

April 29, 2004

NOTE:

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

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C-DAC Working Draft (Partial)

1414 Safety Devices

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

- (1) Boom stops.
- (2) Jib stops (if a jib is attached).
- (3) Foot pedal brakes shall have locks.
- (4) Hydraulic outriggers shall have a primary and secondary lock.
- (5) Equipment on rails shall have rail clamps [to prevent derailment?]
- (6) 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 as a substitute for a properly working device.

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 measures specified by the crane/derrick manufacturer shall also be followed.

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

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

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

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

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

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

(iii) Temporary alternative measures: 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: [?]

(2) Boom hoist limiting device. Temporary alternative measures: [?]

(3) Limiting device for jib luffing if the equipment has a luffing jib. Temporary alternative measures are the same as in paragraph (2), except to limit the movement of the luffing jib.

(4) Boom length indicator if the equipment has a telescopic boom. Temporary alternative measures: A qualified person shall [?] [ANSI just refers to 5-3.2. 2 (1?).1 a,b,c -- just that the procedures must ensure that load capacities are not exceeded. This doesn't say anything about the nature of those procedures]

(5) Crane level indicator. Temporary alternative measures: [What are some examples of manually assessing degree of level?].

(6) *Anti two-blocking.*

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

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

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

(ii) Lattice boom cranes manufactured after (____,2000) [why not Feb 28, 1992?], shall be equipped with a device that, at each point where two-blocking could occur, either automatically prevents two-blocking or warns

the operator in time for the operator to prevent two-blocking. [Why permit the warning device instead of an automatic device?] *Exception:* this requirement does not apply to such lattice boom equipment when used for dragline, clamshell, magnet, drop ball, container handling, & concrete bucket work.

(iii) Temporary alternative measures. [_____]

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

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

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

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

Boom stop	includes boom stops, telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward. This includes devices that combine the function of disengaging the boom hoist power along with physically stopping the boom as it reaches a predetermined maximum angle.
Jib stop	also referred to as a jib backstop, is the same type of device as a boom stop, but is for a jib.
Boom hoist limiting device	includes boom hoist disengaging device, boom hoist shut-off, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, derricking limiter. This type of device disengages boom hoist power when the boom reaches a predetermined maximum [and minimum? If not minimum, then do we need a separate definition for a limiting device for a luffing jib?] operating angle. It also sets brakes or closes valves to prevent the boom from lowering after power is disengaged.
Boom length	[Do these indicate just the length of the permanent part of the

indicator	boom (i.e., without attachments/extensions)?

1415 Inspections [Revised]

(a) New equipment.

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

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

(b) Modified equipment.

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

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

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

(iii) The inspection shall include functional testing.

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

(c) Repaired/adjusted equipment.

(1) Equipment that has had a repair or adjustment that relates to safe operation (such as: a repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system, equipment structure, load hook, or in-use operating mechanism), shall be inspected after such a repair or

adjustment has been completed, prior to initial use. The inspection shall meet the following requirements:

- (i) The inspection shall assure that the repair/adjustment meets manufacturer equipment criteria (where applicable and available).
- (ii) Where manufacturer equipment criteria are unavailable or inapplicable, the inspection shall assure that the repair/adjustment meets equipment criteria approved by a registered professional engineer familiar with the type of equipment involved.
- (iii) The inspection shall include functional testing.

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

(d) *Post-assembly.*

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

(e) *Pre-shift.*

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

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

(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) Safety devices and operational aids for malfunction.

(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 it has been corrected.

(3) If any deficiency in (xii)(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 shall be inspected in accordance with paragraph 1415(e) (pre-shift inspections).

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

(3) *Documentation.*

(i) The following information shall be documented:

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

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

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

(g) *Annual/comprehensive.*

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

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

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

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

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

(C) Welds for cracks.

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

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

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

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

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

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

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

- (ix) Tires for damage or excessive wear.
- (x) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows:
- (A) Flexible hose or its junction with the fittings for indications of leaks.
 - (B) Threaded or clamped joints for leaks that persist after normal tightening to manufacturer specifications or use of manufacturer procedures.
 - (C) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure.
 - (D) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing.
- (xi) Hydraulic and pneumatic pumps and motors, as follows:
- (A) Performance indicators: unusual noises or vibration, low operating speed, excessive heating of the fluid, low pressure.
 - (B) Loose bolts or fasteners.
 - (C) Shaft seals and joints between pump sections for leaks.
- (xiv) Hydraulic and pneumatic valves, as follows:
- (A) Spools: sticking, improper return to neutral, and leaks.
 - (B) Leaks.
 - (C) Valve housing cracks.
 - (D) Relief valves: failure to reach correct pressure and setting (if there is a manufacturer procedure for checking pressure, it must be followed).
- (xv) Hydraulic and pneumatic cylinders, as follows:
- (A) Drifting caused by fluid leaking across the piston.
 - (B) Rod seals and welded joints for leaks.
 - (D) Cylinder rods for scores, nicks, or dents.

(E) Case (barrel) for dents.

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

(xv) Hydraulic filters, as follows:

(A) Indications of rubber particles on the filter element. If found, check for hose, O-ring or other rubber component deterioration.

(B) Metal chips or pieces on the filter element. If found, check for pump, motor or cylinder failure.

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

(xvii) Electrical components and wiring for indications of failure/impending failure.

(xviii) Exhaust system for leaks.

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

(xx) Operator seat: missing or unusable.

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

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

(3) This inspection shall include functional testing.

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

(i) The deficiency constitutes a hazard.

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

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

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

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

(ii) Take the following steps:

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

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

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

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

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

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

(h) *Severe Service.* Where the severity of use/conditions is such that there is a reasonable probability of damage (such as loading that may have exceeded rated capacity, shock loading that may have exceeded rated capacity, prolonged exposure to a corrosive atmosphere), the employer shall stop using the equipment and a qualified person shall:

(1) Inspect the equipment for structural damage.

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

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

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

(i) [Reserved]

(j) *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 (f)(Monthly) before being placed in service initial use.

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

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

1424 Fall Protection

(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 with lattice booms manufactured after January 1, 2008, shall be equipped with walkways on the boom(s) if the top surface of the boom is six or more feet above the ground during assembly/disassembly.

(2) *Boom walkway criteria.*

(a) The walkways shall be have a surface designed to provide a safe means of traversing the boom.

(b) The walkways shall be at least _____ inches wide.

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

(i) Prohibited on booms supported by ropes if the ropes could be snagged by the guardrails/railings/attachments.

(ii) Other than paragraph (i), permitted but not required.

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

(c) *Steps and railings.*

- (1) The employer shall maintain originally-equipped steps, ladders and guardrails/railings/grabrails in good condition.
- (2) Equipment manufactured after January 1, 2008, shall be equipped with steps or ladders, and guardrails/railings/grabrails for access and egress to the operator work station(s). These shall meet the following criteria:
 - (i) Steps, ladders and guardrails/railings/grabrails shall at least meet the [DIN standard (?)].
 - (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 feet above a lower level, as follows:

- (1) Fall protection equipment is permitted, but not required, for employees who are moving along a boom walkway to or from their work station.
- (2) While at a work station on any part of the equipment other than the boom or in the cab, the employee shall be protected by a fall protection system.
- (3) Employees at a work station on the boom shall be protected by a fall protection system (restraint system, positioning device system, or personal fall arrest system) if the affected boom members meet the anchorage criteria for one (or more) of these systems.
 - (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 Lifting [?] Personnel

The requirements of this section are supplemental to the other requirements in this Subpart.

(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. [ANSI requires this finding to be documented – is that needed?]

[Are there any types of cranes/derricks that should be prohibited from hoisting personnel?]

(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 _____. [Need to discuss use of boatswain's chairs]

(2) *Exception:* A personnel platform is not required for employees engaged in communication tower construction where the requirements in paragraph (o) are met. [we'll need to identify which paragraphs in 1425 will apply when not using a personnel platform]

(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 fully extended and locked, following manufacturer's specifications, insofar as applicable, when hoisting employees.

(d) *Equipment criteria.*

(1) *Capacity: use of suspended personnel platforms.*

(i) Load lines [this means wire rope or synthetics can be used] shall be capable of supporting, without failure, at least seven times the maximum intended load [define], except that where rotation resistant rope is used, the lines shall be capable of supporting without failure, at least ten times the maximum intended load. The required design factor is achieved by taking the normal safety factor of 3.5 and applying the 50 percent derating of the crane capacity required by paragraph (1926.550(g)(3)(i)(E)). [Is there a way of making this clearer?]

(ii) The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane/derrick (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 crane/derrick (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) shall be engaged.

(4) *Devices.*

(i) Equipment with a variable angle boom [and/or jib?] shall be equipped with a boom/jib angle indicator, readily visible to the operator.

(ii) Equipment with telescoping booms shall be equipped with a device to indicate the boom's extended length clearly to the operator, .

(6) ~~or~~ [A]n accurate determination of the load radius to be used during the lift shall be made prior to hoisting personnel.

(iii) *Anti-two-block.* When using a suspended personnel platform, a device that automatically prevents two-blocking at each point where two-blocking could occur shall be used. Examples of such devices include:

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

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

(iv) *Controlled load lowering.* The load line hoist drum shall have a system or device on the power train, 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)). [Does this apply to boom-attached personnel platforms?] [What about controlled-boom lowering?]

(NOTE: The use of equipment in which the boom hoist mechanism can free fall is 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 to be used as a substitute for a properly working device.

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

(6) [ANSI B30.23-1.2.2(a)(9) requires positive stops if using “pendant supported, jib type, boom extensions” – should we require that?]

(e) *Personnel platform criteria.*

(1) The personnel platform and attachment/suspension system shall be designed for hoisting personnel by a registered professional engineer [~~or 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. [New – this is similar provision is in ANSI B 30.23-1.1.2(a)(2)]

[ANSI has detailed design factors/criteria (23-1.1.1(a)) – should these be included? Incorporated by reference?]

(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 qualified 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 [should we exempt access gates or doors?].

(8) *Access gates.* If installed, access gates 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, which does not obscure the view of the operator or platform occupants (such wire mesh that has up to ½ inch openings), when employees are exposed to falling objects. [ANSI (23-1.1(b)(11)) and ISO require a clear view]

(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 or maximum intended load, shall be conspicuously posted on the platform with a plate or other permanent marking. [Much more extensive info required by ANSI B30.23-1.1(b)(7)]

(f) *Personnel platform loading.*

(1) The personnel platform shall not be loaded in excess of its rated load capacity. When a personnel platform does not have a rated load capacity, it shall not be loaded in excess of its maximum intended load (the total load of all employees, tools, materials, and other loads reasonably anticipated to be applied to a personnel platform or personnel platform component at any one time).

(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 [3? (Corps of Engineers' & ISO limit); 6?] [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 a bolt, nut and retaining pin, in place.

(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 [wire or synthetics – right?] is used to connect suspend the personnel platform to the load line, each bridle leg shall be

connected to a master link or shackle 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)[what about hooks?] must be capable of supporting, without failure, at least five times the maximum intended load [why not use rated load capacity? Should we be consistent throughout?] applied or transmitted to that component. 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 lightweight 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 operator determines that the route change is insignificant (i.e., the route change would not affect the safety of hoisted employees) the new route presents no new factors affecting safety.

(3) The operator shall determine that:

(i) The systems [what systems?] and controls are activated and functioning properly. Safety devices and operational aids required by this section must be 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 equipment configurations necessary to reach the work locations will allow the operator to remain under the 50 percent limit of the hoist's equipment's rated capacity.

(4) Immediately after the trial lift, a visual inspection of the equipment, base support or ground, and personnel platform, shall be conducted by a competent person to determine whether the testing trial lift has exposed any defect or problem or produced any adverse effect upon any part of the equipment, rigging/accessories, personnel platform or structure.

(5) ~~After the trial lift, and just prior to hoisting personnel,~~ Just prior to each lift:

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

(ii) The following conditions must be determined [by a competent person? qualified 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 stated [?] seated on drums and in sheaves.

~~(6) Any defects or problems found during inspections and trial lifts which fail to meet a requirement of this subpart or otherwise create a safety hazard shall be corrected before hoisting personnel.~~

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 [DOE adds "and hook block" – should we add that?] shall be proof tested to 125% [1998 ANSI was 150% after a repair/modification; 2000 ANSI is 2 X rated capacity] percent of the

platform's rated capacity. The proof test may be done concurrently with the trial lift.

(2) The platform shall be held in a suspended position for a minimum of five minutes with the test load evenly distributed on the platform. [Do we need to add the concept of lowering at a set speed, then braking and holding as ANSI B-30.23-2.2.1(b)(1) & (b)(3) does?]

(3) After proof testing, a [competent] [qualified] person shall inspect the platform and rigging to determine if the test has been passed [what are we looking for? What would a "deficiency" be?]. If any significant deficiencies are found, the platform and rigging shall not be used to hoist personnel unless the deficiencies are corrected, the test is repeated, and a [competent] [qualified] person determines that the test has been passed.

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

[ANSI says that you "should" use the same hoisting equipment in the proof testing that will be used in the personnel lift – why? Isn't the hoisting equipment tested in the trial lift?]

[Do we need documentation of 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) Occupants shall keep all parts of the body inside the platform during raising, lowering, [what about horizontal movement?], and positioning. This provision does not apply to an occupant of the platform when performing the duties of a signal person.

[ANSI adds:

-- occupants shall not stand, sit on, or work from the top or intermediate rail or toeboard, or use any other device to enhance their vertical height working capability

-- occupants shall not pull the platform out of plumb with 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 creates an unsafe situation would create a greater hazard.

[ANSI adds that, if tied to the structure, the operator shall not move the platform until it is verified that it is freely suspended]

(4) Tag lines shall be used except where their use creates an unsafe condition would create a greater hazard.

(5) ~~The equipment operator shall remain at the controls at all times when the equipment engine is running and the platform is occupied.~~

(5) *Platforms without controls.* Where the platform is not equipped with controls [do these controls ever include controls to make the equipment travel?] ~~and the equipment engine is running,~~ the equipment operator shall remain at the equipment controls at all times while the platform is occupied.

(6) *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. [Is this strong enough?]

(ii) The equipment operator must be at the equipment controls, 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.

-- Should there be a requirement regarding simultaneous operation of cab and platform controls?]

(7) *Environmental conditions.*

(i) *Wind.* The use of equipment to hoist personnel is prohibited where wind velocity (sustained or gusts) exceeds 20 mph.

(ii) Personnel shall not be hoisted unless visibility is clear and there are no indications of dangerous weather conditions or other impending danger.

(iii) Hoisting of personnel shall be promptly discontinued upon indication of an impending or existing danger such as lack of clear visibility (for example, from darkness, snow or fog), dangerous weather conditions, or other danger.

[ANSI prohibits hoisting personnel where there is a lack of clear visibility (darkness, fog, snow)]

(8) Employees being hoisted shall:

(i) Remain in direct communication with the signal person (where used), or the operator.

(ii) Remain in continuous sight of the operator, unless both of the following conditions are present: remaining in continuous sight is not possible and the use of a signal person would create a greater hazard for that person.

[So the current standard allows hoisting personnel in blind picks without a signal person – is that a good idea?]

[Should a signal person be required whenever using a personnel platform, or is 1408 sufficient? Note that ANSI requires the operator to move the platform “under the direction” of a signalperson]

(9) *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 one of the following:

(A) The lower load block or overhaul ball.

(B) 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.

(10) *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.

(ii) *Factory-produced 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.

(11) *Traveling.*

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

(A) Equipment that travels on fixed rails [ANSI also allows on a “runway” – what type of equipment would use a runway? Do portal and tower cranes travel on 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 the load radius of the boom used during the lift.

(D) The boom must be parallel to the direction of travel.

(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 for communication tower work.*

[Communication Tower Directive provisions].

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.

1427 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.

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 sufficient, in conjunction (if necessary) with the use of supporting materials, to meet the

equipment manufacturer's specifications for adequate support and degree of level of the equipment.

(c) The controlling contractor shall:

(1) Make or arrange for ground preparations necessary to meet the requirements in paragraph (b).

(2) Inform the operator of voids beneath the equipment set-up area that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are in the possession of the controlling contractor.

(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 inform the controlling contractor of 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 Zone Control

(a) *Swing radius hazards.*

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

(i) Strike an employee; or

(ii) Pinch/crush 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 in how to recognize struck-by and pinch/crush hazard areas posed by the rear of 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 (such as black and yellow stripes/chevrons) that identify the hazard areas. [Add swing alarms?] In addition, the employer shall train the employees to understand what these markings signify.

(3) Work materials and personal items shall be prohibited from being placed in the hazard areas.

(b) Multiple equipment coordination.

(1) *Preventing contact with other cranes/derricks.* Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling employer shall institute a system to coordinate operations and prevent collisions. If there is no controlling employer, the employer(s) of each operator shall institute such a system.

(2) *Preventing contact with other machinery.* Where the working radius of machinery that has a moveable boom (but is not covered by this standard) is within the working radius of a crane/derrick, the controlling employer shall institute a system to coordinate operations and prevent collisions. If there is no controlling employer, the employer of the crane/derrick operator shall notify the machinery operator of the crane/derrick's area of operation. The employer of the operator of the crane/derrick and the employer of the operator of the other machinery shall institute a system to coordinate operations and prevent collisions.

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 directly under the load.
- (ii) A personnel platform 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.
- (iv) The load is over a shaft.

(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?]

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