (anchorage) used to comply with paragraph (i), shall meet the requirements in 1926.502.

NOTE: When working over water, the requirements of 1926.106 apply.

(11) *Other load lines.*

(i) No lifts shall be made on any other of the equipment's load lines while personnel are suspended on a platform, except in pile driving operations.

(ii) *Factory-produced boom-mounted personnel baskets that incorporate a winch as original equipment:* loads are permitted to be hoisted by such a winch while employees occupy the personnel platform only where the load on the winch line does not exceed 500 pounds and does not exceed the rated capacity of the winch and platform.

(12) *Traveling.*

(i) Hoisting of employees while the equipment is traveling is prohibited, except for:

(A) Equipment that travels on fixed rails, or

(B) Where the employer demonstrates that there is no less hazardous way to perform the work. This exception does not apply to rubber-tired equipment.

(ii) Where employees are hoisted while the equipment is traveling, the following criteria shall be met:

(A) Crane travel shall be restricted to a fixed track or runway.

(B) Where a runway is used, it shall be a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the equipment being used to lift and travel with the personnel platform. An existing surface may be used as long as it meets these criteria.

(C) Travel shall be limited to boom length.

(D) The boom shall be parallel to the direction of travel, except where it is safer to do otherwise.

(E) A complete trial run shall be performed to test the route of travel before employees are allowed to occupy the platform. This trial run can be performed at the same time as the trial lift required by paragraph (g) which tests the lift route.

(l) [Reserved]

(m) *Pre-lift meeting.* A pre-lift meeting shall be:

- (1) Held to review the applicable requirements of this section and the procedures that will be followed.
- (2) Attended by the equipment operator, signal person (if used for the lift), employees to be hoisted, and the person responsible for the task to be performed.
- (3) Held prior to the trial lift at each new work location, and shall be repeated for any employees newly assigned to the operation.

(n) *Hoisting personnel near power lines.* Hoisting personnel within 20 feet of a power line that is up to 350 kV, and hoisting personnel within 50 feet of a power line that is over 350 kV, is prohibited, except for work covered by 1926 Subpart V (Power Transmission and Distribution).

(o) *Hoisting personnel in drill shafts.* When hoisting employees into and out of drill shafts that are up to and including 8 feet in diameter, the following requirements shall be met:

- (1) The employee shall be in either a personnel platform or on a boatswain's chair.
- (2) If using a personnel platform, paragraphs (a) through (n) apply.
- (3) If using a boatswain's chair:
  - (i) The following paragraphs of §1425 apply: (a), (c), (d)(1), (d)(3), (d)(4), (e)(1), (e)(2), (e)(3), (f)(1), (f)(2)(i), (f)(3)(i), (g), (h), (j), (k)(1), (k)(6), (k)(8), (k)(9), (k)(11)(i), (m), (n). Where the terms "personal platform" or "platform" are used in these paragraphs, substitute them with "boatswain's chair."
  - (ii) A signal person shall be stationed at the shaft opening.
  - (iii) The employee shall be hoisted in a slow, controlled decent and ascent.
  - (iv) The employee shall use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick.
  - (v) The fall protection equipment shall meet the applicable requirements in 1926.502.
  - (vi) The boatswain's chair itself (excluding the personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
  - (vii) No more than one person shall be hoisted at a time.

(p) *Hoisting personnel for pile driving operations.* When hoisting an employee in pile driving operations, the following requirements shall be met:

- (1) The employee shall be in either a personnel platform or on a boatswain's chair.
- (2) 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, or use a spotter.
- (3) If using a personnel platform, paragraphs (b) through (n) apply.
- (4) If using a boatswain's chair:
  - (i) Paragraphs \_\_\_\_\_ apply.
  - (ii) The employee shall use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhall ball.
  - (iv) The fall protection equipment shall meet the applicable requirements in 1926.502.

(q) [Reserved].

(r) *Hoisting personnel for marine transfer.* When hoisting employees solely for transfer to or from a marine worksite, the following requirements shall be met:

- (1) The employee shall be in either a personnel platform or a marine hoisted personnel transfer device.
- (2) If using a personnel platform, paragraphs (a) through (n) apply.
- (3) If using a marine hoisted personnel transfer device:
  - (i) Paragraphs \_\_\_\_\_ apply.
  - (ii) [Fall protection attached by a quick-release connection to the transfer device.]
  - (iii) [Full body harness.]

#### **1426 Qualifications of Maintenance & Repair Workers**

(a) Maintenance, inspection and repair personnel are permitted to operate the equipment only where the following requirements are met:

(1) The operation is limited to those functions necessary to perform maintenance, inspect or verify the performance of the equipment.

(2) The personnel either:

(i) Operate the equipment under the direct supervision of an operator who meets the requirements of section 1422 (Operator Qualifications), or

(ii) Are familiar with the operation, safe limitations, characteristics and hazards associated with the type of equipment.

(b) Maintenance and repair personnel shall meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.

#### **1428 Ground conditions.**

(a) *Definitions.*

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

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

(b) The equipment shall not be assembled or used unless ground conditions are firm, drained (except for marshes/wetlands), 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.

(c) The controlling entity shall:

(1) Ensure that ground preparations necessary to meet the requirements in paragraph (b) 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) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity.

(d) If there is no controlling employer for the project, the requirement in paragraph (c)(1) shall be met by the employer that has authority at the site to make or arrange for ground preparations needed to meet paragraph (b).

(e) If the person supervising the equipment assembly or the operator determines that ground conditions do not meet the requirements in paragraph (b), that person's employer shall 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), the requirements in paragraph (b) can be met.

#### 1429 Work Area Control

(a) *Swing radius hazards.*

(1) The requirements in paragraph (a)(2) apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of:

- (i) Striking and injuring an employee; or
- (ii) Pinching/crushing an employee against another part of the equipment or another object.

(2) To prevent employees from entering these hazard areas, the employer shall:

(i) Instruct employees assigned to work on or near the equipment ("authorized personnel") in how to recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure.

(ii) Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas. *Exception:* where it is neither feasible to erect such barriers on the ground nor on the equipment, the hazard areas shall be clearly marked by a combination of warning signs (such as "Danger – Swing/Crush Zone" or "Danger – This Thing's Gonna Swing and Crunch You – Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the employer shall train the employees to understand what these markings signify.

~~(3) Unauthorized personnel shall not enter the hazard area without the operator's knowledge.~~

(3) *Protecting workers in the hazard area.*

(i) Before an employee goes to a location in the hazard area that is out of view of the operator, the employee must ensure that the operator is informed that he/she is going to that location.

(ii) Where the operator knows that an employee went to a location covered by paragraph (1), the operator shall not rotate the superstructure until the operator:

(A) Gives a warning that is understood by the employee as a signal that the superstructure is about to be rotated and allows time for the employee to get to a safe position, or

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

(b) *Multiple equipment coordination.* Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity shall institute a system to coordinate operations. If there is no controlling entity, ~~the~~ each entity directing the [equipment operator] use of each piece of equipment shall institute such a system.

CDAC WORK IN PROGRESS DRAFT

**Option A**

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**14XX Power line safety (up to 350 kV) – assembly and disassembly**

(a) Before assembling or disassembling a crane, the employer must determine if any part of the crane, load line or load (including rigging and lifting accessories) could get within 20 feet of a power line during the assembly/disassembly process. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3), as follows:

(1) *Option (1) – Deenergize and ground.* Confirm from the utility operator that the power line has been deenergized and grounded.

(2) *Option (2) – 20 foot clearance.* Ensure that no part of the crane, load line or load (including rigging and lifting accessories), gets within 20 feet of the power line by implementing the measures specified in (b).

(3) *Option (3) – Table A clearance.*

(i) Determine the line's voltage and the minimum approach distance permitted under Table A.

(ii) Determine if any part of the crane, load line or load (including rigging and lifting accessories), could get within the minimum approach distance of the power line permitted under Table A. If so, then the employer must follow the requirements in paragraph (b).

(b) *Preventing encroachment/electrocution.* Where encroachment precautions are required under Option (2), or Option (3), the following requirements must be met:

(1) Conduct a planning meeting with the competent-qualified person who will supervise the assembly/disassembly process, operator, assembly/disassembly crew and the other workers who will be in the assembly/disassembly area to review the location of the power line(s) and the steps that will be implemented to prevent encroachment/electrocution.

(2) If tag lines are used, they must be conductive-resistant.

(3) Use a dedicated spotter who is in continuous contact with the crane operator. The 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 line painted on the ground; a clearly visible line on stanchions; a set of clearly

visible line-of-sight landmarks (such as a fence post behind the spotter and a building corner ahead of the spotter).

(ii) Be positioned to effectively gauge the clearance distance.

(iii) Where necessary, use equipment that enables the spotter to communicate directly with the crane operator.

(iv) Give timely information to the crane operator so that the required clearance distance can be maintained.

(4) During the period when an assembled boom is elevated, at least one of the following additional measures must be in place:

(i) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

(ii) 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.

(iii) A device that automatically limits range of movement, set to prevent encroachment.

(iv) An elevated warning line or barricade, in view of the operator, equipped with flags or similar high-visibility markings.

(v) An insulating link (once the load line is attached).

(c) *Assembly/disassembly below power lines prohibited.* No part of a crane, load line or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed below a power line unless the employer has confirmed that the utility operator has deenergized and grounded the power line.

(d) *Assembly/disassembly inside Table A clearance prohibited.* No part of a crane, load line or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed within the minimum approach distance under Table A of a power line unless the employer has confirmed that the utility operator has deenergized and grounded the power line.

(e) *Voltage information.* Where Option (3) is used, operators of power lines must provide the requested voltage information within 48 hours of the employer's request.

(f) *Power lines presumed energized.* The employer must assume that all power lines are energized unless the utility operator confirms that the power line has been deenergized and grounded.

(g) *Posting of electrocution warnings.* There must be at least one electrocution hazard warning conspicuously posted in the cab so that it is in view of the operator and (except for overhead gantry and tower cranes) at least two on the outside of the equipment.

#### **14XX Power line safety (up to 350 kV) – crane operations**

(a) *Hazard assessments and precautions inside the work zone.* Before beginning crane operations, the employer must:

(1) *Identify the work zone.*

(i) Define a workzone by demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibit the operator from operating the crane past those boundaries, or

(ii) Define the workzone as the area 360 degrees around the crane, up to the crane's maximum working radius.

(2) Determine if any part of the crane, load line or load (including rigging and lifting accessories), if operated up to the crane's maximum working radius in the work zone, could get within 20 feet of a power line. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3), as follows:

(i) *Option (1) – Deenergize and ground.* Confirm from the utility operator that the power line has been deenergized and grounded.

(ii) *Option (2) – 20 foot clearance.* Ensure that no part of the crane, load line or load (including rigging and lifting accessories), gets within 20 feet of the power line by implementing the measures specified in (b).

(iii) *Option (3) – Table A clearance.*

(A) Determine the line's voltage and the minimum approach distance permitted under Table A.

(B) Determine if any part of the crane, load line or load (including rigging and lifting accessories), while operating up to the crane's maximum working radius in the work zone, could get within the minimum approach distance of the power line permitted under Table A. If so, then the employer must follow the requirements in paragraph (b).

(b) *Preventing encroachment/electrocution.* Where encroachment precautions are required under Option (2), or Option (3), 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 crane 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 conductive-resistant.

( ) ~~Discuss whether to require insulating link.~~

(3) Implement at least two of the following measures:

(i) A proximity alarm set to give the operator sufficient warning to prevent encroachment.

(ii) A dedicated spotter who is in continuous contact with the crane operator. Where this measure is selected, the 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 on stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the spotter and a building corner ahead of the spotter).

(B) Be positioned to effectively gauge the clearance distance.

(C) Where necessary, use equipment that enables the spotter to communicate directly with the crane operator.

(D) Give timely information to the crane operator so that the required clearance distance can be maintained.

(iii) 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.

(iv) A device that automatically limits range of movement, set to prevent encroachment.

(v) An elevated warning line or barricade, in view of the crane operator, equipped with flags or similar high-visibility markings.

(vi) An insulating link.

(c) *Voltage information.* Where Option (3) is used, operators of power lines must provide the requested voltage information within 48 hours of the employer's request.

(d) *Operations below power lines.*

(1) On construction sites where there is equipment covered by this Subpart, or where such equipment is likely to be used, no construction materials shall be located under a power line unless the employer handling the materials has confirmed that the utility operator has deenergized and grounded the power line. This prohibition applies irrespective of the means (by hand or by machine) or type of equipment (whether covered by this Subpart or not) used to move the material.

(2) No part of a crane, load line or load (including rigging and lifting accessories) is allowed below a power line unless the employer has confirmed that the utility operator has deenergized and grounded the power line.

(e) *Power lines presumed energized.* The employer must assume that all power lines are energized unless the utility operator confirms that the power line has been deenergized and grounded.

(f) ~~When working near transmitter towers~~ Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane/derrick. The following precautions shall be taken when necessary to dissipate induced voltages:

(1) The equipment shall be provided with an electrical ground directly to the ~~upper~~ rotating structure [part of the equipment structure] supporting the boom.

(2) Ground jumper cables shall be attached to materials being handled by the equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with non-conductive poles having large alligator clips or other similar protection to attach the ground cable to the load.

(3) Combustible and flammable materials shall be removed from the immediate area prior to operations.

*Training.*

(1) Operators shall be trained on the procedures to be followed in the event of electrical contact with a power line. Such training shall include:

(i) Information regarding the danger of electrocution from simultaneously touching the equipment and the ground.

(ii) 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.

(iii) The safest means of evacuating from equipment that may be energized.]

#### **14XX Power line safety (over 350 kV )**

The requirements of sections 14XX and 14XX apply to power lines over 350 kV, except “50 feet” applies (instead of “20 feet”).

[Within “Red Zone” – permit work under these conditions or prohibit at all times?]

#### **14XX Power line safety (all voltages) – crane operations inside the Table A zone**

Crane operations in which any part of the crane, load line or load (including rigging and lifting accessories) is within the minimum approach distance under Table A of an energized power line is prohibited, except where the employer demonstrates that the following requirements are met:

- (a) The employer determines that it is infeasible to do the work without breaching the minimum approach distance under Table A.
- (b) The employer [and utility operator ?] determines that, after consultation with the utility operator, it is infeasible to deenergize and ground the power line.
- (c) The power line 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 (including . . . accessories) and load 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.
- (d) A planning meeting with the employer and power line operator [or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution ?] is 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, the device must be deactivated.
  - (2) A dedicated spotter who is in continuous contact with the crane operator. The 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 line painted on the ground; a clearly visible line on stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the spotter and a building corner ahead of the spotter).
  - (ii) Be positioned to effectively gauge the clearance distance.
  - (iii) Where necessary, use equipment that enables the spotter to communicate directly with the crane operator.
  - (iv) Give timely information to the crane 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.
  - (5) Where feasible, conductive-resistant rigging must be used if the rigging may be within the Table A distance during the operation.
  - (6) If the crane is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the crane, load line or load (including rigging and lifting accessories) from breaching the minimum approach distance established under paragraph (c).
  - (7) If a tag line is used, it must incorporate an insulating device at a point that will always be below the level of the power line while the tag line is held.
  - (8) Conductive-resistant barricades to prevent unauthorized personnel from entering the work area.
  - (9) Workers other than the crane operator must be prohibited from touching the crane, load line and load (including rigging and lifting accessories) until the utility supervisor indicates that it is safe to do so.
  - (10) Only personnel essential to the operation are permitted to be in the area of the crane and load.
  - (11) The crane must be properly grounded.
- (e) The procedures developed to comply with paragraph (d) are documented and immediately available on-site.

(f) The employer and utility operator meet with the crane operator and the other workers who will be in the area of the crane or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in paragraph (c) and prevent electrocution.

(g) The procedures developed to comply with paragraph (d) are implemented.

(h) [The utility operator] [or: an employee of the utility operator who is a qualified person with respect to electrical power transmission and distribution ?] supervises (on site) all work and has the authority to stop work at any time to ensure safety.

#### **14XX Power line safety – equipment in transit**

(a) This section applies to equipment while in transit with no load and the boom/mast and boom/mast support system in the fully lowered position.

(b) The employer shall ensure that:

(1) The clearances specified in paragraph (c), Table [X], are maintained.

(2) The effects of speed and terrain on equipment movement (including movement of the boom/mast) are considered so that those effects do not cause the clearances to be reduced below those specified in Table [X].

**Option B**

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[Same as Option A except “20 feet” is changed to “50 feet” and there is no distinction between power lines below or above 350kV]

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#### **1431 Derricks**

#### **1432 Design, construction and testing.**

The following requirements apply to equipment that has a manufacturer-rated hoisting/lifting capacity of 2000 pounds or more.

(a) Crawler, truck and locomotive cranes manufactured prior to [effective date of 1926.1400] shall meet the applicable requirements for design, construction, and testing as prescribed in ANSI B30.5 – 1968, Safety Code for Crawler, Locomotive, and Truck Cranes.

(b) Mobile (including crawler and truck) and locomotive cranes manufactured on or after [effective date of the standard] shall meet the following portions of ASME B30.5 – 2000

with addenda ASME B30.5a – 2002 Safety Code for Mobile and Locomotive Cranes, as applicable:

(1) In section 5-1.1.1 (“Load Ratings – Where Stability Governs Lifting Performance”), paragraphs (a) – (d) (including subparagraphs). [Instead of using (e) for floating cranes, we will write a provision in the Floating Cranes section.]

(2) In section 5-1.1.2 (“Load Ratings – Where Structural Competence Governs Lifting Performance”), [(a)(1) and (a)(2) are not enforceable as written – do we need something like these provisions?] paragraph (b).

[most of 5-1.1.3 Load Rating Chart incorporated per (e) below]

(3) Section 5-1.2 (“Stability (Backward and Forward)”).

(4) In section 5-1.3.1 (“Boom Hoist Mechanism”), paragraphs (a), (b)(1) and (b)(2).

(5) In section 5-1.3.2 (“Load Hoist Mechanism”), paragraphs (a), (a)(2) – (a)(4) (including subparagraphs) [This does not include paragraph (a)(5), a “should” provision for drum rotation indicators], (b) – (d) (including subparagraphs).

(6) Section 5-1.3.3 (“Telescoping Boom”).

(7) Section 5-1.4 (“Swing Mechanism”).

(8) In section 5-1.5 (“Crane Travel”), all provisions except 5-1.5.3(d).

(9) In section 5-1.6 (“Controls”), all provisions except 5-1.6.1 (c). [(c) is a “should” provision for the arrangement of controls].

(10) [Should we include Reeving Accessories 5-1.7.3?]

(11) Section 5-1.7.4 (“Sheaves”).

(12) Section 5-1.7.5 (“Sheave sizes”).

(13) In section 5-1.9.1 (“Booms”), paragraph (f).

(14) Section 5-1.9.3 (“Outriggers”).

(15) Section 5-1.9.4 (“Locomotive Crane Equipment”).

(16) Section 5-1.9.7 (“Clutch and Brake Protection”).

(17) In section 5-1.9.12 (“Miscellaneous equipment”), paragraphs (a), (c), (e), and (f).

**Testing Option #1**

(c) Testing: crawler, truck and locomotive cranes manufactured prior to [effective date of 1926.1400] shall meet the applicable requirements for testing as prescribed in ANSI B30.5 – 1968, Safety Code for Crawler, Locomotive, and Truck Cranes.

(d) Testing: mobile (including crawler and truck) and locomotive cranes manufactured on or after [effective date of the standard] shall meet the requirements in Test Option A or Test Option B.

(1) *Test Option A.*

(i) The following applies to equipment with cantilevered booms (such as hydraulic boom cranes): All the tests listed in SAE J-1063, Table 1, must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J 1063 table 2 shall be met.

(ii) The following applies to equipment with pendant supported lattice booms: All the tests listed in SAE J-987, Table 1, must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J 987 table 2 shall be met.

(2) *Test Option B.* The requirements of CEN's prEN 13000:2003E (Final Draft) shall be met. In applying the CEN standard, the following additional requirements shall be met:

(i) An analysis shall be done of each structure to identify highly stressed members and locate stress concentration areas in those members.

(ii) *Analysis verification.* The analysis shall be verified by applying stress or strain measuring devices on these structural elements, as follows:

(A) The location and direction of these devices shall be determined from the analysis as well as from the use of other empirical or experimental techniques (such as stress coating).

(B) Where the reliability of the analysis methodology has been demonstrated by a documented history of verification by stress or strain measuring devices on a significant number of prototypes, the number of strain measuring devices used to verify the analysis on a prototype with similar types of members may be reduced below the number that would have been required had SAE J 1063 been used (for

equipment with cantilevered booms) or had SAE J-987 been used (equipment with pendant supported lattice booms).

**Testing option 2**

(c) Testing: crawler, truck and locomotive cranes manufactured prior to [effective date of 1926.1400] shall meet the applicable requirements for testing as prescribed in ANSI B30.5 – 1968, Safety Code for Crawler, Locomotive, and Truck Cranes.

(d) Testing: mobile (including crawler and truck) and locomotive cranes manufactured on or after [effective date of the standard] shall meet the following requirements:

(1) The following applies to equipment with cantilevered booms (such as hydraulic boom cranes): All the tests listed in SAE J-1063, Table 1, must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J 1063 table 2 shall be met.

(2) The following applies to equipment with pendant supported lattice booms: All the tests listed in SAE J-987, Table 1, must be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J 987 table 2 shall be met.

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(e) All equipment covered by this Subpart shall meet the following requirements:

(1) There shall be a manufacturer-equipped marking on the outside of the machine in a conspicuous location stating that the machine meets the design, construction and testing requirements of 1926.1432.

(2) *Load capacity/ratings and related information.* The information available in the cab (see Section 1406 (c)) regarding load capacity/ratings and related information shall include, at a minimum, the information identified in Section 5-1.1.3 (“Load Rating Chart”) (a)(1)-(5) and (b)(1)-(12).

(3) Load hooks (including latched and unlatched types), ball assemblies and load blocks shall be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths and the number of parts of the line in use.

(4) Hook and ball assemblies and load blocks shall be marked with their rated capacity and weight.

(5) *Latching hooks.*

(1) Hooks shall be equipped with latches, except where the requirements of paragraph (2) are met.

(2) Hooks without latches, or with latches removed or disabled, shall not be used unless:

(i) A qualified person has determined that it is safer to hoist and place the load without latches (or with the latches removed/tied-back).

(ii) Routes for the loads are be pre-planned to ensure that no employee is required to work in the fall zone except for employees necessary for the hooking or unhooking of the load.

(3) The latch shall close the throat opening and be designed to retain slings or other lifting devices/accessories in the hook ~~and be designed to retain slings or other lifting devices/accessories in the hook~~.

(6) [Reserved]

(7) All exhaust pipes, turbochargers, and charge air coolers shall be insulated or guarded where contact by employees (except for maintenance and repair workers) is possible in the performance of normal duties.

(8) *Posted warnings.* Posted warnings required by this Subpart as well as those originally supplied with the equipment by the manufacturer shall be maintained in legible condition.

(9) Fiber core ropes shall not be used for boom hoist or luffing attachment reeving. [modified B30.5 – left out Rotation Resistant Rope – See next item].

(10) *Rotation resistant ropes.*

(1) [First generation] [we need a way to distinguish between old and new generation rope] rotation resistant ropes shall not be used for boom hoist reeving as normally defined in B30.5, Section 5-1.3. [Proposed – approved by latest B30.5 ballot] except where the requirements of paragraph (2) are met.

(2) 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, the following requirements shall be met:

(i) All the requirements of 5-1.3.1 with the exception that the drum shall provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(ii) All the requirements of 5-1.3.2.

(iii) All sheaves used in the boom hoist reeving system shall have a rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(iv) The design factor for the boom hoist reeving system shall be not less than five.

(v) The design factor for these ropes shall 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 crane rated load.

(vi) The frequency of inspection of the wire rope shall be increased when using rotation resistant rope in boom hoist or luffing attachment service. [Proposed B30.5 text – Some foreign and US manufacturers are currently doing this to allow a lift crane rotation resistant load line to be used as a luffing jib luffing line when adding an attachment].

(11) *Cabs.* Equipment with cabs shall meet the following requirements:

(1) Cabs shall be designed with a form of adjustable ventilation and method for clearing the windshield for maintaining visibility and preventing heat stroke. Examples of means for adjustable ventilation include air conditioner or window that can be opened (for ventilation and preventing heat stroke); examples of means for maintaining visibility include heater (for preventing windshield icing), defroster, fan, windshield wiper. – proposed .

(2) Cab doors (swinging, sliding) shall be designed to prevent inadvertent opening or closing while traveling or operating the machine. Swinging doors adjacent to the operator shall open outward. Sliding operator doors shall open rearward.

(3) *Windows.*

(a) The cab shall have windows in front and on both sides of the operator. Forward vertical visibility shall be sufficient to give the operator a view of the boom point at all times.

(b) Windows may have sections designed to be opened or readily removed. Windows with sections designed to be opened shall be designed so that they can be secured to prevent inadvertant closure.

(c) Windows shall be of safety glass or material with similar optical and safety properties, that introduce no visible distortion or otherwise

obscure visibility that interferes with the safe operation of the equipment.

(4) *Seat belts.* Cabs used for driving the equipment (transit/travel) shall have seat belts.

(5) A clear passageway shall be provided from the operator's station to an exit door on the operator's side.

[ANSI provision 5-1.8.1(a) on cabs/enclosures to protect machinery & operator from weather omitted – is that OK?].

(6) Areas of the cab roof that serve as a workstation for rigging, maintenance or other equipment-related tasks shall be capable of supporting 250 pounds without permanent distortion.

(12) An accessible fire extinguisher shall be ~~available at all operator stations. on/in the equipment.~~ [Why is it needed in the cab? What about multiple cabs?] in each cab.

(13) The equipment shall be designed so that exhaust fumes are not discharged in the cab and are discharged in a direction away from the operator. (see B30.8)

(14) *Friction mechanisms.* Where friction mechanisms (such as brakes and clutches) are used to control the boom hoist, or load line hoist, they shall be:

(1) Of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.

(2) Adjustable to permit compensation for lining wear to maintain proper operation.

(15) *Welding.*

(1) Welding on load sustaining members shall meet the procedures, specifications and welder qualifications requirements of ANSI/AWS D14.3-94 for Earth Moving & Construction Equipment [or D1.1?].

(2) For welding on special steels or other materials not specifically addressed by ANSI/AWS D14.3-94 [or D1.1?], welding procedures and specifications from the equipment manufacturer shall be used.

(16) Hydraulic and pneumatic lines shall be protected from damage to the extent feasible. [compare to 5-1.9.9 "Exposed lines subject to damage shall be protected in so far as it is practical" – presents enforceability problems]

(17) *Machine guarding.* Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, and other parts or components that reciprocate, rotate or otherwise move shall be guarded where contact by employees (except for maintenance and repair workers) is possible in the performance of normal duties.

(18) Rotation resistant rope and fiber core ropes shall not be used for boom hoist reeving.

### **1433 Floating Cranes & Cranes on Barges**

(a) The requirements of this section apply to floating cranes/derricks and cranes/derricks on barges, pontoons, vessels or other means of floatation, and are supplemental to the other requirements in this Subpart.

(b) *Cranes/derricks on barges, pontoons, vessels or other means of floatation.*

(1) For equipment designed by the manufacturer to be used on barges, pontoons, vessels or other means of floatation:

(i) The manufacturer load charts applicable to operations on water shall not be exceeded. When using these charts, the employer shall comply with all parameters and limitations (such as dynamic/environmental parameters) applicable to the use of the charts.

(ii)

(2)

### **1435 Free Fall and Power Down**

(a) *Boom free fall prohibitions.*

(1) The use of equipment in which the boom hoist mechanism can free fall is prohibited in each of the following circumstances:

(i) An employee is in the fall zone of the boom or load.

(ii) An employee is being hoisted.

(iii) The load is directly over a power line, or over the area extending the Table A clearance distance to each side of the power line.

(iv) The load is over a shaft.

(v) Lifting operations are taking place in a refinery or tank farm.

(2) The use of cranes in which the boom hoist mechanism can free fall is permitted only where none of the circumstances listed in paragraph (1) are present and:

- (i) The equipment is manufactured prior to \_\_\_\_\_, 1971, or
- (ii) The equipment is a floating crane/derrick or is on pontoons, a barge or a vessel.

(b) *Preventing boom free fall.* Where the use equipment with a boom that can free fall is prohibited (see paragraph (a)(1)), the boom hoist shall have:

(1) A secondary mechanism or device that prevents the boom from falling in the event the primary system used to hold or regulate the boom hoist fails, as follows:

(i) Friction drums shall have:

(A) A secondary braking device (such as a secondary friction brake) that automatically backs-up the primary brake while the boom is lowering.

(B) A secondary braking or locking device, which is manually or automatically engaged, to back-up the primary brake while the boom is held (such as a secondary friction brake or a ratchet and pawl device).

~~(C) Friction mechanisms (such as brakes and clutches) of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.~~

~~(D) Friction mechanisms that are adjustable to permit compensation for lining wear to maintain proper operation. [Moved to general design requirements section 1432 (p)]~~

(ii) Hydraulic drums shall have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.

(iii) Hydraulic motors shall not be used as [considered] brake or locking devices for purposes of this Subpart.

(iv) Hydraulic [drums] [hoists] shall have a cylinder lock valve.

(2) Hydraulic telescoping booms shall have an integrally mounted holding device [or internal static brake?] to prevent boom movement in the event of hydraulic failure.

[Should any of these requirements apply to all cranes in all situations?]

(c) *Load line free fall.* In each of the following circumstances, power-down is required and free fall of the load line hoist is prohibited:

- (1) An employee is directly under the load.
- (2) A personnel platform is being used.
- (3) The load is directly over a power line, or over the area extending the Table A clearance distance to each side of the power line.
- (4) The load is over a shaft.

(c) *Preventing load line free fall.*

(1) *Secondary brake feature.* Where load line free fall is prohibited, the crane/derrick must be equipped with a mechanism or device that prevents the load from falling in the event the primary system used to brake or regulate the load line hoist fails.

(2) *Friction mechanism design.*

(i) Where friction mechanisms (such as brakes and clutches) are used to control the load line hoist, they shall be of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.

(ii) Friction mechanisms in paragraph (i) shall be adjustable to permit compensation for lining wear to maintain proper operation. [Moved to general design requirements section 1432 (p)]

(2) *Hydraulic load hoists.* Hydraulic drums shall have an integrally mounted holding device or internal static brake to prevent load hoist movement in the event of hydraulic failure. [Should this be moved to the general design requirements section?]

#### **1436 Multiple-Crane Lifts -- supplemental requirements**

(a) Before beginning a crane operation in which more than one crane will be supporting the load, the crane operation must be planned. The planning must meet the following requirements:

- (1) The development of the plan must be supervised by a competent-qualified person.
- (2) The plan must be designed to ensure that the requirements of this Subpart are met.

(3) The competent-qualified person must review the plan with all workers who will be involved with the operation.

(4) Where the competent-qualified person determines that engineering expertise is needed for the planning, the employer must ensure that it is provided.

(b) The multiple-crane lift must be supervised by a competent-qualified person.

#### 1437 Tower Cranes

#### ~~1438 Operator Cab Criteria~~

#### 1439 Overhead & Gantry Cranes

(a) *Permanently installed overhead and gantry cranes.*

(1) This paragraph applies to the following equipment when used in construction and permanently installed in a facility: overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.

(2) The requirements of 29 CFR 1910.179, except for 1910.179 (b)(1), apply to the equipment identified in paragraph (a)(1).

(b) *Overhead and gantry cranes that are not permanently installed in a facility.*

(1) This paragraph applies to the following equipment when used in construction and not permanently installed in a facility: overhead and gantry cranes, overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.

(2) The following requirements apply to equipment identified in paragraph (b)(1):

(i) Sections \_\_\_\_\_ of this standard [Are there any sections that would NOT be appropriate to apply to them?].

(ii) The requirements of 29 CFR 1910.179, except:

(A) Definitions in 1910.179(a) that differ from those in Section 14XX of this Subpart.

(B) 1910.179 (b)(1).

(C) 1910.179 (b)(2) applies only to equipment identified in paragraph (1) manufactured before September 19, 2001.

(iii) For equipment manufactured on or after September 19, 2001, ASME B.30.2 (2001) applies. [should we also apply ASME B.30.17 (2003)?].

[We are working on identifying and resolving any conflicts between (i), (ii) and (iii), and any enforcement problems in the ASME standards]

#### **14XX Supplemental Requirements for Sideboom Cranes**

[.550 (a)(18): "Sideboom cranes mounted on wheel or crawler tractors shall meet the requirements of SAE j743A-1964].

DRAFT

## 1440 Definitions

- Assembly/disassembly* means assembly and disassembly (also referred to as erecting and dismantling)
- 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.
- Chainfall* see come-a-long.
- 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*
- Crew Leader* A worker who is both a competent person and a qualified person, who oversees an erecting/dismantling operation.
- Crossover points*
- 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.
- Dismantling* includes partial dismantling (such as dismantling to shorten a boom or substitute a different component).
- Flange points*
- Hoist* A mechanical device for lifting and lowering heavy loads usually by winding rope onto or of a drum.

*Hoisting* The act of raising, lowering or otherwise moving a load in the air with equipment covered by this standard. ~~in a vertical direction [through the use of — some type of rope and sheave system] [?].~~

*In-the-air assembly operations* [Need definition]

*Nationally recognized accrediting agency* is an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations.

*Operation* \_\_\_\_\_

*Operational aids* [Need definition]

*Operational controls* levers, switches, pedals and other devices for controlling [crane] [equipment] operation

*Overhead and gantry cranes* includes overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.

*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.

*Repetitive pickup points*

*Running wire rope* [need definition]

*Section* means a section of this Subpart unless otherwise specified.

*Standard* means this Subpart unless otherwise specified.

*Storage* means that it is reasonably anticipated that the material will not be used within \_\_\_ hours (overnight hours included).

*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, or have never been available, from the manufacturer or have not been supplied by the manufacturer.

*Equipment* means equipment covered by this subpart.

## APPENDIX A – USE OF NON-STANDARD SIGNALS

The follow is an example of a situation where the use of the Standard Method for hand signals is infeasible: Due to background lighting conditions behind the signal person, there is insufficient contrast between the person's hand and the sky color. This prevents the operator from being able to clearly see the signal person's hand when extended out to either side.

## APPENDIX B – CHECKLIST FOR DETERMINING IF HOISTING PERSONNEL IS PERMISSIBLE

## APPENDIX C – ASSEMBLY/DISASSEMBLY – SAMPLE PROCEDURES FOR MINIMIZING THE RISK OF UNINTENDED DANGEROUS BOOM MOVEMENT.