

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); industrial (such as carry-deck cranes); 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/bridge cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment, except for equipment listed in paragraph (c).

(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 and to set power and utility poles. [need explanation for why this is excluded]

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

(6) hydraulic jacking systems

(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 [?] [pending discussion re drill rig and pile driver panel presentations].

(d) *Limited requirements.*

(1) The only requirements in this standard that apply to equipment with a manufacturer-rated hoisting/lifting capacity of 2000 pounds or less are in Section 1413.

(2) The only requirements that apply to dedicated pile drivers are in Sections _____.

1401 General Requirements

Sections 1402 – 14XX (and the sections they refer to) apply to all equipment except equipment with a manufacturer-rated hoisting/lifting capacity of 2000 pounds or less.

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 safe 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) ~~Overight~~ *Supervision – Competent-qualified person.* Assembly/disassembly must be overseen supervised by a person who meets the criteria for both a competent person and a qualified person (“competent-qualified person”), or by a competent person who is assisted by one or more qualified persons (“supervision team”).

(b) *Knowledge of procedures.* The competent-qualified person/supervision team supervising the assembly/disassembly operation must understand the assembly/disassembly procedures.

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

(d) *Crew instructions.*

(1) Before commencing assembly/disassembly operations, the competent-qualified person supervising the assembly/disassembly operation must determine that the crew members understand all of the following:

(i) Their tasks.

(ii) The hazards associated with their tasks.

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

(2) During 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 inform the operator that he/she is going to that location.

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

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

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

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

(f) *Working under the boom or other components.* When pins (or similar devices) are being removed, employees must not be under the boom or other components, except for: in-the-air assembly/disassembly operations. For in-the-air assembly/disassembly operations, the competent-qualified person/ supervision team 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. [moved here from paragraph (h)]

(h) *Addressing specific hazards.* The competent-qualified person/ supervision team 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 [discuss controlling contractor issue] for safe assembly/disassembly operations and to support the equipment during assembly/disassembly.

(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, blocking must be appropriately placed to:

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

(ii) Prevent dangerous movement and collapse.

(4) *Calculating [identifying?] 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 calculated [identified ?] 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 boom/boom sections 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 AppendixXX for examples of techniques).

(7) *Stability upon pin-release removal.* The equipment or components must be rigged 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 capacity safe assembly/disassembly of the equipment is not exceeded compromised.

(11) *Boom hoist brake failure.*

(i) Where reliance is placed on the boom hoist brake to prevent boom movement, determine if it is necessary to use a boom hoist pawl or other locking device/back-up braking device.

(ii) Where use of such a device is found to be necessary but the equipment lacks such a device, another method of preventing dangerous movement of the boom hoist from a boom hoist brake failure must be used.

~~(12) *Imbalance of take-up tension and braking.*~~

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

(i) Manufacturer instructions, recommendations, limitations, and specifications. Where these are unavailable, a registered professional

engineer familiar with the type of equipment involved must approve, in writing, the selection and configuration of components; or

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

(2) *Post-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 Assembly/Disassembly – Additional requirements for assembly/disassembly of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).

(a) *Dismantling (including shortening) booms and jibs.*

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

[Insert new diagram]

(2) 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].

(3) 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]

(b) *Assembly of booms and jibs.*

(1) *Wind velocity.* Wind velocity must be considered before lifting the boom (or boom section or jib or jib section) off the ground.

1405 Assembly/Disassembly – Employer Procedures – General Requirements

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

- (1) Prevent unintended dangerous movement, and to prevent collapse, of part or all of the equipment.
- (2) Provide adequate support and stability of all parts of the equipment during the 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.

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

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.

(d) *Accessibility.*

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

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

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

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 [changes from Feb meeting not yet made]

(a) A signal person must be provided when:

- (1) point of operation, meaning the load travel or the area near or at load placement is not in full view of the operator, or
- (2) due to site specific safety concerns, either the operator or the person handling the load determines that it is necessary.

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

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

(c) Hand, voice, or audible signals.

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

(2) *Exception:* where use of the Standard Method for the type of signal selected is infeasible, or where an operation or use of an attachment is not covered in the Standard Method, Non-standard hand, voice or audible signals

may be used [See Appendix A for examples]. The following requirements apply to the use of non-standard signals:

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

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

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

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

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

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

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

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

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

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

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

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

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

1409 Radio, telephone or other electronic transmission of signals.

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

1410 Voice signals – additional requirements

- (1) Prior to beginning operations, the crane operator, signal person and lift supervisor (if there is one), shall contact each other and review the Standard Voice Signals (see Appendix __).
- (2) Each voice signal shall contain the following three elements, given in the following order:
 - (i) Function (such as hoist, boom, etc.).
 - (ii) Direction.
 - (iii) Distance and/or speed.
 - (iv) Stop command.

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

1412 Signal Person Qualifications

- (a) The employer [which employer?] shall ensure that each signal person meets the Qualification Requirements in paragraph (e) prior to giving any signals.
- (b) *Documented qualifications.* The requirement in paragraph (a) is met where the employer has documentation from a qualified evaluator showing that the signal person meets the Qualification Requirements (see paragraph (e)).
- (c) Where the employer does not have documentation showing that the signal person meets the Qualifications Requirements in paragraph (e), the employer is prohibited from using the individual as a signal person unless a comprehensive assessment demonstrates that the Qualification Requirements have been met. That assessment must include:
 - (1) A verbal or written examination of the individual to determine if they know, understand and are competent in the application of the Standard Method for the signals used.

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

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

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

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

1413 Requirements for equipment with a manufacturer-rated hoisting/lifting capacity below 2000 pounds.

1414 Operational Aids

1415 Inspections [Changes from the October meeting are still being worked on]

(a) *New, modified and repaired equipment.* Prior to initial use, new equipment and equipment that has been modified must be inspected by a [qualified person?] [competent-qualified person?] to determine if it meets the requirements of [this section?] [manufacturer instructions, recommendations, limitations, and specifications, or, where these are unavailable, the instructions, recommendations, limitations, and specifications of a registered professional engineer familiar with the type of equipment involved?]

(b) *Post-assembly.*

- (1) Upon completion of assembly, the equipment must be inspected by a [qualified person] [competent-qualified person] to determine if it is configured in accordance with manufacturer instructions, recommendations, limitations, and specifications. Where these are unavailable, the [qualified person] [competent-qualified person] must determine if it is configured in accordance with the instructions, recommendations,

limitations, and specifications of a registered professional engineer familiar with the type of equipment involved.

[Should this paragraph be moved to the assembly/disassembly section?]

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

(c) *Pre-shift.*

(1) Equipment shall be visually inspected prior to each shift by a [competent person]; the inspection shall ~~include~~ [consist of] observation for [apparent] deficiencies during [trial] operation. ([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]). At a minimum this inspection shall include the following:

- (i) All control mechanisms for maladjustments [interfering with proper operation?]
- (ii) All control [and drive?] mechanisms for excessive wear of components and contamination by lubricants, water or other foreign matter.
- (iii) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation.
- (iv) Hooks and latches for deformation, chemical damage, cracks, or wear.
- (v) Wire rope reeving for compliance with the manufacturer's specifications.
- (vi) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt or moisture accumulation.
- (vii) Hydraulic system for proper fluid level.
- (viii) Tires (when in use) for proper inflation and pressure.
- (ix) Ground conditions around the equipment for proper support, including ground settling under and around outriggers, ground water accumulation, or similar conditions.
- (x) The equipment for level position.
- (xi) The equipment for level position after each move and setup.

(xii) [Safety devices, including, but not limited to, boom angle indicators, boom stops, boom kick-out devices, anti-two block devices, and load moment indicators where required]. [or: Operational aids for proper functioning. (if we use “operational aids”, then what is definition of that?)]

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

(3) If any deficiency in (xii)(safety devices/operational aids) is identified, [this will then refer to section 1414 – Safety Devices/operational aids].

(4) Pre-shift inspections of the equipment’s wire rope shall be done in accordance with section 1419(b).

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

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

(d) *Monthly*. Each month the equipment shall be inspected in accordance with paragraph 1415(c) (pre-shift inspections). The results of this inspection shall be documented.

(e) *Annual/periodic*.

(1) At least each year the equipment shall be inspected in accordance with paragraph 1415(c) (pre-shift inspections).

(2) In addition, at least once a year, the equipment shall be inspected for the following:

(i) Deformed, cracked, or corroded members in the equipment structure (including the boom and, if equipped, the jib).

(ii) Loose bolts or rivets.

(iii) Cracked welds.

(iv) Cracked or worn sheaves and drums.

(v) Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices.

(vi) Excessive wear on brake and clutch system parts, linings, pawls and ratchets.

(vii) Operational aids for significant inaccuracies (see section 1414 [operational aids]).

(viii) Gasoline, diesel, electric, or other power plants for performance [what is the safety concern on this?] and compliance with safety requirements [such as?]

(ix) Excessive wear of chain drive sprockets and excessive chain stretch.

(x) Travel steering, braking, and locking devices, for malfunction.

(xi) Excessively worn or damaged tires.

(xii) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:

(A) Evidence of leakage at the surface of the flexible hose or its junction with the metal and couplings.

(B) Blistering or abnormal deformation of the outer covering of the hose.

(C) Leakage at threaded or clamped joints that cannot be eliminated by normal tightening or application of manufacturer procedures.

(D) Evidence of excessive abrasion or scrubbing on the outer surface of a hose, rigid tube, or fitting. Means shall be taken to eliminate the interference of elements in contact or otherwise protect the components. [this needs to be moved to the repair section].

(xiii) Hydraulic and pneumatic pumps and motors, as follows:

(A) Loose bolts or fasteners.

(B) Leaks at joints between sections.

(C) Shaft seal leaks.

(D) Unusual noises or vibration.

(E) Loss of operating speed.

(F) Excessive heating of the fluid.

(G) Loss of pressure.

(xiv) Hydraulic and pneumatic cylinders, as follows:

- (A) Drifting caused by fluid leaking across the piston.
- (B) Rod seals leakage.
- (C) Leaks at welded joints.
- (D) Scored, nicked, or dented cylinder rods.
- (E) Dented case (barrel).
- (F) Loose or deformed rod eyes or connecting joints.

(xv) Hydraulic filters, as follows:

- (A) Evidence of rubber particles on the filter element. If found, check for hose, D-ring or other rubber component deterioration.
- (B) Metal chips or pieces on the filter. If found, check for pump, motor or cylinder failure.

(xvi) Additional inspection items for _____ [crane category]

(xvii) Additional inspection items for _____ [crane category]

(xviii) Additional inspection items for _____ [crane category]

(3) If under the manufacturer's inspection instructions an item/ condition listed in paragraph (i) needs to be inspected sooner than annually, then the manufacturer's instructions shall apply for scheduling the inspection of that condition.

(4) If the manufacturer specifies that an item/condition not listed in paragraphs (1) or (2) is to be inspected, then that item/condition shall be inspected in accordance with the manufacturer instructions.

(5) *Heavy Service*

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

(6) *Severe Service*

The inspection in (e)(2) must be done monthly where the equipment is operated in extreme temperatures or in a corrosive atmosphere. [From Dept. of Energy].

(7) The inspections under this section shall be documented.

(f) *Equipment not in regular use.*

(1) Equipment that has been idle for 1 month or more, but less than 6 months, shall be inspected by a [qualified person] in accordance with the requirements of paragraph (c)(Pre-shift inspection) before being placed in service [what does “placed in service” mean? Does this mean that it will be inspected twice before it is used – this inspection plus the pre-shift inspection?].

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

(3) *Stand-by cranes.* Stand-by cranes shall be inspected by a [qualified person] in accordance with the requirements of paragraph (c)(Pre-shift inspection) before being placed in service. [Same question as in (1)].

[What do we do about cranes “exposed to adverse environmental conditions?”].

(4) If the manufacturer’s inspection instructions call for a more rigorous inspection, then the manufacturer’s instructions shall apply to this inspection.

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 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 crane design:

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

(B) Modifies load charts, instruction manuals/procedures 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) through (2)(iii) 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 merits of the proposed modification/addition, rejects the proposal.

1417 Training

[Training subject – keeping limbs out of holes and crush/pinch points]

1418 Wire Rope - General Requirements

The employer shall ensure that wire rope used on equipment within the scope of this standard is inspected, maintained and replaced in accordance with requirements set forth in Sections 1419 – 1421. However, where manufacturer [specifications] are more stringent than those specified in these sections, the manufacturer ~~guidelines~~ specifications shall control.
[COE]

1419 Wire Rope Inspection

(a) *General Requirements.*

(1) *Action required.* Daily [preshift?], Frequent [monthly?], and Periodic [annual/periodic?] inspections of wire rope are required as set forth below in Sections 1419 (b), (c) and (d). The person(s) conducting a wire rope inspection shall determine whether any wire rope deficiencies [conditions?] exist that affect the safe operation of the equipment.

(i) If such a deficiency [condition] is located, that person(s) shall:

(A) initially determine whether wire rope replacement is required as specified in Section 1420, Wire Rope Replacement, and, if so, the employer must comply with those provisions; and

(B) in all other instances, the employer must prohibit the use of the wire rope until the deficiency is repaired corrected. [~~unless in the judgment of the person or persons performing the inspection, the wire rope can be safely used in~~]

~~operating the equipment until the end of the work shift. At that point, the wire rope must be repaired prior to the equipment being returned to service.]~~

(ii) If, in the opinion of the competent and qualified person, a deficiency is localized in an operating wire rope, and the section in question and related safety hazard can be eliminated by making a new attachment of wire rope, a partial removal is permissible rather than replacing the entire rope. [reworded from SAE]

(iii) Splicing of running ropes is prohibited. [Does this conflict with (ii)?]

(2) *Critical Review Items.* Certain critical items shall be included in each inspection. The extent of the examination shall be ~~limited by~~ in accordance with the type of inspection being conducted (daily, frequent or periodic). These items are:

(i) Rotation resistant wire rope in use.

(ii) Wire rope being used for boom hoists [how about others such as luffing hoists and load hoists].

(iii) Wire rope at flange points, crossover points and repetitive pickup points on drums.

(iv) Wire rope adjacent to end connections.

(3) *Inspection Records.* Required documentation reflecting inspections and wire rope replacement shall be available [at the project site][is this necessary?]. Wire rope replacement shall ~~always~~ be documented and reflect the date of replacement, and the size, construction, grade, length, safety factor and minimum breaking force of the wire rope replacement. [how long retained?] The remaining documentation requirements vary by the type of inspection as follows:

[deleted reference to documentation for daily]

(i) *Pre-shift.* Written records are required only where a rope is removed from service.

(ii) *Frequent.* Written records are required and shall reflect ~~, at a minimum,~~ any deficiencies that are required to be considered in a Frequent Inspection. Other deterioration observed shall also be noted, as well as corrective action taken. [retention period? should it parallel regular inspections?]

(iii) *Periodic.* Written records are required and shall reflect ~~, at a minimum,~~ any deficiencies that are required to be considered in a Periodic Inspection. Other deficiencies observed shall also be noted, as well as corrective action taken for any deficiency. [retention period? should it parallel regular inspections?]

(4) *Wire rope on idle equipment.*

(i) The requirements in this section (wire rope inspections) do not apply to wire rope on equipment that is not in use.

(ii) All wire rope on equipment that has not been used [would this include unused rope on the drum?] for a month or more shall be inspected prior to return to service in accordance with Section 1419 (d) *Periodic Inspections*. [what about where rope is not in use but equipment is?]

~~(5) Visual inspections defined. For purposes of Sections _____, a visual inspection means an inspection limited to the external surfaces of wire rope. [see second to last sentence to (b) below]~~

(b) *Daily[Pre-shift?] Inspections.* Running wire ropes that are in use on equipment in continuous service shall be visually inspected on a daily basis for ~~visible deficiencies~~ deficiencies. This inspection shall be ~~limited to~~ of wire ropes that are reasonably likely to be in use on the day of the inspection and shall be ~~overseen~~ [conducted] by a competent person [or should this also include qualified person?]. Except for paragraph (5), untwisting of wire rope is not required as part of this inspection. Examples of visible deficiencies are:

- (1) Distortion of the rope structure such as kinking, crushing, unstranding, birdcaging, stretching or core protrusion.
- (2) Wire rope corrosion, particularly at socket and end connections.
- (3) Broken or cut strands.
- (4) Visible broken wires in accordance with the parameters set forth in Section 1420, Wire Rope Replacement per lay length [for] running ropes, pendants and standing ropes, or per diameters for rotation resistant rope.
- (5) Core failure in rotation resistant rope.
- (6) Reduction of rope diameter [from COE] (see section 1420 (Wire rope replacement)).
- (7) Electric arc or heat damage.
- (8) Corroded, cracked, bent, worn or improperly applied end connections.

(c) *Frequent[Monthly?] Inspections.* Frequent Inspections shall be conducted at least on a monthly basis and these inspections shall be ~~overseen~~ [why not “conducted”?] by a [competent and qualified person][?]. [These inspections shall be conducted more

frequently based on usage.][parameters for this?] A visual inspection (as defined in paragraph (b)) for deficiencies of the types listed in 1419(b)(1) – (8) shall be conducted on [all wire ropes] [or: on the following]:

- (1) all running wire rope;
- (2) counterweight wire ropes [from COE]; and
- (3) load trolley wire ropes [from COE].
- (4) [would it be appropriate to list pendant or standing ropes here?]

(d) *Periodic Inspections.*

(1) *Frequency and Oversight.* Periodic Inspections shall be conducted at least annually, and shall be overseen [why not “conducted” ?] by a competent and qualified person. The ~~person overseeing the inspection may require inspections~~ competent and qualified person shall conduct this inspection more frequently depending upon such factors as the expected rope life, environment, and the size, type, frequency and severity of lifts (including exposure to shock loads) [last item from ANSI] [enforceability problems with this type of subjective trigger].

(2) *Review Required.* The inspection shall be complete and thorough, covering the surface of the entire length of the wire rope with particular attention given to those sections of wire rope that are normally hidden during daily and frequent visual inspections. An inspection for deficiencies of the types listed in 1419(b)(1) – ~~(7)~~ (8) shall be conducted on the following:

- (i) all running wire rope;
- (ii) counterweight wire ropes;
- (iii) load trolley wire ropes;
- (iv) wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited;
- (v) wire rope subject to reverse bends;
- (vi) wire rope passing over outer sheaves;
- (vii) wire rope at or near terminal ends; and
- (viii) all wire standing ropes [is this item repetitive?].

1420 Wire Rope Replacement

(a) *Oversight. Action.* Wire rope that exhibits the deficiencies any one of the deficiencies listed in 1419(b) shall be immediately removed from service, and replaced prior to the equipment's next use. ~~[However, an exception applies when a person or persons who meet the criteria for both a competent and qualified person determines that such wire rope is sufficiently safe for continued use on the equipment until the end of the work shift, at which point the wire rope must be replaced prior to the equipment being returned to service.] [ANSI standard provides for this discretion]~~

(b) *Criteria.* Any one of the following deficiencies are cause for requires wire rope replacement:

(1) *Broken wires:*

(i) In running wire ropes: six randomly distributed broken wires in one lay or three broken wires in one strand in one lay, where a lay is the length along the rope in which one strand makes a complete revolution around the rope.

[illustration?]

(ii) In rotation resistant ropes: two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters.

(iii) In pendants or standing wire ropes: more than two broken wires in one lay located in rope beyond end connections and/or more than one broken wire in a lay located at an end connection.

(2) *Diameter reduction due to loss of core support*

(i) reductions of 1/64 in. (.4 mm) for diameters up to and including 5/16 in. (8 mm);

(ii) reductions of 1/32 in. (.8 mm) for diameters 3/8 in. (9.5 mm) to and including 1/2 in. (13 mm);

(iii) 3/64 in. (1.2 mm) for diameters 9/16 in. (14.5 mm) to and including 3/4 in. (19 mm);

(iv) 1/16 in. (1.6 mm) for diameters 7/8 in. (22 mm) to and including 1 1/8 in. (29 mm);

(v) 3/32 in. (2.4 mm) for diameters 1 1/4 in. (32 mm) to and including 1 1/2 in. (38 mm);

- (2) Diameter reduction of more than 5% from the nominal rope diameter. [per Larry's group's suggestion]
- ~~(3) One third reduction of diameter due to wear of surface wires;~~ [How does this work with (2)? Also, Mr. Means suggested that this be deleted as it is hard to determine/enforce – note, however, that SAE, ANSI, ACCSH and the Rigging Manual have retained it]
- (4) Heat damage from any source, including, but not limited to, welding, power line contact or lightning. [as elaborated by COE and ACCSH]
- (5) Kinking, crushing, birdcaging or other distortion of the wire rope structure. [in ANSI]
- (6) Wire rope stretch in excess of 6 inches per 100 feet in 6 stranded rope and 10 inches in an 8 stranded rope. [this came from Rigging Manual – include?]
- (7) Core protrusion between the outer strands.
- (8) [Larry: Severe] [Structural] Corrosion/rusting in the vicinity of attachments [Rigging Manual, SAE].

(c) *Wire Rope Selection and Disposal.*

(1) *Selection.* Replacement wire rope shall have a ~~strength rating~~ minimum breaking force of at least as great as the rope originally provided or recommended by the crane manufacturer. In addition, no deviation from the size, grade or construction of wire rope originally provided or recommended by the crane manufacturer shall be permitted without the prior written approval of the crane manufacturer, wire rope manufacturer or a qualified person.

~~(2)~~ [Partial removal paragraph moved to 1419(a)(1)(ii)]

(2) *Removal.*

(i) Wire rope removed from service due to a deficiency shall be cut up or plainly marked as unfit for further use.

(ii) Wire rope removed from service due to a deficiency may be reused if the section of the wire rope containing the deficiency is cut off. The cut-off section with the deficiency must then be cut up or plainly marked as unfit for further use.

1421 Wire Rope Maintenance

(a) *General Requirements.*

(1) Maintenance of wire rope, including preventative maintenance and repairs, shall be in accordance with the crane and/or wire rope manufacturer's recommendations.

(2) Maintenance records shall be documented and available at the project site [why is this necessary?].

(b) *On site storage.* Where it is reasonably anticipated that wire rope on site will not be installed within ___ [days or hours], the wire rope must be stored in coils or on reels ~~preferably indoors, or, if outdoors, covered,~~ and in conditions that are removed from moisture, heat [why heat? how hot is too hot?], steam, and direct contact with ~~concrete or ash~~ floors the ground or floors. In addition, coils and reels stored outdoors must be covered. [we need a definition of storage. We could use the approach we are now using for gas cylinders (see first sentence above)].

(c) *Lubrication.*

(1) Wire ropes shall be properly lubricated at all times, in accordance with the wire rope or crane manufacturer's recommendations. Lubricants shall be compatible with the original lubricant and shall not hinder visual inspection of the wire rope.

(2) Sections of wire rope that are hidden or obscured ~~during inspections or~~ maintenance, such as areas over sheaves, shall be lubricated as required by the crane or wire rope manufacturer even if access is difficult. ~~or absence from view.~~

(d) *Use.* [the following provisions appear in ANSI; do these all apply to rigging "above the hook?"]

(1) During installation, wire rope shall not be dragged in dirt or otherwise brought in contact with surfaces or objects that may scrape, nick, crush, or create sharp bends in the rope.

(2) *Seizing.* Prior to cutting a wire rope, seizings shall be placed on each side of the point to be cut. The minimum length of each seizing must be equal to or exceed the diameter of the wire rope to which the seizing is applied. The required number of seizings ~~to be placed on each side of the cut~~ follow:

(i) on preformed rope, one seizing on each side;

(ii) on nonpreformed ropes of 7/8 in. (22 mm) diameter or smaller, two seizings on each side; and

(iii) on nonpreformed rope of 1 in. (26 mm) or larger, three seizings on each side. [Mr. Means suggested that due to the disappearance of nonpreformed rope from the market, these numbers should be left off and a qualified person

should determine the number of seizings, or alternatively uniformly require three for nonperformed rope]

(3) The reeling, unreeling and uncoiling of rope shall be performed in accordance with wire rope manufacturer recommendations.

[Do we need to add provisions on the following (from ANSI and Workgroup draft)?]:

(4) 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.

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

(6) Wire rope safety factors shall be in accordance with ANSI B 30.5-2000 or SAE J959-1991.

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

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.*

(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].

[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], until (and including) [4 years after the effective date of this standard], the operator must be certified by either the employer (in accordance with paragraph (d)), or by an accredited testing organization (in accordance with paragraph (e)).

(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 equipment the individual will operate, including the following:

(A) The controls and operational/performance characteristics.

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

(C) Procedures for responding to: loss of stability, control malfunction, power line contact, and fire.

(D) This Subpart, including applicable incorporated materials, and the applicable American Society of Mechanical Engineers (ASME) standard regarding the equipment.

(ii) The individual is able to read and locate relevant information in the equipment manual and materials 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.
- (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].

1423 Keeping Clear of the Load

(a) Where available, hoisting routes that [eliminate] [substantially reduce] 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 the initial attachment of the load to a component or structure, or
- (2) Operating a concrete hopper.

(c) When employees are engaged 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 safety latches or their equivalent shall be used to prevent materials from slipping out of the hook; and
- (3) The materials shall be rigged by a qualified rigger.

(d) *Receiving a load.*

[Option #1]:

[Only employees needed to receive a load shall be permitted to be within the fall zone when a load is being landed.]

[Option #2]:

[When a load is being landed:

- (1) Only employees needed to receive a load shall be permitted to be alongside the load.]
- (2) No employee is to be permitted to be directly under the load.]

(e) In a tilt-up operation, no employee shall be within the fall zone when the panel is being raised.

Definitions

Alongside means the part of the fall zone that is outside the area directly under the load.

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

Directly under the load means a part or all of an employee is directly beneath the load.

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

1424 Fall Protection

1425 Hoisting Personnel

1426 Qualifications of Maintenance & Repair Workers

1427 Machine Guarding

1428 Environmental considerations & site conditions, ground conditions

1429 Work Zone Control (access/egress)

1430 Power Line Safety

[Option A]

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.

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.* 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.

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

[not drafted yet]

Definitions [for terms used in the power line sections]

<i>Power lines</i>	electrical distribution and electrical transmission lines.
<i>Proximity alarm</i>	
<i>Range control warning device</i>	
<i>Crane</i>	Whenever the term “crane” is used in this Subpart, “derrick” is included.
<i>Encroachment</i>	is where any part of the crane, load line or load (including rigging and lifting accessories) breaches a minimum clearance distance that this Subpart requires to be maintained from a power line.
<i>Dedicated spotter</i>	is a signal person who meets the requirements of 14XX (signal person requirements) and whose sole responsibility is to watch the separation between the power line and the crane, load line and load (including rigging and lifting accessories), and ensure through communication with the operator that the applicable minimum approach distance is not breached.
<i>Insulating link</i>	

[Option B]

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

1431 Derricks

1432 Verification criteria for structural adequacy

1433 Floating Cranes & Cranes on Barges

1435 Free Fall and Power Down

(a) *Boom free fall.*

(1) The use of cranes in which the boom hoist mechanism can free fall is prohibited where:

- (i) An employee is directly under the load.
- (ii) A personnel basket is being used.
- (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.

(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 crane is manufactured prior to _____, 1971, or
- (ii) The crane is a floating crane or is on a barge.

(b) *Load line free fall.* Free fall of the load line hoist is prohibited in each of the following circumstances:

- (1) Where an employee is directly under the load.
- (2) Where a personnel basket is being used.
- (3) Where 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.

(c) *Preventing unintended free fall.*

(1) *Secondary brake feature.* The crane must be equipped with a mechanism or device that prevents the load from falling in the event the primary system used to brake or modulate 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.

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

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 or lowering a load 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

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 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.