

DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

DIRECTOR'S OFFICE

CONSTRUCTION SAFETY STANDARDS

(By authority conferred on the director of the department of licensing and regulatory affairs by sections 19 and 21 of 1974 PA 154, and Executive Reorganization Order Nos. 1996-2, 2003-18, 2008-4, and 2011-4, MCL 408.1019, 408.1021, 445.2001, 445.2011, 445.2025, and 445.2030)

PART 10. LIFTING AND DIGGING EQUIPMENT

R 408.41001 Rescinded.

History: 1979 AC; 1983 AACS; 1995 AACS.

R 408.41001a Scope.

Rule 1001a. (1) This standard applies to power operated equipment, when used in construction, that can hoist, lower, and horizontally move a suspended load. Such equipment includes, but is not limited to, any of the following:

- (a) Articulating cranes, such as knuckle-boom cranes.
- (b) Crawler cranes.
- (c) Floating cranes.
- (d) Cranes on barges.
- (e) Locomotive cranes.
- (f) Mobile cranes, such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes.
- (g) Multi-purpose machines when configured to hoist and lower by means of a winch or hook and horizontally move a suspended load.
- (h) Industrial cranes, such as carrydeck cranes.
- (i) Dedicated pile drivers.
- (j) Service/mechanic trucks with a hoisting device.
- (k) Crane on a monorail.
- (l) Tower cranes, such as a fixed jib, for example, "hammerhead boom", luffing boom and self-erecting.
- (m) Pedestal cranes.
- (n) Portal cranes.
- (o) Overhead and gantry cranes.
- (p) Straddle cranes.
- (q) Sideboom cranes.
- (r) Derricks.
- (s) Material and personnel hoists.
- (t) Helicopter cranes, elevators, and excavation equipment and variations of such equipment.

(2) Attachments. This standard applies to equipment included in subrule (1) of this rule when used with attachments. These attachments, whether crane-attached or suspended include, but are not limited, to any of the following:

- (a) Hooks.
- (b) Magnets.
- (c) Grapples.
- (d) Clamshell buckets.
- (e) Orange peel buckets.
- (f) Concrete buckets.
- (g) Drag lines.
- (h) Personnel platforms.
- (i) Augers or drills.
- (j) Pile driving equipment.

(3) Exclusions. This standard does not cover any of the following:

(a) Machinery included in subrule (1) of this rule while it has been converted or adapted for a non-hoisting or lifting use. These conversions or adaptations include, but are not limited, to any of the following:

- (i) Wheel loaders and backhoes.
- (ii) Loader backhoes.
- (iii) Track loader.
- (iv) Concrete pumps.

This machinery is also excluded when used with chains, slings, or other rigging to lift suspended loads.

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

(c) Digger derricks used in work subject to construction safety standard part 16 “Power Transmission and Distribution,” shall comply with general industry safety standard part 86 “Electric Power Generation, Transmission and Distribution.” Digger derricks used in construction work for telecommunication service (as defined at construction safety standard part 30 “Telecommunications,” 1910.268(s)(40)) shall comply with construction safety standard part 30 “Telecommunications”. These rules are referenced in R 408.41003a.

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

(e) Telescopic or hydraulic gantry systems.

(f) Stacker cranes.

(g) Powered industrial trucks, such as, forklifts, except when configured to hoist and lower by means of a winch or hook and horizontally move a suspended load.

(h) Mechanic’s truck with a hoisting device when used in activities related to equipment maintenance and repair.

(i) Machinery that hoists by using a come-a-long or chainfall.

(j) Dedicated drilling rigs.

(k) Gin poles when used for the erection of communication towers.

(l) Tree trimming and tree removal work.

(m) Anchor handling or dredge-related operations with a vessel or barge using an affixed A-frame.

(n) Roustabouts.

(o) Any of the following material delivery:

(i) Articulating knuckle-boom truck cranes that deliver material to a construction site when used to transfer materials from the truck crane to the ground, without arranging the materials in a particular sequence for hoisting.

(ii) Articulating knuckle-boom truck cranes that deliver material to a construction site when the crane is used to transfer building supply sheet goods or building supply packaged materials from the truck crane onto a structure, using a fork or cradle at the end of the boom, but only when the truck crane is equipped with a properly functioning automatic overload prevention device. These sheet goods or packaged materials include, but are not limited to, sheets of sheet rock, sheets of plywood, bags of cement, sheets or packages of roofing shingles, and rolls of roofing felt.

(iii) This exclusion shall not apply under the following circumstances:

(A) The articulating knuckle-boom crane is used to hold, support or stabilize the material to facilitate a construction activity, such as holding material in place while it is attached to the structure.

(B) The material being handled by the articulating knuckle-boom crane is a prefabricated component. Prefabricated components include, but are not limited to precast concrete members or panels, roof trusses constructed of wood, cold formed metal, steel, or other materials, prefabricated building sections such as, but not limited to floor panels, wall panels, roof panels, roof structures, or similar items.

(C) The material being handled by the crane is a structural steel member for example, steel joists, beams, columns, bundled or unbundled steel decking or a component of a systems-engineered metal building, as defined in construction safety standard part 26 “Steel Erection,” as referenced in R 408.41003a.

(D) The activity is not specifically excluded under R 408.41001a(3)(q)(i) and (ii).

(4) All rules of this part apply to the equipment covered by this standard unless specified otherwise.

(5) The duties of controlling entities under this standard include, but are not limited to, the duties specified in R 408.41017a(2), R 408.41017a(4), and R 408.41022a(2).

(6) Where provisions of this standard direct an operator, crewmember, or other employee to take certain actions, the employer shall establish, effectively communicate to the relevant persons, and enforce, work rules to ensure compliance with the provisions.

(7) For work involving power transmission and distribution, compliance with general industry safety standard part 86 “Electric Power Generation, Transmission and Distribution” R 1910.269(p) is deemed compliance with R 408.41016a through R 408.41016e.

(8) R 408.41017a does not apply to cranes designed for use on railroad tracks, when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213, and that comply with applicable Federal Railroad Administration requirements. See R 408.41017a(5).

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41002a Rescinded.

History: 1995 AACS; 2012 AACS.

R 408.41003a Adopted and referenced standards.

Rule 1003a. (1) The following standards are adopted by reference in these rules and are available from IHS Global, 15 Inverness Way East, Englewood, Colorado, 80112, USA, telephone number: 1-800-854-7179 or via the internet at website: <http://global.ihs.com>; at a cost as of the time of adoption of these rules, as stated in this subrule.

(a) American National Standards Institute (ANSI) standard A10.4 “Safety Requirements for Personnel Hoists and Employee Elevators for Construction and Demolition Operations,” 2004 edition. Cost: \$128.00.

(b) ANSI Standard B20.1, “Safety Standard for Conveyors, and Related Equipment,” 1999 edition. Cost: \$52.00

(c) ANSI/ American Society of Mechanical Engineers (ASME) standard B30.5 “Mobile and Locomotive Cranes,” 1994 edition. Cost: \$119.00.

(d) ANSI/ASME standard B30.5 “Mobile and Locomotive Cranes,” 2004 edition. Cost: \$60.00.

(e) ANSI/American Society of Safety Engineers (ASSE) standard A10.5 “Safety Requirements for Material Hoists,” 1992 edition. Cost: \$69.00.

(f) ASME standard B30.14 “Side Boom Tractors,” 2004 edition. Cost: \$64.00.

(g) ASME standard B30.2 “Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist),” 2005 edition. Cost: \$63.00.

(h) ASME standard B30.7 “Base Mounted Drum Hoists,” 1994 edition. Cost: \$60.00.

(i) ASME standard B30.7 “Base Mounted Drum Hoists,” 2001 edition. Cost: \$60.00.

(j) American Welding Society (AWS) standard “IHS AWSC Structural Welding Code,” 2000 edition. Cost: \$601.00.

(k) AWS standard D1.1/D1.1M “Structural Welding Code – Steel Updates Every 5 Years,” 2002 edition. Cost: \$468.00.

(l) AWS standard D14.1 “Welding of Industrial and Mill Cranes and Other Material Handling Equipment,” 1997 edition. Cost: \$148.00.

(m) AWS standard D14.3 “Specification for Welding Earthmoving and Construction Equipment,” 1994 edition. Cost: \$109.00.

(n) AWS standard D14.4 “Class and Application of Welded Joints for Machinery Equipment,” 1997 edition. Cost: \$139.00.

(o) International Organization for Standardization (ISO) standard 11660–1 “Cranes – Access, Guards and Restraints – Part 1: General,” 2008 edition. Cost: \$139.00.

(p) ISO standard 11660–2 “Cranes – Access, Guards and Restraints – Part 2: Mobile Cranes,” 1994 edition. Cost: \$107.00.

(q) ISO standard 11660–3 “Cranes – Access, Guards and Restraints – Part 3: Tower Cranes,” 2008 edition. Cost: \$65.00.

(r) Society of Automotive Engineers (SAE) standard J185, “Access Systems for Off-Road Machines,” May 2003 edition. Cost: \$73.00.

(s) SAE standard J987 “Lattice Boom Cranes – Method of Test,” June 2003 edition. Cost: \$73.00

(t) SAE standard J1063 “Cantilevered Boom Crane Structures – Method of Test,” November 1993 edition. Cost: \$73.00.

(2) The following standards are adopted by reference in these rules and are available from Techstreet, 3916 Ranchero Drive, Ann Arbor, Michigan, 48108, USA, telephone number: 1-800-699-9277 or via the internet at website: [www.techstreet.com](http://www.techstreet.com); at a cost as of the time of adoption of these rules, as stated in this subrule.

(a) ANSI standard B20.1, “Safety Standard for Conveyors, and Related Equipment,” 2000 edition. Cost: \$67.00.

(b) AWS standard B1.10 “Guide for the Nondestructive Inspection of Welds,” 1986 edition. Cost: \$60.00.

(c) British European Standards (BS EN) standard 13000, “Cranes – Mobile Cranes,” 2004 edition. Cost: \$244.61.

(d) BS EN standard 14439, “Cranes – Safety – Tower Cranes,” 2006 edition. Cost: \$202.18.

(3) Power Crane and Shovel Association (PCSA) Standard No. 4 “Mobile Power Crane and Excavator and Hydraulic Crane Standards,” 1983 edition, is adopted by reference in these rules. This standard is available from the Association of Equipment Manufacturers, 6737 West Washington Street, Suite 2400, Milwaukee, Wisconsin, 53214-5647, USA, telephone number: 1-414-272-0943 or via the internet at website: <http://shop.aem.org>; at a cost as of the time of adoption of these rules of \$3.00.

(4) The following federal occupational safety and health administration’s regulations promulgated by the United States department of labor are adopted by reference in this rule and are available from the United States Department of Labor, Occupational Safety and Health Administration, 315 West Allegan, room 315, Lansing, Michigan, 48917, or via the internet at website [www.osha.gov](http://www.osha.gov), at no charge as of the time of adoption of these rules.

(a) The provisions of 29 C.F.R. §1910.7 Definition and requirements for a nationally recognized testing laboratory.

(b) The provisions of 29 C.F.R. §§1926.555 Conveyors, except as amended in this rule.

(c) As of the effective date of this part, subpart G referenced in the provisions of 19 C.F.R. §1926.555 Conveyors means construction safety standard Part 22 “Signals, Signs, Tags, and Barricades,” as referenced in R 408.41003a.

(d) The provisions of 29 C.F.R. §1926.556, as incorporated by reference under section 14(1) of 1974 PA 154, MCL 408.1014(1), are hereby rescinded as authorized by section 14(1).

(e) Conveyors. The provisions of 29 C.F.R. §1926.555 are amended to read as follows.

(i) Means for stopping the motor or engine shall be provided at the operator’s station. Conveyor systems shall be equipped with an audible warning signal to be sounded immediately before starting up the conveyor.

(ii) If the operator’s station is at a remote point, the employer shall provide similar provisions for stopping the motor or engine at the motor or engine location.

(iii) Emergency stop switches shall be arranged so that the conveyor cannot be started again until the actuating stop switch has been reset to running or the “on” position.

(iv) Screw conveyors shall be guarded to prevent employee contact with turning flights.

(v) Where a conveyor passes over work areas, aisles, or thoroughfares, the employer shall provide suitable guards to protect employees required to work below the conveyors.

(vi) The employer shall ensure that all crossovers, aisles, and passageways are conspicuously marked by suitable signs, as required by subpart G of this part.

(vii) The employer shall ensure that conveyors are locked out or otherwise rendered inoperable, and tagged out with a "DO NOT OPERATE" tag during repairs and when operation is hazardous to employees performing maintenance work.

(viii) All conveyors in use shall meet the applicable requirements for design, construction, inspection, testing, maintenance, and operation, as prescribed in the ANSI Standard B20.1, "Safety Standard for Conveyors, and Related Equipment," 1999 edition.

(5) The provisions of 49 C.F.R. §§391.41 to 391.49 of the United States department of transportation are adopted by reference in this rule and are available from the United States Department of Transportation, 1200 New Jersey Avenue, SE, Washington, DC 20590, or via the internet at website [www.access.gpo.gov/nara/cfr/waisidx\\_06/49cfr391\\_06.html](http://www.access.gpo.gov/nara/cfr/waisidx_06/49cfr391_06.html), at no charge as of the time of adoption of these rules.

(6) The provisions of 1967 PA 227 and 1976 PA 333, MCL 408.801 to 408.824 and 338.2151, respectively, are adopted by reference in this rule and are available via the internet at website [www.legislature.mi.gov](http://www.legislature.mi.gov), at no charge as of the time of adoption of these rules.

(7) The standards adopted in subrules (1) to (6) of this rule are also available for inspection at the Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143.

(8) Copies of the standards adopted in subrules (1) to (6) of this rule may be obtained from the publisher or may also be obtained from the Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143, at the cost charged in subrules (1) to (6) of this rule, plus \$20.00 for shipping and handling.

(9) The following Michigan occupational safety and health standards are referenced in these rules. Up to 5 copies of these standards may be obtained at no charge from the Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143 or via the internet at website: [www.michigan.gov/mioshastandards](http://www.michigan.gov/mioshastandards). For quantities greater than 5, the cost, as of the time of adoption of these rules, is 4 cents per page.

(a) Construction safety standard part 6 "Personal Protective Equipment," R 408.40601 to R 408.40641.

(b) Construction safety standard part 8 "Handling and Storage of Materials," R 408.40801 to R 408.40841.

(c) Construction safety standard part 13 "Mobile Equipment," R 408.41301.

(d) Construction safety standard part 16 "Power Transmission and Distribution," R 408.41601 to R 408.41658.

(e) Construction safety standard part 18 "Fire Protection and Prevention," R 408.41801 to R 408.41884.

(f) Construction safety standard part 22 "Signals, Signs, Tags, and Barricades," R 408.42201 to R 408.42243.

(g) Construction safety standard part 26 "Steel Erection," R 408.42601 to R 408.42656.

(h) Construction safety standard part 28 "Personnel Hoisting in Steel Erection," R 408.42801 to R 408.42809.

(i) Construction safety standard part 30 "Telecommunications," R 408.43001 to R 408.43006.

(j) Construction safety standard part 45 "Fall Protection," R 408.44501 to R 408.44501.

(k) General industry safety standard part 18 "Overhead and Gantry Cranes," R 408.11801 to R 408.11875.

(l) General industry safety standard part 59 "Helicopters," being R 408.15901 to R 408.15931.

(m) General industry safety standard part 86 "Electric Power Generation, Transmission, and Distribution," R 408.18601 to R 408.18602.

History: 1995 AACS; 2012 AACS.

R 408.41004a Definitions; A to J.

Rule 1004a. (1) "A/D director" means the assembly/disassembly director who is an individual that meets this standard's requirements of a competent and qualified person, or by a competent person who is assisted by 1 or more qualified persons, irrespective of the person's formal job title or whether the person is non-management or management personnel.

(2) "Articulating crane" means a crane whose boom consists of a series of folding, pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders.

(3) "Assembly or disassembly" means the assembly, disassembly, or both, of equipment covered under this standard. With regard to tower cranes, "erecting and climbing" replaces the term "assembly," and "dismantling" replaces the term "disassembly." Regardless of whether the crane is initially erected to its full height or is climbed in stages, the process of increasing the height of the crane is an erection process.

(4) "Assist crane" means a crane used to assist in assembling or disassembling a crane.

(5) "Attachments" means any device that expands the range of tasks that can be done by the equipment. Examples include, but are not limited to, an auger, drill, magnet, pile-driver, and boom-attached personnel platform.

(6) "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.

(7) "Base-mounted drum hoist" means a self-contained lifting unit which has a motor, a drum to receive the lifting cable, and mounting flanges for anchoring.

(8) "Blocking," also referred to as "cribbing," means wood or other material used to support equipment or a component and distribute loads to the ground. Blocking is typically used to support lattice boom sections during assembly/disassembly and under outrigger and stabilizer floats.

(9) "Boatswain's chair" means a single-point adjustable suspension scaffold consisting of a seat or sling, which may be incorporated into a full body harness, designed to support 1 employee in a sitting position.

(10) "Bogie" means "travel bogie," as defined in R 408.41005a(60).

(11) "Boom" when used on equipment other than a tower crane, means an inclined spar, strut, or other long structural member which supports the upper hoisting tackle on a crane or derrick. Typically, the length and vertical angle of the boom can be varied to achieve

increased height or height and reach when lifting loads. Booms may be grouped into general categories of hydraulically extendible, cantilevered type, latticed section, cable supported type or articulating type.

(12) "Boom" or principle horizontal structure, when used on a tower crane, means if it is moveable up and down. If the "boom" is fixed, it is referred to as a jib.

(13) "Boom angle indicator" means a device which measures the angle of the boom relative to horizontal.

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

(15) "Boom length indicator" indicates the length of the permanent part of the boom or the length of the boom with extensions/attachments.

(16) "Boom stop" means a device that is used to limit the angle of the boom at the highest recommended position. Boom stop includes boom stops, belly straps with struts or standoff, telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward.

(17) "Boom suspension system" means a system of pendants, running ropes, sheaves, and other hardware which supports the boom tip and controls the boom angle.

(18) "Builder" means the builder or constructor of equipment.

(19) "Center of gravity" means the center of gravity of any object is the point in the object around which its weight is evenly distributed. If a support were put under that point, it could balance the object on the support.

(20) "Certified welder" means a welder who meets nationally recognized certification requirements applicable to the task being performed.

(21) "Climbing" means the process in which a tower crane is raised to a new working height, either by adding additional tower sections to the top of the crane (top climbing), or by using a system in which the entire crane is raised inside the structure (inside climbing).

(22) "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.

(23) "Commercial truck-mounted crane" means a crane which consists of a rotating superstructure either a center post or turntable, a boom, operating machinery, and 1 or more operator's stations, which is mounted on a frame that is attached to a commercial truck chassis, which typically retains a payload hauling capability, and which has a power source that typically powers the crane. The crane's function is to lift, lower, and swing loads at various radii.

(24) "Competent person" means a person who is trained, experienced, and capable of identifying an existing or potential hazard in surroundings, or under working conditions, that are hazardous or dangerous to an employee and who has the authority and knowledge to take prompt corrective measures to eliminate the hazards.

(25) "Controlled load lowering" means lowering a load by means of a mechanical hoist drum device that allows a hoisted load to be lowered with maximum control using the gear train or hydraulic components of the hoist mechanism. Controlled load lowering



requires the use of the hoist drive motor, rather than the load hoist brake, to lower the load.

(26) "Controlling entity" means an employer that is a prime contractor, general contractor, construction manager or any other legal entity which has the overall responsibility for the construction of the project including its planning, quality, and completion.

(27) "Counterweight" means a weight that is used to supplement the weight of the machine in providing stability for lifting working loads.

(28) "Crane/derrick" includes all equipment covered by this standard.

(29) "Crawler crane" means a crane which consists of a rotating superstructure that has a power plant, operating machinery, and a boom and which is mounted on a base and equipped with crawler treads for travel. The crane's function is to lift, lower, and swing loads at various radii.

(30) "Crawler excavator" means a device which consists of a rotating superstructure that has a power plant, operating machinery, and a boom, and which is mounted on a base, and which is equipped with crawler treads for travel. The function of the excavator is to dig, lift, lower, and swing loads at various radii.

(31) "Crossover points" means locations on a wire rope which is spooled on a drum where 1 layer of rope climbs up on and crosses over the previous layer. This takes place at each flange of the drum as the rope is spooled onto the drum, reaches the flange, and begins to wrap back in the opposite direction.

(32) "Dedicated channel" means a line of communication assigned by the employer who controls the communication system to only 1 signal person and a crane/derrick or to a coordinated group of cranes/derricks, signal person or persons.

(33) "Dedicated pile-driver" means 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.

(34) "Dedicated spotter" means an employee who meets the requirements for signal person qualifications and whose sole responsibility is to watch the separation between the power line and the equipment, load line and load including rigging and lifting accessories, and ensure through communication with the operator that the applicable minimum approach distance is not breached.

(35) "Derrick" means powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting mechanism. The mast or equivalent member, or the load, or both are moved by the hoisting mechanism, which is typically base-mounted, and operating ropes. Derricks include A-frame, basket, breast, Chicago boom, gin pole, except gin poles used for erection of communication towers, guy, shearleg, stiffleg, and variations of such equipment.

(36) "Directly under the load" means when any part of an employee is directly beneath the load.

(37) "Dismantling" includes complete and partial dismantling, such as dismantling to shorten a boom or substitute a different component.

(38) "Drum rotation indicator" means a device on a crane or hoist which indicates in which direction and at what relative speed a particular hoist drum is turning.

(39) "Dynamic loading" means the loads introduced into the machine or its components by forces in motion.

(40) "Electrical contact" occurs when a person, object, or equipment makes contact or comes in close proximity with an energized conductor or equipment that allows the passage of current.

(41) "Employer-made equipment" means floating cranes/derricks designed and built by an employer for the employer's own use.

(42) "Employer's qualified evaluator" means a person employed by the signal person's employer who has demonstrated that he or she is competent in accurately assessing whether individuals meet the requirements of R 408.41011a(3) for a signal person.

(43) "Encroachment" means where any part of the crane, load line or load, including rigging and lifting accessories, breaches a minimum clearance distance that this standard requires to be maintained from a power line.

(44) "Equipment" means equipment covered by this standard.

(45) "Equipment criteria" means instructions, recommendations, limitations, and specifications.

(46) "Fall protection equipment" means guardrail systems, safety net systems, personal fall arrest systems, positioning device systems, or fall restraint systems.

(47) "Fall restraint system" means a fall protection system that prevents the user from falling any distance. The system is comprised of either a body belt or body harness, along with an anchorage, connectors, and other necessary equipment. The other components typically include a lanyard, and may also include a lifeline and other devices.

(48) "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.

(49) "Flange point" means a point of contact between the rope and the drum flange where the rope changes layers.

(50) "Floating cranes/derricks" means equipment designed by the manufacturer or employer for marine use by permanent attachment to a barge, pontoons, vessel, or other means of flotation.

(51) "For example" means 1 example, although there are others.

(52) "Free fall" means that only the brake is used to regulate the descent of the load line. The drive mechanism is not used to drive the load down faster or retard its lowering.

(53) "Free surface effect" means the uncontrolled transverse movement of liquids in compartments which reduce a vessel's transverse stability.

(54) "Friction drum hoist" means a hoist which has a drum that is controlled by friction clutches and brakes and which is provided with drum ratchets and pawls.

(55) "Ground conditions" means the ability of the ground to support the equipment including, but not limited to slope, compaction, and firmness.

(56) "Gudgeon pin" means a pin that is used to connect the base of a boom to the main frame.

(57) "Hoist" means a system of power driven drums, gears, cables, chains, or hydraulic cylinders capable of lifting and lowering loads.

(58) "Hoist tower" means a vertical structure used to support or house the platform and cab of an elevator or hoist.

(59) "Hoisting" means the act of raising, lowering, or otherwise moving a load in the air with equipment covered by this standard. As used in this standard, "hoisting" can be done by means other than wire rope/hoist drum equipment.

(60) "Include" or "including" means including, but not limited to.

(61) "Insulating link or device" means an insulating device listed, labeled, or accepted by a nationally recognized testing laboratory in accordance with 29 CFR 1910.7.

(62) "Jib stop" or "jib backstop" means the same type of device as a boom stop but is for a fixed or luffing jib.

History: 1995 AACS; 2012 AACS.

## CRANES, DERRICKS, AND EXCAVATION EQUIPMENT

R 408.41005a Definitions; L to W.

Rule 1005a. (1) "Land crane/derrick" means equipment not originally designed by the manufacturer for marine use by permanent attachment to barges, pontoons, vessels, or other means of floatation.

(2) "Landing" means the floor or stage elevation at which the cab or platform can be entered.

(3) "Line pull" means the manufacturer's recommended load in pounds or kilograms applied to the rope attached to the hoist drum.

(4) "List" means the angle of inclination about the longitudinal axis of a barge, pontoons, vessel or other means of floatation.

(5) "Load" means to the object or objects being hoisted, the weight of the object or objects, or both. Both uses refer to the object or objects and the load-attaching equipment. This may include the load block, ropes, slings, shackles, and any other ancillary attachment.

(6) "Load moment or rated capacity indicator" means a system which aids the equipment operator by directly or indirectly sensing the overturning moment on the equipment, for example, load multiplied by radius. The system compares this lifting condition to the equipment's rated capacity, and indicates to the operator the percentage of capacity at which the equipment is working. Lights, bells, or buzzers may be incorporated as a warning of an approaching overload condition.

(7) "Load moment or rated capacity limiter" means a system which aids the equipment operator by directly or indirectly sensing the overturning moment on the equipment, for example, load multiplied by radius. The system compares this lifting condition to the equipment's rated capacity. When the rated capacity is reached, it shuts off power to those equipment functions that can increase the severity of loading on the equipment, for example, hoisting, telescoping out, or luffing out. Typically, those functions which decrease the severity of loading on the equipment remain operational, for example, lowering, telescoping in, or luffing in.

(8) "Locomotive crane" means a crane which consists of a rotating superstructure that has a power plant, operating machinery, and a boom and which is mounted on a base or car that is equipped for travel on a railroad track. A locomotive crane may be self-

propelled or propelled by an outside source. The crane's function is to lift, lower, and swing loads at various radii.

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

(10) "Material hoist" means a mechanism for use in the hoisting or lowering of construction or demolition material. A material hoist is equipped with a platform, car, cage, or bucket that moves vertically on guide members.

(11) "Marine hoisted personnel transfer device" means a device that is designed to protect the employees being hoisted during a marine transfer and to facilitate rapid entry into and exit from the device. Such devices do not include boatswain's chairs when hoisted by equipment covered by this standard.

(12) "Marine worksite" means a construction worksite located in, on, or above the water.

(13) "Mobile crane" means a lifting device incorporating a cable suspended latticed boom or hydraulic telescopic boom designed to be moved between operating locations by transport over the road.

(14) "Moving point-to-point" means the times during which an employee is in the process of going to or from a work station.

(15) "Multi-purpose machine" means a machine that is designed to be configured in various ways, at least 1 of which allows it to hoist by means of a winch or hook and horizontally move a suspended load. For example, a machine that can rotate and can be configured with removable forks or tongs, for use as a forklift, or with a winch pack, jib with a hook at the end or a jib used in conjunction with a winch. When configured with the forks or tongs, the multi-purpose machine is not covered by this standard. When configured with a winch pack, jib with a hook at the end or a jib used in conjunction with a winch is covered by this standard.

(16) "Nationally recognized accrediting agency" means an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations. Examples of such accrediting agencies include, but are not limited to, the National Commission for Certifying Agencies and the American National Standards Institute.

(17) "Nonconductive" means that, because of the nature and condition of the materials used, and the conditions of use, including environmental conditions and condition of the material, the object in question has the property of not becoming energized, that is, it has high dielectric properties offering a high resistance to the passage of current under the conditions of use.

(18) "Operational aids" means devices that assist the operator in the safe operation of the crane by providing information or automatically taking control of a crane function.

(19) "Operational controls" means levers, switches, pedals, and other devices for controlling equipment operation.

(20) "Operator" means a person who is operating the equipment.

(21) "Overhead and gantry cranes" includes overhead, bridge, semi-gantry, cantilever gantry, wall, storage bridge, launching gantry cranes, and similar equipment, regardless of how it travels, whether on tracks, wheels, or other means.

(22) "Pawl or dog" means a device for positively holding a member against motion in 1 or more directions.

(23) "Pendants" includes both wire and bar types. Wire type means a fixed length of wire rope with mechanical fittings at both ends for pinning segments of wire rope together. Bar type means a bar is used instead of wire rope. Pendants are typically used in a latticed boom crane system to easily change the length of the boom suspension system without completely changing the rope on the drum when the boom length is increased or decreased.

(24) "Personal fall arrest system" means a system used to arrest an employee in a fall from a working level. The system consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combination of these.

(25) "Personnel hoist" means a type of elevator which is used for the raising or lowering of personnel and or materials and which is guided.

(26) "Portal crane" means a type of crane consisting of a rotating upperstructure, hoist machinery, and boom mounted on top of a structural gantry that may be fixed in 1 location or have travel capability. The gantry legs or columns usually have portal openings in between to allow passage of traffic beneath the gantry.

(27) "Power-controlled lowering" means a system or device in the power train, other than the load hoist brake, that can control the lowering rate of speed of the load hoist mechanism.

(28) "Power lines" means electric transmission and distribution lines.

(29) "Procedures" means, but are not limited to, instructions, diagrams, recommendations, warnings, specifications, protocols, and limitations.

(30) "Proximity alarm" means a device that provides a warning of proximity to a power line and that has been listed, labeled, or accepted by a nationally recognized testing laboratory in accordance with 29 CFR 1910.7.

(31) "Qualified person" means a person who, through attainment of a recognized degree or certificate of professional standing or by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

(32) "Qualified rigger" means an individual who is a qualified person with specific training and experience demonstrating the ability to solve or resolve problems relating to rigging.

(33) "Qualified signal person" means an individual who is a qualified person with specific training and experience demonstrating the ability to solve or resolve problems relating to signaling.

(34) "Range control limit device" is a device that can be set by an equipment operator to limit movement of the boom or jib tip to a plane or multiple planes.

(35) "Range control warning device" means a device that can be set by an equipment operator to warn that the boom or jib tip is at a plane or multiple planes.

(36) "Rated capacity" means the maximum working load permitted by the manufacturer under specified working conditions. These working conditions typically include a specific combination of factors such as equipment configuration, radii, boom length, and other parameters of use.

(37) "Rated capacity indicator" means the term as defined in R 408.41005a(6).

(38) "Rated capacity limiter" means the term as defined in R 408.41005a(7).

(39) "Reeving" means a rope system in which the rope travels around drums and sheaves.

(40) "Repetitive pickup points" means, when operating on a short cycle operation, the rope being used on a single layer and being spooled repetitively over a short portion of the drum.

(41) "Running rope" means a rope that travels around sheaves or drums.

(42) "Running wire rope" means a wire rope that moves over sheaves or drums.

(43) "Runway" means a firm, level surface designed, prepared, and designated as a path of travel for the weight and configuration of the crane being used to lift and travel with the crane suspended platform. An existing surface may be used as long as it meets these criteria.

(44) "Safety device" means a device used to prevent the unwanted or unsafe operation of a piece of equipment.

(45) "Sideboom crane" means a track-type or wheel-type tractor having a boom mounted on the side of the tractor, used for lifting, lowering, or transporting a load suspended on the load hook. The boom or hook can be lifted or lowered in a vertical direction only.

(46) "Signal system" means an audible or visual method of communication between the equipment operator and the persons on the landing or floors.

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

(48) "Stability" as it pertains to flotation devices, means the tendency of a barge, pontoons, vessel or other means of flotation to return to an upright position after having been inclined by an external force.

(49) "Standard method" means the protocol in Appendix A of this standard for hand signals.

(50) "Standing rope" including guy rope, means a supporting rope that maintains a constant distance between the points of attachment to the 2 components connected by the rope.

(51) "Such as" means "such as, but not limited to."

(52) "Superstructure" means upperworks.

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

(54) "Tagline" means a rope, usually fiber, that is attached to a lifted load for controlling load spinning and pendular motions or used to stabilize a bucket or magnet during material handling operations.

(55) "Telescoping boom" means a base boom from which 1 or more boom sections are extended for additional length.

(56) "Tender" means an individual responsible for monitoring and communicating with a diver.

(57) "Third party qualified evaluator" means an entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the requirements of R 408.41011a(3) for a signal person.

(58) "Tilt up or tilt down operation" means the raising or lowering of a load from the horizontal to vertical or vertical to horizontal.

(59) "Tower crane" means a type of lifting structure which utilizes a vertical mast or tower to support a working boom or jib in an elevated position. Loads are suspended from the working boom. While the working boom may be of the fixed type, horizontal or

angled, or have luffing capability, it can always rotate to swing loads, either by rotating on the top of the tower, referred to as top slewing, or by the rotation of the tower, referred to as bottom slewing. The tower base may be fixed in 1 location or ballasted and moveable between locations. Mobile cranes that are configured with a luffing jib or tower attachments are not considered tower cranes under this rule.

(60) "Travel bogie" as it pertains to tower cranes, means an assembly of 2 or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels.

(61) "Trim" means angle of inclination about the transverse axis of a barge, pontoons, vessel or other means of floatation.

(62) "Two-blocking" means a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component.

(63) "Unavailable procedures" means procedures that are no longer available from the manufacturer, or have never been available, from the manufacturer.

(64) "Upperstructure" means upperworks, as defined in subrule (65) of this rule.

(65) "Upperworks" means the revolving frame of equipment on which the operating machinery, and in many cases the engine, are mounted along with the operator's cab. The counterweight is typically supported on the rear of the upperstructure and the boom or other front end attachment is mounted on the front.

(66) "Up to" means "up to and including."

(67) "Winch head" means a rotating cylindrical drum that has curved end flanges and that is used for load handling by means of fiber rope coiled about its barrel with hand tension applied to the nonload end.

(68) "Wire rope" means a flexible rope constructed by laying steel wires into various patterns of multi-wired strands around a core system to produce a helically wound rope.

(69) "Working day" means all calendar days except weekends and holidays.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41006a Helicopter cranes.

Rule 1006a. Helicopter cranes in construction shall be used in accordance with general industry safety standard part 59 "Helicopters," as referenced in R 408.41003a.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41007a Rescinded.

History: 1995 AACS; 2012 AACS.

R 408.41008a Operator qualification and certification.

Rule 1008a. (1) The employer shall ensure that, prior to operating any equipment covered under this standard, the person is operating the equipment during a training period in accordance with subrule (5) of this rule, or the operator is qualified or certified to operate the equipment.

(a) Exceptions. Operator qualification or certification under this rule shall not be required for operators of any of the following:

(i) Derricks. See R 408.41025a.

(ii) Sideboom cranes. See R 408.41033a.

(iii) Excavation equipment. See R 408.41041a.

(iv) Material and personnel hoists, elevators. See R 408.41065a.

(v) Equipment with a maximum manufacturer-rated hoisting or lifting capacity of 2,000 pounds or less. See R 408.41034a.

(b) When operator qualification or certification is required under R 408.41008a, the employer shall provide the qualification or certification at no cost to operators who are employed by the employer at the time these rules become effective.

(2) Option (1): The following applies to certification by an accredited crane operator testing organization:

(a) For a testing organization to be considered accredited to certify operators under this standard, it shall comply with all of the following:

(i) Be accredited by a nationally recognized accrediting agency based on that agency's determination that industry recognized criteria have been met for all of the following:

(A) Written testing materials.

(B) Practical examinations.

(C) Test administration.

(D) Grading.

(E) Facilities and equipment.

(F) Personnel.

(ii) Administer written and practical tests that comply with both of the following:

(A) Assess the operator applicant regarding, at a minimum, the knowledge and skills listed in subrule (8)(a) and (b) of this rule.

(B) Provide different levels of certification based on equipment capacity and type.

(iii) Have procedures for operators to reapply and be retested if an operator applicant fails a test or is decertified.

(iv) Have testing procedures for recertification designed to ensure that the operator continues to meet the technical knowledge and skills requirements in subrule (8)(a) and (b) of this rule.

(v) Have the testing organization's accreditation reviewed by the nationally recognized accrediting agency at least every 3 years.

(b) An operator shall be deemed qualified to operate a particular piece of equipment if the operator is certified under subrule (2) of this rule for that type and capacity of equipment or for higher-capacity equipment of that type. If no accredited testing agency offers certification examinations for a particular type, capacity of equipment, or both, an operator shall be deemed qualified to operate that equipment if the operator has been certified for the type and capacity that is most similar to that equipment and for which a certification examination is available. The operator's certificate shall state the type and capacity of equipment for which the operator is certified.



(c) A certification issued under this option is portable.

(d) A certification issued under this subrule is valid for 5 years.

(3) Option (2): Qualification by an audited employer program. The employer's qualification of its employee shall meet all of the following requirements:

(a) The written and practical tests shall comply with either of the following:

(i) Have been developed by an accredited crane operator testing organization as provided under subrule (2) of this rule.

(ii) Have been approved by an auditor in accordance with the following requirements:

(A) The auditor is certified to evaluate these tests by an accredited crane operator testing organization as provided under subrule (2) of this rule.

(B) The auditor is not an employee of the employer.

(C) The approval shall be based on the auditor's determination that the written and practical tests meet nationally recognized test development criteria and are valid and reliable in assessing the operator applicants regarding, at a minimum, the knowledge and skills listed in subrule (8)(a) and (b) of this rule.

(D) The audit shall be conducted in accordance with nationally recognized auditing standards.

(b) The following apply to administration of tests:

(i) The written and practical tests shall be administered under circumstances approved by the auditor as meeting nationally recognized test administration standards.

(ii) The auditor shall be certified to evaluate the administration of the written and practical tests by an accredited crane operator testing organization as provided under subrule (2) of this rule.

(iii) The auditor shall not be an employee of the employer.

(iv) The audit shall be conducted in accordance with nationally recognized auditing standards.

(c) The employer program shall be audited within 3 months of the beginning of the program and at least every 3 years thereafter.

(d) The employer program shall have testing procedures for requalification designed to ensure that the operator continues to meet the technical knowledge and skills requirements in subrule (8)(a) and (b) of this rule. The requalification procedures shall be audited in accordance with subrule (3)(a) and (b) of this rule.

(e) Deficiencies. If the auditor determines that there is a significant deficiency in the program, the employer shall ensure all of the following:

(i) No operator is qualified until the auditor confirms that the deficiency has been corrected.

(ii) The program is audited again within 180 days of the confirmation that the deficiency was corrected.

(iii) The auditor files a documented report of the deficiency to the Michigan occupational safety and health administration within 15 days of the auditor's determination that there is a deficiency.

(iv) Records of the audits of the employer's program are maintained by the auditor for 3 years and are made available by the auditor to the director of the department of licensing and regulatory affairs or his or her designee upon request.

(f) A qualification under this paragraph shall be both of the following:

(i) Not portable. A qualification meets the requirements of subrule (1) of this rule only where the operator is employed by and operates the equipment for the employer that issued the qualification.

(ii) Valid for 5 years.

(4) Option (3): The following apply to licensing by a government entity:

(a) For purposes of this section, a government licensing department or office that issues operator licenses for operating equipment covered by this standard is considered a government accredited crane operator testing organization if the criteria in subrule (4)(b) are met.

(b) The following apply to licensing criteria:

(i) The requirements for obtaining the license include an assessment by written and practical tests of the operator applicant regarding, at a minimum, the knowledge and skills listed in subrule (8)(a) and (b).

(ii) The testing meets industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities, equipment, and personnel.

(iii) The government authority that oversees the licensing department or office has determined that the requirements in subrule (4)(b)(i) and (ii) have been met.

(iv) The licensing department or office has testing procedures for relicensing designed to ensure that the operator continues to meet the technical knowledge and skills requirements in subrule (8)(a) and (b) of this rule.

(c) The following apply to a license issued by a government accredited crane operator testing organization that meets the requirements of this option:

(i) Meets the operator qualification requirements of this rule for operation of equipment only within the jurisdiction of the government entity.

(ii) Is valid for the period of time stipulated by the licensing department or office, but not longer than 5 years.

(5) Prequalification or certification training period. An employee who is not qualified or certified under this rule may operate equipment only as an operator-in-training and only where the requirements of this subrule are met. All of the following apply:

(a) The employer shall provide each operator-in-training with sufficient training prior to operating the equipment to enable the operator-in-training to operate the equipment safely under limitations established by this rule, including continuous monitoring, and any additional limitations established by the employer.

(b) The tasks performed by the operator-in-training while operating the equipment shall be within the operator-in-training's ability.

(c) Trainer. While operating the equipment, the operator-in-training shall be continuously monitored by an operator's trainer who shall meet all of the following requirements:

(i) Is an employee or agent of the operator-in-training's employer.

(ii) Is either a certified operator under this rule, or has passed the written portion of a certification test under 1 of the options in subrules (2) to (4) of this rule, and is familiar with the proper use of the equipment's controls.

(iii) While monitoring the operator-in-training, the operator's trainer shall not perform tasks that detract from the trainer's ability to monitor the operator-in-training.

(iv) For equipment other than tower cranes, the operator's trainer and the operator-in-training shall be in direct line of sight of each other and communicate verbally or by hand

signals. For tower cranes, the operator's trainer and the operator-in-training shall be in direct communication with each other.

(d) Continuous monitoring. The operator-in-training shall be monitored by the operator's trainer at all times, except for short breaks where all of the following are met:

(i) A break lasts not longer than 15 minutes and there is not more than 1 break per hour.

(ii) Immediately prior to a break the operator's trainer informs the operator-in-training of the specific tasks that the operator-in-training is to perform and limitations to which he or she shall adhere to during a break.

(iii) The specific tasks that the operator-in-training will perform during a break shall be within the operator-in-training's abilities.

(e) The operator-in-training shall not operate the equipment in any of the following circumstances:

(i) If any part of the equipment, load line, or load including rigging and lifting accessories, if operated up to the equipment's maximum working radius in the work zone as prescribed in R 408.41016b(1)(a), could get within 20 feet of a power line that is up to 350 kV, or within 50 feet of a power line that is over 350 kV.

(ii) If the equipment is used to hoist personnel.

(iii) In multiple-equipment lifts.

(iv) If the equipment is used over a shaft, cofferdam, or in a tank farm.

(v) In multiple-lift rigging operations, except where the operator's trainer determines that the operator-in-training skills are sufficient for this high-skill work.

(6) Under this rule, a testing entity may provide training and testing as long as the applicable accredited agency criteria for an organization providing both services are met.

(7) Language and literacy requirements.

(a) Tests under this rule may be administered verbally, with answers given verbally, when the operator candidate meets both of the following:

(i) Passes a written demonstration of literacy relevant to the work.

(ii) Demonstrates the ability to use the type of written manufacturer procedures applicable to the class or type of equipment for which the candidate is seeking certification.

(b) Tests under this rule may be administered in any language the operator candidate understands, and the operator's certificate shall note the language in which the test was given. The operator is qualified under subrule (2)(b) of this rule to operate equipment that is furnished with materials required by this standard that are written in the language of the certification. The operator may only operate equipment furnished with these materials.

(8) Certification criteria. Qualifications and certifications shall be based, at a minimum, on both of the following:

(a) A determination through a written test as prescribed in this subrule. All of the following apply:

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

(A) The controls as well as the operational and performance characteristics.

(B) Use of, and the ability to calculate, either manually or with a calculator, load and capacity information on a variety of configurations of the equipment.

(C) Procedures for preventing and responding to power line contact.

(D) Technical knowledge similar to the subject matter criteria listed in Appendix C of this standard applicable to the specific type of equipment the individual will operate. Use of the Appendix C criteria meets the requirements of this subrule.

(E) Technical knowledge applicable to the following:

(I) The suitability of the supporting ground and surface to handle expected loads.

(II) Site hazards.

(III) Site access.

(F) This subpart, including applicable incorporated materials.

(ii) The individual is able to read and locate relevant information in the equipment manual and other materials containing information referred to in subrule (8)(a)(i) of this rule.

(b) 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 auditory observation, the items listed in R 408.41012a(5).

(ii) Operational and maneuvering skills.

(iii) Application of load chart information.

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

(9) The following apply to phase-in:

(a) The provisions of this rule are applicable at the effective date of these rules, except for subrules (1)(b) and (5) which are applicable as of November 8, 2014.

(b) When R 408.41008a(1)(a) is not applicable, both of the following requirements apply until November 8, 2014:

(i) The employer shall ensure that operators of equipment covered by this standard are competent to operate the equipment safely.

(ii) When an employee assigned to operate machinery does not have the required knowledge or ability to operate the equipment safely, the employer shall train that employee prior to operating the equipment. The employer shall ensure that each operator is evaluated to confirm that he or she understands the information provided in the training.

History: 1995 AACS; 2012 AACS.

#### R 408.41009a Training.

Rule 1009a. The employer shall provide training as follows:

(a) Overhead powerlines. The employer shall train each employee specified in R 408.41016b(7) and R 408.41016d(m) in the topics listed in R 408.41016b(7).

(b) Signal persons. The employer shall train each employee who will be assigned to work as a signal person who does not meet the requirements of R 408.41011a(3) in the areas addressed in that subrule.

(c) The following apply to operators:

(i) Operators-in-training for equipment where certification or qualification is required by this standard. The employer shall train each operator-in-training in the areas addressed in R 408.41008a(8). The employer shall provide retraining if the operator-in-training does not pass a qualification or certification test.

(ii) Transitional period. During the phase-in period for operator certification or qualification, as provided in R 408.41008a(9), employers shall train each operator who has not been certified or qualified in the areas addressed in R 408.41008a(8).

(iii) Operators excepted from the requirements of R 408.41008a. The employer shall train each operator excepted under R 408.41008a(1) from the requirements of R 408.41008a on the safe operation of the equipment the operator will be using.

(iv) The employer shall train each operator of the equipment covered by this standard in the following practices:

(A) On friction equipment, when moving a boom off a support, first raise the boom a short distance sufficient to take the load of the boom to determine if the boom hoist brake needs to be adjusted. On other types of equipment with a boom, the same practice is applicable, except that typically there is no means of adjusting the brake; if the brake does not hold, a repair is necessary. See R 408.41019b(3) and (6) for additional requirements.

(B) When available, the manufacturer's emergency procedures for halting unintended equipment movement.

(d) Competent persons and qualified persons. The employer shall train each competent person and each qualified person regarding the requirements of this standard applicable to their respective roles.

(e) Crush and pinch points. The employer shall train each employee who works with the equipment to keep clear of holes, and crush and pinch points and the hazards addressed in R 408.41022a.

(f) Tag-out. The employer shall train each operator and each additional employee authorized to start or energize equipment or operate equipment controls, such as maintenance and repair employees, in the tag-out and start-up procedures in R 408.1019b(5) and (6).

(g) The following apply to training administration:

(i) The employer shall evaluate each employee required to be trained under this subrule to confirm that the employee understands the information provided in the training.

(ii) The employer shall provide refresher training in relevant topics for each employee when, based on the conduct of the employee or an evaluation of the employee's knowledge, there is an indication that retraining is necessary.

(iii) When training is required under this standard, the employer shall provide the training at no cost to the employee.

History: 1995 AACS; 2012 AACS.

R 408.41009b Qualifications of maintenance and repair employees.

Rule 1009b. (1) Maintenance, inspection, and repair personnel may be permitted to operate the equipment only when all of the following requirements are met:

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

(b) The personnel do either of the following:

(i) Operate the equipment under the direct supervision of an operator who meets the requirements of R 408.41008a.

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

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

History: 2012 AACS.

R 408.41010a Rescinded.

History: 1995 AACS; 2012 AACS.

R 408.41011a Signal person qualifications.

Rule 1011a. (1) The employer of the signal person shall ensure that each signal person meets the qualification requirements in subrule (c) of this rule prior to giving any signals. This requirement shall be met by using either Option (1) or Option (2) of this rule as follows:

(a) Option (1)—Third-party qualified evaluator. The signal person has documentation from a third-party qualified evaluator as defined in R 408.41005a showing that the signal person meets the qualification requirements in subrule (3) of this rule.

(b) Option (2)—Employer's qualified evaluator. The employer's qualified evaluator as defined in R 408.41004a shall assess the individual and determine that he or she meets the qualification requirements in subrule (3) of this rule and provides documentation of that determination. An assessment by an employer's qualified evaluator under this option shall not be portable. Other employers shall not be permitted to use it to meet the requirements of this rule.

(c) The employer shall make the documentation for whichever option is used available at the site while the signal person is employed by the employer. The documentation shall specify each type of signaling, such as hand signals and radio signals, for which the signal person meets the requirements of subrule (3) of this rule.

(2) If subsequent actions by the signal person indicate that the individual does not meet the qualification requirements as provided in subrule (3) of this rule, the employer shall not allow the individual to continue working as a signal person until retraining is provided and a reassessment is made in accordance with subrule (1) of this rule that confirms that the individual meets the qualification requirements.

(3) Qualification requirements. The signal person shall have all of the following qualifications:

(a) Know and understand the type of signals used. If hand signals are used, the signal person shall know and understand the standard method for hand signals.

(b) Be competent in the application of the type of signals used.

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

(d) Know and understand the relevant requirements of R 408.41011a to R 408.41011c.

(e) Demonstrate that he or she meets the requirements in subrule (3)(a) to (d) of this rule through an oral or written test and a practical test.

History: 1995 AACS; 2012 AACS.

R 408.41011b Signals; general requirements.

Rule 1011b. (1) A signal person shall be provided in each of the following situations:

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

(b) When the equipment is traveling, the view in the direction of travel is obstructed.

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

(2) Types of signals. Signals to operators shall be by hand, voice, audible, or new signals.

(3) The following apply to hand signals:

(a) When using hand signals, the standard method shall be used. See Appendix A of this standard.

Exception: When use of the standard method for hand signals is infeasible, or when an operation or use of an attachment is not covered in the standard method, nonstandard hand signals may be used in accordance with subrule (3)(b) of this rule.

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

(4) New signals. Signals other than hand, voice, or audible signals may be used when the employer demonstrates either of the following:

(a) The new signals provide at least equally effective communication as voice, audible, or standard method hand signals.

(b) The new signals comply with a national consensus standard that provides at least equally effective communication as voice, audible, or standard method hand signals.

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

(6) During operations requiring signals, the ability to transmit signals between the 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.

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

(8) Only 1 person shall give signals to a crane or derrick at a time, except in circumstances covered by subrule (10) of this rule.

(9) [Reserved.]

(10) A person who becomes aware of a safety problem shall alert the operator or signal person by giving the stop or emergency stop signal.

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

(12) [Reserved.]

(13) Communication with multiple cranes or derricks. When the signal person or persons communicates with more than 1 crane or derrick, a system shall be used to identify the crane or derrick each signal is for, by either 1 of the following:

(a) The signal person shall identify for each signal the crane or derrick that the signal is for prior to giving the function, direction, or both.

(b) Use an equally effective method of identifying which crane or derrick the signal is for.

History: 2012 AACS.

R 408.41011c Signals; radio, telephone, or other electronic transmission of signals.

Rule 1011c. (1) The devices used to transmit signals shall be tested on site before beginning operations to ensure that the signal transmission is clear and reliable.

(2) Signal transmission shall be through a dedicated channel except under the following circumstances:

(a) When multiple cranes or derricks are used for the same task, 1 or more qualified signal persons may share a dedicated channel for coordinating operations.

(b) When a crane is being operated on or adjacent to railroad tracks and the actions of the crane operator need to be coordinated with the movement of other equipment or trains on the same or adjacent tracks.

(3) The crane or derrick operator shall receive signals using a hands-free device.

History: 2012 AACS.

R 408.41011d Signals; voice signals; additional requirements.

Rule 1011d. (1) The operator, signal person and lift director, if there is one, shall contact each other and agree on the voice signals that will be used prior to beginning operations. These individuals shall meet again if any of the following occurs:

(a) A worker is substituted or added.

(b) There is confusion about the voice signals.

(c) Voice signals are to be changed.

(2) Each voice signal shall contain the following 3 elements, given in the following order:

(a) Function, such as hoist or boom, direction.

(b) Distance or speed, or both.

(c) Function, stop command.

(3) The operator, signal person and lift director, if there is one, involved shall be able to effectively communicate in the language used.

History: 2012 AACS.



R 408.41011e Signals; hand signal chart.

Rule 1011e. Hand signal charts shall be posted either on the crane or derrick or be readily available on site.

History: 2012 AACS.

R 408.41012a Inspections.

Rule 1012a. (1) An employer shall maintain crane, derrick, or excavation equipment and accessories in a condition that shall not endanger an operator or other employees.

(2) All of the following apply to modified equipment:

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

(i) The inspection shall assure that the modifications or additions have been done in accordance with the approval obtained pursuant to R 408.41028a.

(ii) The inspection shall include functional testing of the equipment.

(b) Equipment shall not be used until an inspection under this rule demonstrates that the requirements of subrule (2)(a)(i) have been met.

(3) All of the following apply to repaired or adjusted equipment:

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

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

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

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

(B) Determine if the repair or adjustment meets the criteria developed in accordance with subrule (3)(ii)(A).

(iii) The inspection shall include functional testing of the repaired or adjusted parts and other components that may be affected by the repair or adjustment.

(b) Equipment shall not be used until an inspection under this subrule demonstrates that the repair or adjustment meets the requirements of subrule (3)(a)(i) of this subrule or, where applicable, subrule (3)(a)(ii).

(4) All of the following apply to post-assembly:

(a) Upon completion of assembly, a qualified person shall inspect the equipment to ensure that it is configured in accordance with manufacturer equipment criteria.

(b) When manufacturer equipment criteria are unavailable, a qualified person shall do both of the following:

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

(ii) Determine if the equipment meets the criteria developed in accordance with subrule (4)(b)(i).

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

(5) All of the following apply to each shift inspection:

(a) A competent person shall begin a visual inspection prior to each shift the equipment will be used. The inspection shall be completed before or during that shift and shall consist of observation for apparent deficiencies. Taking apart equipment components and booming down shall not be required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitates taking apart equipment components or booming down. Determinations made in conducting the inspection shall be reassessed in light of observations made during operation. At a minimum the inspection shall include all of the following:

(i) Control mechanisms for maladjustments interfering with proper operation.

(ii) Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter.

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

(iv) Hydraulic system for proper fluid level.

(v) Hooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat.

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

(vii) Wire rope, in accordance with R 408.41013a.

(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 or stabilizers and supporting foundations, ground water accumulation, or similar conditions. This subrule shall not apply to the inspection of ground conditions for railroad tracks and their underlying support when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

(xi) The equipment for level position within the tolerances specified by the equipment manufacturer's recommendations, both before each shift and after each move and setup.

(xii) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view.

(xiii) Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling. This subrule shall not apply to the inspection of rails, rail stops, rail clamps and supporting surfaces when the railroad tracks are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213.

(xiv) Safety devices and operational aids for proper operation.

(b) If any deficiency in subrule (5)(a)(i) to (xiii) or in additional inspection items required to be checked for specific types of equipment in accordance with other rules of this standard is identified, a competent person shall make an immediate determination as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the equipment shall be taken out of service until it has been corrected, as specified in R 408.41019b.

(c) If there is any deficiency in safety devices and operational aids for proper operation identified, the action specified in R 408.41018a and R 408.41019a shall be taken prior to using the equipment.

(6) All of the following apply to monthly inspections:

(a) Each month the equipment is in service it shall be inspected in accordance with subrule (5) of this rule.

(b) Equipment shall not be used until an inspection under this subrule demonstrates that no corrective action under subrule (5)(b) and (c) is required.

(c) Documentation.

(i) The following information shall be documented and maintained by the employer that conducts the inspection:

(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 3 months.

(7) All of the following apply to annual inspections:

(a) At least every 12 months, a qualified person shall inspect the equipment in accordance with subrule (5) of this rule except that the corrective action set forth in subrules (7)(d), (e), and (f) of this rule shall apply in place of the corrective action required by subrule (5)(b) and (c) of this rule.

(b) In addition, at least every 12 months, the equipment shall be inspected by a qualified person. Disassembly shall be required, as necessary, to complete the inspection. The equipment and equipment structure including the boom and, if equipped, the jib, shall be inspected for all of the following:

(i) Deformed, cracked, or significantly corroded structural members.

(ii) Loose, failed, or significantly corroded bolts, rivets, and other fasteners.

(iii) Cracked welds.

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

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

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

(vii) Safety devices and operational aids for proper operation, including significant inaccuracies.

(viii) Gasoline, diesel, electric, or other power plants for proper operation and safety-related problems or conditions, such as a leaking exhaust and an emergency shut-down feature.

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

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

(xi) Tires for damage or excessive wear.

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

(A) A flexible hose or its junction with the fittings for indications of leaks.

(B) Threaded or clamped joints for leaks.

(C) Outer covering of the hose for blistering, abnormal deformation, or other signs of failure or impending failure.

(D) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing.

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

(A) Performance indicators for unusual noises or vibration, low operating speed, excessive heating of the fluid, or 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 for sticking, improper return to neutral, and leaks.

(B) Leaks.

(C) Valve housing cracks.

(D) Relief valves for failure to reach correct pressure. If there is a manufacturer procedure for checking pressure, it shall 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.

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

(D) Case or barrel for significant dents.

(E) Rod eyes and connecting joints that are loose or deformed.

(xvi) Outrigger or stabilizer pads or floats for excessive wear or cracks.

(xvii) Slider pads for excessive wear or cracks.

(xviii) Electrical components and wiring for cracked or split insulation and loose or corroded terminations.

(xix) Warning labels and decals originally supplied with the equipment by the manufacturer or otherwise required under this standard that are missing or unreadable.

(xx) Originally equipped operator seat or equivalent that are missing.

(xxi) Operator seat that is unserviceable.

(xxii) Originally equipped steps, ladders, handrails, and guards that are missing.

(xxiii) Steps, ladders, handrails, and guards that are in unusable or unsafe condition.

(c) This inspection shall include functional testing of the equipment as configured to determine if it is functioning properly.

(d) If any deficiency is identified, a qualified person shall make an immediate determination as to whether the deficiency constitutes a safety hazard or, though not yet a safety hazard, needs to be monitored in the monthly inspections.

(e) If the qualified person determines that a deficiency is a safety hazard, the equipment shall be taken out of service until it has been corrected, except when temporary alternative measures are implemented as specified in R 408.41019a(4) or R 408.41029a(4)(c), as specified in R 408.41019b.

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

(g) Documentation of annual inspection. The following information shall be documented, maintained, and retained for a minimum of 12 months by the employer that conducts the inspection:

(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) The employer shall maintain, on the jobsite, a copy of the records of the date and results of the latest inspection for each piece of equipment.

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

(a) Inspect the equipment for structural damage to determine if the equipment can continue to be used safely.

(b) In light of the use or conditions determine whether any items and conditions listed in subrule (7) of this rule need to be inspected. If an inspection is needed, the qualified person shall inspect those items and conditions.

(c) If a deficiency is found, the employer shall follow the requirements in subrules (7)(d) to (f) of this rule.

(9) Equipment not in regular use. Equipment that has been idle for 3 months or more shall be inspected by a qualified person in accordance with the requirements of subrule (6) of this rule before initial use.

(10) [Reserved.]

(11) Any part of a manufacturer's procedures regarding inspections that relate to safe operation that is more comprehensive or has a more frequent schedule of inspection than the requirements of this rule shall be followed.

(12) All documents produced under this rule shall be available, during the applicable document retention period, to all persons who conduct inspections under this rule.

History: 1995 AACS; 2012 AACS.

R 408.41013a Wire rope inspection.

Rule 1013a. (1) A wire rope that is in continuous service shall be visually inspected by a competent person prior to each shift. A visual inspection shall consist of observing all rope, including running and standing, that can be expected to be in use during the day's operations. The purpose of the visual observations shall be to discover damage that may be an immediate hazard. Untwisting or opening of wire rope or booming down is not required as part of this inspection.

(2) The frequency of wire rope inspection shall be determined by a qualified person and shall be based on all of the following factors:

(a) Expected rope life as determined through experience on the particular installation or similar installations.

(b) Severity of the environment.

(c) Percentage of capacity lifts.

(d) Frequency rates of operation.

(e) Exposure to shock loads. Inspections need not be at equal calendar intervals and shall be more frequent as the rope approaches the end of its useful life.

(3) Category I. Apparent deficiencies in this category include any of the following:

(a) Significant distortion of the rope, including any of the following:

(i) Kinking.

(ii) Crushing.

(iii) Unstranding.

(iv) Birdcaging.

(v) Main strand displacement.

(vi) Signs of core failure or steel core protrusion between the outer strands.

(b) Electric arc damage, from a source other than power lines, or heat damage.

(c) Improperly applied end connections.

(d) Significantly corroded, cracked, bent, or worn end connections, such as from severe service.

(4) Category II. Apparent deficiencies in this category are any of the following:

(a) Broken or cut strands.

(b) In running wire ropes, 6 randomly distributed broken wires in 1 rope lay or 3 broken wires in 1 strand in 1 rope lay, where a rope lay is the length along the rope in which 1 strand makes a complete revolution around the rope.

(c) In rotation-resistant ropes, 2 randomly distributed broken wires in 6 rope diameters or 4 randomly distributed broken wires in 30 rope diameters.

(d) In standing ropes, there are more than 2 broken wires in 1 rope lay in sections beyond end connections or more than 1 broken wire at an end connection.

(e) A diameter reduction of more than 5% from nominal diameter.

(5) Category III. Apparent deficiencies in this category include any of the following:

(a) In rotation resistant wire rope, core protrusion or other distortion indicating core failure.

(b) Prior electrical contact with a power line.

(c) A broken strand.

(6) Critical review items. The competent person shall give particular attention to all of the following:

(a) Rotation resistant wire rope in use.

(b) Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.

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

(d) Wire rope at or near terminal ends.

(e) Wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.

(7) Removal from service.

(a) If a deficiency in Category I is identified, a competent person shall make an immediate determination as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question shall be prohibited until 1 of the following occurs:

(i) The wire rope is replaced, as specified in R 408.41019b.

(ii) If the deficiency is localized, the problem shall be corrected by severing the wire rope in 2. The undamaged portion may continue to be used. Joining lengths of wire rope by splicing shall be prohibited. If a rope is shortened under this subrule, the employer shall ensure that the drum will have 2 wraps of wire when the load, boom, or both is in the lowest position.

(iii) The defective portion of a wire rope that is removed shall not be used for other load-carrying service.

(b) If a deficiency in Category II is identified, operations involving use of the wire rope in question shall be prohibited until 1 of the following occurs:

(i) The employer complies with either the wire rope manufacturer's established criterion for removal from service or a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope, as specified in R 408.41019b.

(ii) The wire rope is replaced, as specified in R 408.41019b.

(iii) If the deficiency is localized, the problem shall be corrected by severing the wire rope in 2. The undamaged portion may continue to be used. Joining lengths of wire rope by splicing shall be prohibited. If a rope is shortened under this subrule, the employer shall ensure that the drum will have 2 wraps of wire when the load, boom, or both is in the lowest position.

(c) If a deficiency in Category III is identified, operations involving use of the wire rope in question shall be prohibited until 1 of the following occurs:

(i) The wire rope is replaced, as specified in R 408.41019b.

(ii) If the deficiency, other than power line contact, is localized, the problem is corrected by severing the wire rope in 2. The undamaged portion may continue to be used. Joining lengths of wire rope by splicing shall be prohibited. Repair of wire rope that contacted an energized power line shall also be prohibited. If a rope is shortened under this subrule, the employer shall ensure that the drum will have 2 wraps of wire when the load, boom, or both is in the lowest position. The defective portion of a wire rope that is removed shall not be used for other load-carrying service.

(d) Where a wire rope is required to be removed from service under this rule, either the equipment as a whole or the hoist with that wire rope shall be tagged-out, in accordance with R 408.41019b(5)(a), until the wire rope is repaired or replaced.

(8) All of the following apply to monthly inspections:

(a) Each month an inspection shall be conducted in accordance with subrule (1) of this rule

(b) The inspection shall include any deficiencies that the qualified person who conducts the annual inspection determines under subrule (9)(c)(ii) of this rule shall be monitored.

(c) Wire ropes on equipment shall not be used until an inspection under this paragraph demonstrates that no corrective action under subrule (7) of this rule is required.

(d) The inspection shall be documented according to R 408.41012a(6)(c).

(9) All of the following apply to annual inspections:

(a) At least every 12 months, wire ropes in use on equipment shall be inspected by a qualified person in accordance with subrule (1) of this rule.

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

(i) The inspection shall be for deficiencies of the types listed in subrule (3) of this rule.

(ii) The inspection shall be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to all of the following:

(A) Critical review items listed in subrule (6) of this rule.

(B) Those sections that are normally hidden during shift and monthly inspections.

(C) Wire rope subject to reverse bends.

(D) Wire rope passing over sheaves.

(iii) Exception. If an inspection under subrule (9)(b) of this rule is not feasible due to existing set-up and configuration of the equipment, such as where an assist crane is needed, or due to site conditions, such as a dense urban setting, these inspections shall be conducted as soon as it becomes feasible, but no longer than an additional 6 months for running ropes and at the time of disassembly for standing ropes.

(c) If a deficiency is identified, a qualified person shall make an immediate determination as to whether the deficiency constitutes a safety hazard.

(i) If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question shall be prohibited until 1 of the following occurs:

(A) The wire rope is replaced, as specified in R 408.41019b.

(B) If the deficiency is localized, the problem is corrected by severing the wire rope in 2. The undamaged portion may continue to be used. Joining lengths of wire rope by splicing shall be prohibited. If a rope is shortened under this subrule, the employer shall ensure that the drum will have 2 wraps of wire when the load, boom, or both is in its lowest position.

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

(d) The inspection shall be documented according to R 408.41012a(7)(g).

(10) Rope lubricants that are of the type that hinder inspection shall not be used.

(11) All documents produced under this rule shall be available, during the applicable document retention period, to all persons who conduct inspections under this rule.

History: 1995 AACS; 2012 AACS.

R 408.41014a Wire rope selection and installation criteria.

Rule 1014a. (1) Original equipment wire rope and replacement wire rope shall be selected and installed in accordance with this rule. Selection of replacement wire rope shall be in accordance with the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.

(2) Wire rope design criteria. Wire rope, other than rotation resistant rope, shall comply with either of the following:



(a) Option (1). Wire rope shall comply with section 5–1.7.1 of ANSI/ASME B30.5 “Mobile and Locomotive Cranes,” 2004 edition, which is adopted by reference in R 408.41003a, except that section 5-1.7.1 paragraph (c) shall not apply.

(b) Option (2). Wire rope shall be designed to have, in relation to the equipment’s rated capacity, a sufficient minimum breaking force and design factor so that compliance with the applicable inspection provisions in R 408.41013a will be an effective means of preventing sudden rope failure.

(3) Wire rope shall be compatible with the safe functioning of the equipment.

(4) Both of the following apply to boom hoist reeving:

(a) Fiber core ropes shall not be used for boom hoist reeving, except for derricks.

(b) Rotation resistant ropes shall be used for boom hoist reeving only where the requirements of subrule (5)(d)(ii) of this rule are met.

(5) All of the following apply to rotation resistant ropes:

(a) The following definitions apply:

(i) Type I rotation resistant wire rope (Type I) means stranded rope constructed to have little or no tendency to rotate or, if guided, transmits little or no torque. It has at least 15 outer strands and comprises an assembly of at least 3 layers of strands laid helically over a center in 2 operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(ii) Type II rotation resistant wire rope (Type II) means stranded rope constructed to have significant resistance to rotation. It has at least 10 outer strands and comprises an assembly of 2 or more layers of strands laid helically over a center in 2 or 3 operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(iii) Type III rotation resistant wire rope (Type III) means stranded rope constructed to have limited resistance to rotation. It has no more than 9 outer strands, and comprises an assembly of 2 layers of strands laid helically over a center in 2 operations. The direction of lay of the outer strands is opposite to that of the underlying layer.

(b) The following requirements apply:

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

(ii) Rotation resistant ropes, including Types I, II and III, shall have an operating design factor of not less than 3.5.

(iii) Type I shall have an operating design factor of not less than 5, except where the wire rope manufacturer and the equipment manufacturer approves the design factor, in writing.

(iv) Types II and III shall have an operating design factor of not less than 5, except where the requirements of subrule (5)(c) of this rule are met.

(c) When Types II and III with an operating design factor of less than 5 are used for non-duty cycle, non-repetitive lifts, the following requirements shall be met for each lifting operation:

(i) A qualified person shall inspect the rope in accordance with R 408.41013a(1). The rope shall be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than 1 broken wire in any 1 rope lay shall be considered a hazard.

(ii) Operations shall be conducted in a manner and at speeds so as to minimize dynamic effects.

(iii) Each lift made under subrule (5)(c) of this rule shall be recorded in the monthly and annual inspection documents. Prior uses shall be considered by the qualified person in determining whether to use the rope again.

(d) The following are additional requirements for rotation resistant ropes for boom hoist reeving:

(i) Rotation resistant ropes shall not be used for boom hoist reeving, except where the requirements of subrule (5)(d)(ii) of this rule are met.

(ii) Rotation resistant ropes may be used as boom hoist reeving when load hoists are used as boom hoists for attachments, such as luffing attachments or boom and mast attachment systems. Under these conditions, all of the following requirements shall be met:

(A) The drum shall provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(B) The requirements in R 408.41024a(1), irrespective of the date of manufacture of the equipment, and R 408.41024a(2).

(C) The requirements in ANSI/ASME B30.5 “Mobile and Locomotive Cranes,” 2004 edition, sections 5–1.3.2(a), (a)(2) through (a)(4), (b) and (d), which is adopted by reference in R 408.41003a, except that the minimum pitch diameter for sheaves used in multiple rope reeving is 18 times the nominal diameter of the rope used, instead of the value of 16 specified in section 5–1.3.2(d).

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

(E) The operating design factor for the boom hoist reeving system shall be not less than 5.

(F) The operating design factor for these ropes shall be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure and the load within the equipment’s rated capacity.

(G) When provided, a power-controlled lowering system shall be capable of handling rated capacities and speeds as specified by the manufacturer.

(6) 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 shall be permitted.

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

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

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41015a Assembly or disassembly.

Rule 1015a. (1) When selecting manufacture or employer procedures for assembling or disassembling equipment or attachments, the employer shall comply with all applicable manufacturer prohibitions and with either of the following:

(a) Manufacturer procedures applicable to assembly and disassembly.

(b) Employer procedures for assembly or disassembly. Employer procedures may be used only where the employer can demonstrate that the procedures used meet the requirements in subrule (4) of this rule. The employer shall follow manufacturer procedures when an employer uses synthetic slings during assembly or disassembly rigging, as specified in subrule (2)(r) of this rule.

(2) General requirements. These requirements shall apply to all assembly and disassembly operations:

(a) Supervision by a competent and qualified person. Both of the following criteria apply to this person:

(i) Assembly or disassembly shall be directed by a person who meets the criteria of an A/D director.

(ii) Where the assembly or disassembly is being performed by only 1 person, that person shall meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D director.

(b) Knowledge of procedures. The A/D director shall understand the applicable assembly or disassembly procedures.

(c) Review of procedures. The A/D director shall review the applicable assembly or disassembly procedures immediately prior to the commencement of assembly or disassembly unless the A/D director understands the procedures and has applied them to the same type and configuration of equipment, including accessories, if any.

(d) Both of the following apply to crew instructions:

(i) Before commencing assembly or disassembly operations, the A/D director shall ensure that the crew members understand all of the following:

(A) Their tasks.

(B) The hazards associated with their tasks.

(C) The hazardous positions and locations that crew members need to avoid.

(ii) During assembly or disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations, the requirements in subrule (2)(d)(i)(A) to (C) of this rule shall be met.

(e) Protecting assembly or disassembly crew members out of operator view.

(i) 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 shall inform the operator that he or she is going to that location.

(ii) Where the operator knows that a crew member went to a location covered by subrule (2)(e)(i) of this rule, the operator shall not move any part of the equipment or load until the operator is informed in accordance with a prearranged system of communication that the crew member is in a safe position.

(f) When working under the boom, jib, or other components, the following apply:

(i) When pins or similar devices are being removed, employees shall not be under the boom, jib, or other components, except where the requirements of subrule (2)(f)(ii) of this rule are met.

(ii) Exception. When the employer demonstrates that site constraints require 1 or more employees to be under the boom, jib, or other components when pins or similar devices are being removed, the A/D director shall 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 B of this standard for an example.

(g) Capacity limits. During all phases of assembly or disassembly, rated capacity limits for loads imposed on the equipment, equipment components including rigging, lifting lugs, and equipment accessories shall not be exceeded for the equipment being assembled or disassembled.

(h) Addressing specific hazards. The A/D director who supervises the assembly or disassembly operation shall address the hazards associated with the operation, which include all of the following:

(i) Site and ground bearing conditions. Site and ground conditions shall be adequate for safe assembly or disassembly operations and to support the equipment during assembly or disassembly, as specified in R 408.41017a.

(ii) Blocking material. The size, amount, condition and method of stacking the blocking shall be sufficient to sustain the loads and maintain stability.

(iii) Proper location of blocking. When used to support lattice booms or components, blocking shall be appropriately placed to do both of the following:

(A) Protect the structural integrity of the equipment.

(B) Prevent dangerous movement and collapse.

(iv) Verifying assist crane loads. When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly or disassembly shall be verified in accordance with R 408.41019b(14)(c) before assembly or disassembly begins.

(v) Boom and jib pick points. The points of attachment of rigging to a boom, or boom sections or jib or jib sections, shall be suitable for preventing structural damage and facilitating safe handling of these components.

(vi) The following apply to center of gravity:

(A) The center of gravity of the load shall be identified if that is necessary for the method used for maintaining stability.

(B) When 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 shall be used. See Non-mandatory Appendix B of this standard for an example.

(vii) Stability upon pin removal. The boom sections, boom suspension systems, such as gantry A-frames and jib struts, and components shall be rigged or supported to maintain stability upon the removal of the pins.

(viii) Snagging. Suspension ropes and pendants shall not be allowed to catch on the boom or jib connection pins or cotter pins, including keepers and locking pins.

(ix) Struck by counterweights. Address potential for unintended movement from inadequately supported counterweights and from hoisting counterweights.

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

(xi) Loss of backward stability. Address backward stability before swinging the upperworks, travel, and when attaching or removing equipment components.

(xii) Wind speed and weather. Address the effect of wind speed and weather on the equipment.

(i) [Reserved.]

(j) Cantilevered boom sections. Manufacturer limitations on the maximum amount of boom supported only by cantilevering shall not be exceeded. When these are unavailable, a registered professional engineer familiar with the type of equipment involved shall determine in writing this limitation, which shall not be exceeded.

(k) Weight of components. The weight of each of the components shall be readily available.

(l) [Reserved.]

(m) The following apply to components and configuration:

(i) The selection of components, and configuration of the equipment, that affect the capacity or safe operation of the equipment shall be in accordance with 1 of the following:

(A) Manufacturer instructions, prohibitions, limitations, and specifications. When these are unavailable, a registered professional engineer familiar with the type of equipment involved shall approve, in writing, the selection and configuration of components.

(B) Approved modifications that meet the requirements of R 408.41028a.

(ii) Post-assembly inspection. Upon completion of assembly, the equipment shall be inspected to ensure compliance with subrule (2)(m)(i) of this rule as specified in R 408.41012a(4).

(n) [Reserved.]

(o) Shipping pins. Reusable shipping pins, straps, links, and similar equipment shall be removed. After they are removed, they shall either be stowed or otherwise stored so that they do not present a falling object hazard.

(p) Pile driving. Equipment used for pile driving shall not have a jib attached during pile driving operations.

(q) Outriggers and stabilizers. When the load to be handled and the operating radius require the use of outriggers or stabilizers, or at any time when outriggers or stabilizers are used, all of the following requirements shall be met, except as otherwise indicated:

(i) The outriggers or stabilizers shall be either fully extended or, if the manufacturer's procedures permit, deployed as specified in the load chart.

(ii) The outriggers shall be set to remove the equipment weight from the wheels, except for locomotive cranes. For use of outriggers on locomotive cranes, see subdivision (q)(vi) of this subrule. This provision does not apply to stabilizers.

(iii) When outrigger floats are used, they shall be attached to the outriggers. When stabilizer floats are used, they shall be attached to the stabilizers.

(iv) Each outrigger or stabilizer shall be visible to the operator or to a signal person during extension and setting.

(v) Outrigger and stabilizer blocking shall comply with both of the following:

(A) Meet the requirements in subdivision (h)(ii) and (iii) of this subrule.

(B) Be placed only under the outrigger or stabilizer float or pad of the jack or, where the outrigger or stabilizer is designed without a jack, under the outer bearing surface of the extended outrigger or stabilizer beam.

(vi) For locomotive cranes, when using outriggers or stabilizers to handle loads, the manufacturer's procedures shall be followed. When lifting loads without using

outriggers or stabilizers, the manufacturer's procedures shall be met regarding truck wedges or screws.

(r) Rigging. In addition to following the requirements in construction safety standard Part 8 "Handling and Storage of Materials," as referenced in R 408.41003a, and other requirements in this and other standards applicable to rigging, when rigging is used for assembly or disassembly, the employer shall ensure all of the following:

(i) The rigging work is done by a qualified rigger.

(ii) Synthetic slings are protected from abrasive, sharp, or acute edges, and configurations that could cause a reduction of the sling's rated capacity, such as distortion or localized compression. Requirements for the protection of wire rope slings are contained in construction safety standard Part 8 "Handling and Storage of Materials," as referenced in R 408.41003a.

(iii) When synthetic slings are used, the synthetic sling manufacturer's instructions, limitations, specifications, and recommendations shall be followed.

(3) Disassembly. Additional requirements for dismantling of booms and jibs applies to both the use of manufacturer procedures and employer procedures. Dismantling, including dismantling for changing the length of, booms and jibs shall comply with all of the following:

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

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

(c) None of the pins at the top or bottom on boom sections located between the uppermost boom section and the crane or derrick body shall be removed, either partly or completely, when the boom is being supported by the uppermost boom section resting on the ground or other support.

(d) None of the top pins on boom sections located on the cantilevered portion of the boom being removed, for example the portion being removed ahead of the pendant attachment points, shall not be removed, either partly or completely, until the cantilevered section to be removed is fully supported.

(4) Assembly or disassembly—employer procedures—general requirements. All of the following apply:

(a) When using employer procedures instead of manufacturer procedures for assembly or disassembly, the employer procedures shall ensure all of the following:

(i) Prevent unintended dangerous movement, and prevent collapse, of any part of the equipment.

(ii) Provide adequate support and stability of all parts of the equipment.

(iii) Position employees involved in the assembly or disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.

(b) Qualified person. Employer procedures shall be developed by a qualified person.

History: 1995 AACS; 1996 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41016a Power line safety up to 350 kV; assembly and disassembly.

Rule 1016a. (1) Before assembling or disassembling equipment, the employer shall determine if any part of the equipment, load line, or load, including rigging and lifting accessories, could get closer than 20 feet to a power line during the assembly or disassembly process. If this could occur, the employer shall meet the requirements in 1 of the following options:

(a) Option (1)—Deenergize and ground. Confirm from the utility owner or operator that the power line has been deenergized and visibly grounded at the worksite. Employers choosing this option shall not proceed with this option if the electric utility does not deenergize the power line. This standard does not require utility companies to deenergize power lines.

(b) Option (2)—20 foot clearance. Ensure that no part of the equipment, load line or load, including rigging and lifting accessories, gets closer than 20 feet to the power line by implementing the measures specified in subrule (2) of this rule.

(c) Option (3)—Table A clearance. All of the following apply:

(i) Determine the line's voltage and the minimum clearance distance permitted under Table A, as specified in R 408.41016b.

(ii) Determine if any part of the equipment, load line, or load, including rigging and lifting accessories, could get closer than the minimum clearance distance to the power line permitted under Table A, as specified in R 408.41016b. If this could occur, then the employer shall follow the requirements in subrule (2) of this rule to ensure that no part of the equipment, load line, or load, including rigging and lifting accessories, gets closer to the line than the minimum clearance distance.

(2) Preventing encroachment and electrocution. When encroachment precautions are required under Option (2) or Option (3) of subrule (1) of this rule, all of the following requirements shall be met:

(a) Conduct a planning meeting with the A/D director, operator, assembly or disassembly crew and the other workers who will be in the assembly or disassembly area to review the location of the power lines and the steps that will be implemented to prevent encroachment and electrocution.

(b) If tag lines are used, they shall be nonconductive.

(c) At least 1 of the following additional measures shall be in place. The measure selected shall be effective in preventing encroachment.

(i) Use a dedicated spotter who is in continuous contact with the equipment operator. The dedicated spotter shall comply with all the following:

(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 the following:

(I) A clearly visible line painted on the ground.

(II) A clearly visible line of stanchions.

(III) A set of clearly visible line-of-sight landmarks, such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter.

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

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

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

(ii) Use a proximity alarm set to give the operator sufficient warning to prevent encroachment.

(iii) Use a device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device shall be set to give the operator sufficient warning to prevent encroachment.

(iv) Use a device that automatically limits range of movement and that is set to prevent encroachment.

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

(3) Assembly or disassembly below power lines shall be prohibited. No part of a crane or derrick, 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 owner or operator has deenergized and visibly grounded the power line at the worksite.

(4) Assembly or disassembly inside Table A clearance shall be prohibited. No part of a crane or derrick, load line, or load, including rigging and lifting accessories, whether partially or fully assembled, shall be closer than the minimum approach distance under Table A, as specified in R 408.41016b, to a power line unless the employer has confirmed that the utility owner or operator has deenergized and visibly grounded the power line at the worksite.

(5) Voltage information. When Option (3) of subrule (1) of this rule is used, the utility owner or operator of the power lines shall provide the requested voltage information within 2 working days of the employer's request.

(6) Power lines presumed energized. The employer shall assume that all power lines are energized unless the utility owner or operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(7) Posting of electrocution warnings. At least 1 electrocution hazard warning shall be conspicuously posted in the cab so that it is in view of the operator and, except for overhead gantry and tower cranes, at least 2 on the outside of the equipment.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41016b Power line safety up to 350 kV; equipment operations.

Rule 1016b. (1) Hazard assessments and precautions inside the work zone. Before beginning equipment operations, the employer shall do both of the following:

(a) Identify the work zone by either of the following means:

(i) Demarcating boundaries, such as with flags, or a device such as a range limit device or range control warning device, and prohibiting the operator from operating the equipment past those boundaries.

(ii) Defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius.

(b) Determine if any part of the equipment, load line, or load, including rigging and lifting accessories, if operated up to the equipment's maximum working radius in the work zone, could get closer than 20 feet to a power line. If this could occur, the employer shall meet the requirements in 1 of the following:



(i) Option (1)—Deenergize and ground. Confirm from the utility owner or operator that the power line has been deenergized and visibly grounded at the worksite.

(ii) Option (2)—20 foot clearance. Ensure that no part of the equipment, load line, or load, including rigging and lifting accessories, gets closer than 20 feet to the power line by implementing the measures specified in subrule (2) of this rule.

(iii) Option (3)—Table A clearance. The following apply:

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

(B) Determine if any part of the equipment, load line, or load, including rigging and lifting accessories, while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Table A. If this could occur, the employer shall follow the requirements in subrule (2) of this rule to ensure that no part of the equipment, load line, or load, including rigging and lifting accessories, gets closer to the line than the minimum approach distance.

(2) Preventing encroachment or electrocution. Where encroachment precautions are required under Option (2) or Option (3) of this rule, all of the following requirements shall be met:

(a) Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power lines, and the steps that shall be implemented to prevent encroachment or electrocution.

(b) If tag lines are used, they shall be nonconductive.

(c) Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line, if using Option (2) of this rule, or at the minimum approach distance under Table A, if using Option (3) of this rule. If the operator is unable to see the elevated warning line, a dedicated spotter shall be used as described in subrule (1)(d)(ii) of this rule in addition to implementing 1 of the measures described in subrule (1)(d)(i), (iii), (iv) and (v) of this rule.

(d) Implement at least 1 of the following measures:

(i) Set a proximity alarm to give the operator sufficient warning to prevent encroachment.

(ii) Use a dedicated spotter as specified in R 408.41016a(2)(c)(i).

(iii) Use a device that automatically warns the operator when to stop movement, such as a range control warning device. This device shall be set to give the operator sufficient warning to prevent encroachment.

(iv) Use of a device that automatically limits range of movement shall be set to prevent encroachment.

(v) Use of an insulating link or device, as defined in R 408.41004a, shall be installed at a point between the end of the load line, or below, and the load.

(e) The requirements of subrule (2)(d) of this rule do not apply to work covered by construction safety standard Part 16 "Power Transmission and Distribution," as referenced in R 408.41003a.

(3) Voltage information. When Option (3) of this rule is used, the utility owner or operator of the power lines shall provide the requested voltage information within 2 working days of the employer's request. See Appendix D.

(4) Operations below power lines. The following apply:

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

(b) Exceptions. Subrule (4)(a) of this rule shall be inapplicable when the employer demonstrates that 1 of the following applies:

(i) The work is covered by construction safety standard Part 16 “Power Transmission and Distribution,” as referenced in R 408.41003a.

(ii) For equipment with nonextendible booms, the uppermost part of the equipment, with the boom at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this rule minimum clearance distance below the plane of the power line.

(iii) For equipment with articulating or extendible booms, the uppermost part of the equipment, with the boom in the fully extended position, at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this rule minimum clearance distance below the plane of the power line.

(iv) The employer demonstrates that compliance is infeasible and meets the requirements of R 408.41016d.

(5) Power lines presumed energized. The employer shall assume that all power lines are energized unless the utility owner or operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(6) When working near transmitter or communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter shall be deenergized or both of the following precautions shall be taken:

(a) The equipment shall be provided with an electrical ground.

(b) If tag lines are used, they shall be non-conductive.

(7) All of the following apply to training:

(a) The employer shall train each operator and crew member assigned to work with the equipment on all of the following:

(i) The procedures to be followed in the event of electrical contact with a power line, including all of the following:

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

(B) The importance to the operator’s safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.

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

(D) The danger of the potentially energized zone around the equipment, step potential.

(E) The need for crew in the area to avoid approaching or touching the equipment and the load.

(F) Safe clearance distance from power lines.

(ii) Power lines are presumed to be energized unless the utility owner or operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

(iii) Power lines are presumed to be uninsulated unless the utility owner or operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.

(iv) The limitations of an insulating link or device, proximity alarm, and any range control devices, if used.

(v) The procedures to be followed to properly ground equipment and the limitations of grounding.

(b) Employees working as dedicated spotters shall be trained to enable them to effectively perform their task, including training on the applicable requirements of this rule.

(c) Training under this rule shall be administered in accordance with R 408.41009a(g).

(8) Devices originally designed by the manufacturer for use as a safety device, as specified in R 408.41018a, operational aid, or a means to prevent power line contact or electrocution, when used to comply with this rule, shall meet the manufacturer's procedures for use and conditions of use.

**TABLE A—MINIMUM CLEARANCE DISTANCES**

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

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

History: 2012 AACS.

R 408.41016c Power line safety over 350 kV.

Rule 1016c. The requirements of R 408.41016a and R 408.41016b shall apply to power lines over 350 kV except for the following:

(a) For power lines at or below 1000 kV, wherever the distance “20 feet” is specified, the distance “50 feet” shall be substituted.

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

History: 2012 AACS.

R 408.41016d Power line safety for all voltages for equipment operations closer than the Table A zone.

Rule 1016d. Equipment operations in which any part of the equipment, load line, or load, including rigging and lifting accessories, is closer than the minimum approach distance under Table A in R 408.41016b to an energized power line shall be prohibited, except where the employer demonstrates that all of 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 in R 408.41016b.

(b) The employer determines that, after consultation with the utility owner or operator, it is infeasible to deenergize and ground the power line or relocate the power line.

(c) All of the following apply to minimum clearance distances:

(i) The power line owner or operator or registered professional engineer, who is a qualified person with respect to electrical power transmission and distribution, determines the minimum clearance distance that shall be maintained to prevent electrical contact in light of the on-site conditions. The factors that shall be considered in making this determination include, but are not limited to the following:

(A) Conditions affecting atmospheric conductivity.

(B) Time necessary to bring the equipment, load line, and load, including rigging and lifting accessories, to a complete stop.

(C) Wind conditions.

(D) Degree of sway in the power line.

(E) Lighting conditions.

(F) Other conditions affecting the ability to prevent electrical contact.

(ii) Subdivision (c)(i) of this subrule does not apply to work covered by construction safety standard Part 16 "Power Transmission and Distribution," (CS Part 16) as referenced in R 408.41003a. For such work, the minimum clearance distances specified in CS Part 16 Table 1 shall apply. Employers engaged in CS Part 16 work may work closer than the distances in CS Part 16 Table 1 where both the requirements of this rule and CS Part 16 R 408.41642(2) are met.

(d) A planning meeting with the employer and utility owner or 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 shall include all of the following:

(i) If the power line is equipped with a device that automatically reenergizes the circuit in the event of a power line contact, before the work begins, the automatic reclosing feature of the circuit interrupting device shall be made inoperative if the design of the device permits.

(ii) Use a dedicated spotter as specified in R 408.41016a(2)(c)(i).

(iii) Use of an elevated warning line or barricade that is not attached to the crane in view of the operator, either directly or through video equipment, and equipped with flags or similar high-visibility markings to prevent electrical contact. This provision does not apply to work covered by construction safety standard Part 16 “Power Transmission and Distribution,” as referenced in R 408.41003a.

(iv) The following apply to use of an insulating link or device:

(A) An insulating link or device shall be installed at a point between the end of the load line, or below, and the load.

(B) For work covered by construction safety standard Part 16 “Power Transmission and Distribution,” (CS Part 16) as referenced in R 408.41003a, the requirement in subdivision (d)(iv)(A) of this subrule shall apply only when working inside the CS Part 16 Table 1 clearance distances.

(C) For work covered by construction safety standard Part 16 “Power Transmission and Distribution”, as referenced in R 408.41003a, involving operations where use of an insulating link or device is infeasible, the requirements of general industry safety standard Part 86 “Electric Power Generation, Transmission, and Distribution,” 1910.269(p)(4)(iii)(B) or (C), as referenced in R 408.41003a, may be substituted for the requirement in subparagraph (A).

(D) Until November 8, 2013, the following procedure may be substituted for the requirement in subparagraph (A) of this paragraph:

(I) The employer shall use a link or device manufactured on or before November 8, 2011 that meets the definition of an insulating link or device, except that it has not been approved by a nationally recognized testing laboratory, and is maintained, used, and installed in accordance with manufacturer requirements and recommendations at a point between the end of the load line, or below, and the load.

(II) All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load shall be insulated or guarded from the equipment, the load line, and the load through an additional means other than the device described in subdivision (d)(iv)(D)(I). Insulating gloves rated for the voltage involved are adequate additional means of protection for the purposes of this subrule.

(v) Use of nonconductive rigging if the rigging may be within the minimum clearance distances during operation, as specified in Table A in R 408.41016b.

(vi) If the equipment is equipped with a device that automatically limits range of movement, it shall be used and set to prevent any part of the equipment, load line, or load, including rigging and lifting accessories, from breaching the minimum approach distance established under subdivision (c).

(vii) If a tag line is used, it shall be of the nonconductive type.

(viii) Use of barricades forming a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade shall be as far from the equipment as feasible.

(ix) Workers other than the operator shall be prohibited from touching the load line above the insulating link or device and crane. Operators who remotely operate the equipment from the ground shall use either wireless controls that isolate the operator from the equipment or insulating mats that insulate the operator from the ground.

- (x) Only personnel essential to the operation may be in the area of the crane and load.
- (xi) The equipment shall be properly grounded.
- (xii) Insulating line hose or cover-up shall be installed by the utility owner or operator except where such devices are unavailable for the line voltages involved.
- (e) The procedures developed to comply with subdivision (d) of this rule are documented and immediately available on-site.
- (f) The equipment user and utility owner or operator, or registered professional engineer shall meet with the equipment operator and the other workers who will be in the area of the equipment or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in subdivision (c) of this subrule and prevent electrocution.
- (g) The procedures developed to comply with subdivision (d) of this subrule are implemented.
- (h) The utility owner or operator, or registered professional engineer and all employers of employees involved in the work shall identify 1 person who will direct the implementation of the procedures. The person identified in accordance with this subrule shall direct the implementation of the procedures and shall have the authority to stop work at any time to ensure safety.
- (i) [Reserved.]
- (j) If a problem occurs implementing the procedures being used to comply with subdivision (d) of this subrule, or indicating that those procedures are inadequate to prevent electrocution, the employer shall safely stop operations and either develop new procedures to comply with subdivision (d) of this subrule or have the utility owner or operator deenergize and visibly ground or relocate the power line before resuming work.
- (k) Devices originally designed by the manufacturer for use as a safety device, as specified in R 408.41018a, operational aid, or a means to prevent power line contact or electrocution, when used to comply with this rule, shall comply with the manufacturer's procedures for use and conditions of use.
- (l) [Reserved.]
- (m) The employer shall train each operator and crew member assigned to work with the equipment in accordance with R 408.41016b(7).

History: 2012 AACCS.

R 408.41016e Power line safety while traveling under or near power lines with no load.

Rule 1016e. (1) This rule establishes procedures and criteria that shall be met for equipment traveling under or near a power line on a construction site with no load. Equipment traveling on a construction site with a load shall comply with R 408.41016b, R 408.41016c, or R 408.41016d, whichever is appropriate, and R 408.41019b(19).

(2) The employer shall ensure that all of the following are met:

- (a) The boom or mast and boom or mast support system are lowered sufficiently to meet the requirements of this rule.
- (b) The clearances specified in Table T of this rule are maintained.

(c) The effects of speed and terrain on equipment movement, including movement of the boom or mast, are considered so that those effects do not cause the minimum clearance distances specified in Table T of this rule to be breached.

(d) Dedicated spotter. If any part of the equipment while traveling will get closer than 20 feet to the power line, the employer shall ensure that a dedicated spotter who is in continuous contact with the driver or operator is used. The dedicated spotter shall do all of the following:

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

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

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

(e) Additional precautions for traveling in poor visibility. When traveling at night or in conditions of poor visibility, in addition to the measures specified in subdivisions (a) to (d), the employer shall ensure the following:

(i) The power lines are illuminated or another means of identifying the location of the lines is used.

(ii) A safe path of travel is identified and used.

**TABLE T—  
MINIMUM CLEARANCE DISTANCES WHILE TRAVELING WITH NO LOAD**

Voltage (nominal, kV, alternating current)	While traveling—minimum clearance distance (feet)
Up to 0.75	4
Over .75 to 50	6
Over 50 to 345	10
Over 345 to 750	16
Over 750 to 1,000	20
Over 1,000	(as established by the utility owner or operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

History: 2012 AACS.

**R 408.41017a Ground conditions.**

Rule 1017a. (1) The equipment shall not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction with the use of supporting materials if necessary, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes or wetlands.

(2) The controlling entity shall do both of the following:

(a) Ensure that ground preparations necessary to meet the requirements in subrule (1) of this rule are provided.

(b) Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area, such as voids, tanks, and utilities, if those hazards are identified in documents, such as site drawings, as-built drawings, and soil analyses, that are in the possession of the controlling entity, whether at the site or off-site, or the hazards are otherwise known to that controlling entity.

(3) If there is no controlling entity for the project, the requirement in subrule (2)(a) of this rule shall be met by the employer who has authority at the site to make or arrange for ground preparations needed to meet subrule (1) of this rule.

(4) If the A/D director or the operator determines that ground conditions do not meet the requirements in subrule (1) of this rule, that person's employer shall have a discussion with the controlling entity regarding the ground preparations that are needed so that the requirements in subrule (1) of this rule can be met with the use of suitable supporting materials or devices, if necessary.

(5) This rule does not apply to cranes designed for use on railroad tracks when used on railroad tracks that are part of the general railroad system of transportation that is regulated pursuant to the Federal Railroad Administration under 49 CFR part 213 and that comply with applicable Federal Railroad Administration requirements.

History: 1995 AACS; 2012 AACS.

R 408.41018a Safety devices.

Rule 1018a. (1) The following safety devices shall be required on all equipment covered by this part, unless otherwise specified:

(a) The following apply to crane level indicators:

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

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

(iii) This requirement shall not apply to portal cranes, derricks, floating cranes or derricks and land cranes or derricks on barges, pontoons, vessels or other means of flotation.

(b) Boom stops, except for derricks and hydraulic booms.

(c) Jib stops, if a jib is attached, except for derricks.

(d) Equipment with foot pedal brakes shall have locks.

(e) Hydraulic outrigger jacks and hydraulic stabilizer jacks shall have an integral holding device or check valve.

(f) Equipment on rails shall have rail clamps and rail stops, except for portal cranes.

(g) Both of the following apply to horns:

(i) The equipment shall have a horn that is either built into the equipment or is on the equipment and immediately available to the operator.

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



(2) Proper operation required. Operations shall not begin unless all of the devices listed in subrule (1) of this rule are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations. If any of the devices listed in subrule (1) of this rule are not in proper working order, the equipment shall be taken out of service and operations shall not resume until the device is again working properly as specified in R 408.41019b. Alternative measures shall not be used.

History: 1995 AACS; 1996 AACS; 1998-2000 AACS; 2012 AACS.

#### R 408.41019a Operational aids.

Rule 1019a. (1) The devices listed in this rule are required on all equipment covered by this part, unless otherwise specified.

(a) The requirements in subrule (5)(a), (b), and (c) do not apply to articulating cranes.

(b) The requirements in subrules (4)(c), (5)(a) and (d) apply only to those digger derricks manufactured after November 8, 2011.

(2) Operations shall not begin unless the listed operational aids are in proper working order, except when an operational aid is being repaired the employer shall use the specified temporary alternative measures. The time periods permitted for repairing defective operational aids are specified in subrules (4) and (5) of this rule. More protective alternative measures specified by the crane or derrick manufacturer, if any, shall be followed.

(3) If a listed 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. If a replacement part is no longer available, the use of a substitute device that performs the same type of function shall be permitted and shall not be considered a modification under R 408.41028a.

(4) Category I operational aids and alternative measures. Operational aids listed in this subrule that are not working properly shall be repaired not later than 7 calendar days after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair shall be completed within 7 calendar days of receipt of the parts. See R 408.41019b(9) for additional requirements.

(a) The following apply to boom hoist limiting devices:

(i) For equipment manufactured after December 16, 1969, a boom hoist limiting device shall be required. If temporary alternative measures are necessary, 1 or more of the following methods shall be used:

(A) Use a boom angle indicator.

(B) Clearly mark the boom hoist cable so that it can easily be seen by the operator at a point that shall give the operator sufficient time to stop the hoist to keep the boom within the minimum allowable radius. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

(C) Clearly mark the boom hoist cable so that it can easily be seen by a spotter at a point that shall give the spotter sufficient time to signal the operator and have the operator stop the hoist to keep the boom within the minimum allowable radius.

(ii) If the equipment was manufactured on or before December 16, 1969 and is not equipped with a boom hoist limiting device, at least 1 of the measures in subrule (4)(a)(i)(A) to (C) of this rule shall be used.

(b) Luffing jib limiting device. Equipment with a luffing jib shall have a luffing jib limiting device. Temporary alternative measures shall be the same as in subrule (4)(a)(i), except to limit the movement of the luffing jib rather than the boom hoist.

(c) The following apply to anti two-blocking devices:

(i) Telescopic boom cranes manufactured after February 28, 1992 shall be equipped with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip or fixed upper block or similar component. The device shall prevent this damage at all points where two-blocking could occur. Temporary alternative measures: Clearly mark the cable so that it can easily be seen by the operator at a point that shall give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

(ii) The following apply to lattice boom cranes:

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

(B) Lattice boom cranes and derricks manufactured after November 8, 2011 shall be equipped with a device that automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip or fixed upper block or similar component. The device shall prevent this damage or failure at all points where two-blocking may occur.

(C) Exception. The requirements in subrule (4)(c)(ii)(A) and (B) of this rule shall not apply to lattice boom equipment when used for dragline, clamshell or grapple, magnet, drop ball, container handling, concrete bucket, marine operations that do not involve hoisting personnel and pile driving work.

(D) Temporary alternative measures. Clearly mark the cable so that it can easily be seen by the operator at a point that shall give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter.

(iii) Articulating cranes manufactured after December 31, 1999 that are equipped with a load hoist shall be equipped with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip or fixed upper block or similar component. The device shall prevent this damage at all points where two-blocking may occur. Temporary alternative measures: When two-blocking may only occur with movement of the load hoist, clearly mark the cable so that it can easily be seen by the operator at a point that shall give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter. When two-blocking may occur without movement of the load hoist, clearly mark the cable so that it can easily be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom.

(5) Category II operational aids and alternative measures. Operational aids listed in this subrule that are not working properly shall be repaired not later than 30 calendar days

after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency and the part is not received in time to complete the repair in 30 calendar days, the repair shall be completed within 7 calendar days of receipt of the parts. See R 408.41019b(9) for additional requirements. All of the following apply:

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

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

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

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

(ii) Calculate boom length from boom angle and radius measurements.

(iii) Measure the boom with a measuring device.

(d) The following apply to load weighing and similar devices:

(i) Equipment, other than derricks and articulating cranes, manufactured after March 29, 2003 with a rated capacity over 6,000 pounds shall have at least 1 of the following: a load weighing device, a load moment or rated capacity indicator, or a load moment or rated capacity limiter. Temporary alternative measures: The weight of the load shall be determined from a source recognized by the industry, such as the load's manufacturer, or by a calculation method recognized by the industry, such as calculating a steel beam from measured dimensions and a known per foot weight. This information shall be provided to the operator prior to the lift.

(ii) Articulating cranes manufactured after November 8, 2011 shall have at least 1 of the following: an automatic overload prevention device, a load weighing device, a load moment or rated capacity indicator, or a load moment rated capacity limiter. Temporary alternative measures: The weight of the load shall be determined from a source recognized by the industry, such as the load's manufacturer, or by a calculation method recognized by the industry, such as calculating a steel beam from measured dimensions and a known per foot weight. This information shall be provided to the operator prior to the lift.

(e) Both of the following devices shall be required on equipment manufactured after November 8, 2011:

(i) Outrigger or stabilizer position, horizontal beam extension, sensor or monitor if the equipment has outriggers or stabilizers. Temporary alternative measures: The operator shall verify that the position of the outriggers or stabilizers is correct in accordance with manufacturer procedures before beginning operations requiring outrigger or stabilizer deployment.

(ii) Hoist drum rotation indicator if the equipment has a hoist drum not visible from the operator's station. Temporary alternative measures: Mark the drum to indicate the rotation of the drum. In addition, install mirrors or remote video cameras and displays if necessary for the operator to see the mark.

History: 1995 AACS; 2012 AACS.

R 408.41019b Operations.

Rule 1019b. (1) The employer shall comply with all manufacturer procedures applicable to the operational functions of equipment, including its use with attachments.

(2) The following apply to unavailable operation procedures:

(a) When 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.

(b) Procedures for the operational controls shall be developed by a qualified person.

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

(3) The following apply to accessibility of procedures:

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

(b) When rated capacities are available in the cab only in electronic form and in the event of a failure that makes the rated capacities inaccessible, the operator shall immediately cease operations or follow safe shut-down procedures until the rated capacities, in electronic or other form, are available.

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

(4) The following apply to leaving the equipment unattended:

(a) The operator shall not leave the controls while the load is suspended, except when all of the following are met:

(i) The operator remains adjacent to the equipment and is not engaged in any other duties.

(ii) The load is to be held suspended for a period of time exceeding normal lifting operations.

(iii) The competent person determines that it is safe and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger or stabilizer functions.

(iv) Barricades or caution lines, and notices, are erected to prevent all employees from entering the fall zone. No employees, including those listed in R 408.41023a(2)(a) to (c) and R 408.41023a(4) or (5), are permitted in the fall zone.

(b) The provisions in subrule (4)(a) of this rule do not apply to working gear, such as slings, spreader bars, ladders, and welding machines, where the weight of the working gear is negligible relative to the lifting capacity of the equipment as positioned, and the working gear is suspended over an area other than an entrance or exit.

(5) The following apply to tag-out:

(a) Tagging out of service equipment and functions. When the employer has taken the equipment out of service, a tag shall be placed in the cab stating that the equipment is out

of service and is not to be used. When the employer has taken a function out of service, a tag shall be placed in a conspicuous position stating that the function is out of service and shall not be used.

(b) The following apply to response to “do not operate” and tag-out signs:

(i) If there is a warning sign, such as a tag-out or maintenance, and do not operate, on the equipment or starting control, the operator shall not activate the switch or start the equipment until the sign has been removed by a person authorized to remove it, or until the operator has verified both of the following:

(A) No one is servicing, working on, or otherwise in a dangerous position on the machine.

(B) The equipment has been repaired and is working properly.

(ii) If there is a warning sign, tag-out or maintenance, and do not operate, on any other switch or control, the operator shall not activate that switch or control until the sign has been removed by a person authorized to remove it, or until the operator has verified that the requirements in subrule (5)(b)(i)(A) and (B) of this rule have been met.

(6) Before starting the engine, the operator shall verify that all controls are in the proper starting position and that all personnel are in the clear.

(7) All controls shall be tested by an operator before beginning a new shift. Any controls that do not operate properly shall be adjusted or repaired before operations are begun.

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

(9) If equipment adjustments or repairs are necessary both of the following shall be done:

(a) The operator shall, in writing, promptly inform the person designated by the employer to receive such information and, where there are successive shifts, to the next operator.

(b) The employer shall notify all affected employees, at the beginning of each shift, of the necessary adjustments or repairs and all alternative measures.

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

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

(12) Before starting to hoist, an operator shall do all of the following:

(a) Make sure the hoist rope is not kinked.

(b) Make sure the multiple part lines are not twisted around each other.

(c) Make sure the hook is not swinging when brought over the load.

(13) The competent person shall adjust the equipment, or operations, or both, to address the effect of wind, ice, and snow on equipment stability and rated capacity.

(14) The following apply to compliance with rated capacity:

(a) The equipment shall not be operated in excess of its rated capacity.

(b) The operator shall not be required to operate the equipment in a manner that would violate subrule (14)(a) of this rule.

(c) Load weight. The operator shall verify that the load is within the rated capacity of the equipment by not less than 1 of the following methods:

(i) The weight of the load shall be determined from a source recognized by the industry such as the load's manufacturer, or by a calculation method recognized by the industry such as calculating a steel beam from measured dimensions and a known per foot weight, or by other equally reliable means. In addition, when requested by the operator, this information shall be provided to the operator prior to the lift.

(ii) The operator shall begin hoisting the load to determine if it exceeds 75% of the maximum rated capacity at the longest radius that will be used during the lift operation by using a load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. If it does, the operator shall not proceed with the lift until he or she verifies the weight of the load in accordance with subrule (14)(c)(i) of this rule.

(15) The boom or other parts of the equipment shall not contact any obstruction.

(16) The equipment shall not be used to drag or pull loads sideways.

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

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

(19) Neither the load nor the boom shall be lowered below the point where less than 2 full wraps of rope remain on their respective drums.

(20) The following apply to traveling with a load:

(a) Traveling with a load shall be prohibited if the practice is prohibited by the manufacturer.

(b) Where traveling with a load, the employer shall ensure all of the following:

(i) A competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.

(ii) The determinations of the competent person required in subrule (20)(b)(i) of this rule are implemented.

(iii) For equipment with tires, tire pressure specified by the manufacturer shall be maintained.

(21) Rotational speed of the equipment shall be such that the load does not swing out beyond the radius at which it can be controlled.

(22) A tag or restraint line shall be used if necessary to prevent rotation of the load that would be hazardous.

(23) The brakes shall be adjusted in accordance with manufacturer procedures to prevent unintended movement.

(24) A load in an elevated position shall not be detached from the load line of a crane, derrick, or excavation equipment until the load has been secured to prevent unintentional movement.

(25) A fuel tank filler pipe for an internal combustion engine that powers a crane or derrick shall be located or guarded to prevent the spillage of fuel onto a hot surface or electrical equipment.

(26) Fuels shall be transported, stored, and handled as prescribed in construction safety standard part 18 “Fire Protection and Prevention,” as referenced in R 408.41003a.

(27) A load line shall not be wrapped around the material being lifted.

(28) A load shall be secured and balanced before the load is lifted more than 6 inches.

(29) Clothing, personal belongings, tools, and other articles within a cab or operating enclosure shall be stored in cabinets, boxes, or by other means so as not to interfere with access or operations.

(30) A portable fire extinguisher that has a rating of not less than 10 BC shall be kept in the cab or operating enclosure. When there is no cab or enclosure, it shall be kept on the jobsite within a 200-foot radius of the equipment and shall be readily available. The operator and maintenance employees shall be trained in the use of the fire extinguisher.

(31) When night operations are carried out, lighting shall illuminate the immediate working area to a minimum of 10 footcandles and shall not interfere with the operator’s vision.

(32) A rope shall not be used to carry current or as a ground on any crane or derrick.

(33) An employee shall not ride the bare hook or on a load of material suspended from the hook.

(34) The operator shall obey a stop or emergency stop signal, irrespective of who gives it.

(35) Swinging locomotive cranes. A locomotive crane shall not be swung into a position where railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track and that proper flag protection has been established.

(36) The following apply to counterweights and ballasts:

(a) The following applies to equipment other than tower cranes:

(i) Equipment shall not be operated without the counterweight or ballast in place as specified by the manufacturer.

(ii) The maximum counterweight or ballast specified by the manufacturer for the equipment shall not be exceeded.

(b) Counterweight and ballast requirements for tower cranes are specified in R 408.41029a(2)(h).

History: 2012 AACS.

R 408.41019c Authority to stop operation.

Rule 1019c. Each equipment operator shall be responsible for those operations that are under the operator’s direct control. When there is a concern about safety, the operator may stop and refuse to handle loads until a qualified person has determined that safety has been assured.

History: 2012 AACS.

R 408.41020a Fall protection.

Rule 1020a. (1) All of the following apply to application of rules:

(a) Subrules (2), (3)(c), (5) and (6) of this rule shall apply to all equipment covered by this standard except tower cranes.

(b) Subrules (3)(a) and (b), (4), (7), (10) and (11) of this rule shall apply to all equipment covered by this standard.

(c) Subrules (3)(d) and (8) of this rule shall apply only to tower cranes.

(2) The following apply to boom walkways:

(a) Equipment manufactured after November 8, 2011 with lattice booms shall be equipped with walkways on the boom or booms if the vertical profile of the boom, from cord centerline to cord centerline, is 6 feet or more.

(b) The following apply to boom walkway criteria:

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

(ii) All of the following apply to guardrails, railings, and other permanent fall protection attachments along walkways:

(A) Not required.

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

(C) Prohibited if they are of the removable type or designed to be installed and removed each time the boom is assembled or disassembled.

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

(3) The following apply to steps, handholds, ladders, grabrails, guardrails, and railings:

(a) Construction safety standard part 45 “Fall Protection,” 1926.502(b), as referenced in R 408.41003a, does not apply to equipment covered by this standard.

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

(c) Equipment manufactured after November 8, 2011 shall be equipped so as to provide safe access and egress between the ground and the operator work station, including the forward and rear positions, by the provision of devices such as steps, handholds, ladders, and guardrails, railings, or grabrails. These devices shall meet both of the following criteria:

(i) Steps, handholds, ladders and guardrails, railings, or grabrails shall meet the criteria of the Society of Automotive Engineers (SAE) J185 “Access Systems for Off-Road Machines,” May 2003 edition, which is adopted by reference in R 408.41003a, or the International Organization for Standardization (ISO) 11660–2 “Cranes – Access, Guards and Restraints – Part 2: Mobile Cranes,” 1994 edition, which is adopted by reference in R 408.41003a, except where infeasible.

(ii) Walking or stepping surfaces, except for crawler treads, shall have slip-resistant features or properties, such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint.

(d) Tower cranes manufactured after November 8, 2011 shall be equipped so as to provide safe access and egress between the ground and the cab, machinery platforms, and tower or mast, by the provision of devices such as steps, handholds, ladders, and guardrails, railings, or grabrails. These devices shall meet both of the following criteria:

(i) Steps, handholds, ladders, and guardrails, railings, or grabrails shall meet the criteria of ISO 11660–1 “Cranes – Access, Guards and Restraints – Part 1: General,” 2008 edition, and ISO 11660–3 “Cranes – Access, Guards and Restraints – Part 3: Tower



Cranes,” 2008 edition, or SAE J185 “Access Systems for Off-Road Machines,” May 2003 edition, all of which are adopted by reference in R 408.41003a, except where infeasible.

(ii) Walking or stepping surfaces shall have slip-resistant features or properties, such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint.

(4) Personal fall arrest and fall restraint systems. Personal fall arrest system components shall be used in personal fall arrest and fall restraint systems and shall conform to the criteria in construction safety standard part 45 “Fall Protection,” 1926.502(d), as referenced in R 408.41003a, except that 1926.502(d)(15) shall not apply to components used in personal fall arrest and fall restraint systems. Either body belts or body harnesses shall be used in personal fall arrest and fall restraint systems.

(5) For non-assembly or disassembly work, the employer shall provide and ensure the use of fall protection equipment for employees who are on a walking or working surface with an unprotected side or edge more than 6 feet above a lower level. The following apply:

(a) When moving point-to-point, equipment shall be provided for the following:

(i) On non-lattice booms, whether horizontal or not horizontal.

(ii) On lattice booms that are not horizontal.

(iii) On horizontal lattice booms where the fall distance is 15 feet or more.

(b) While at a work station on any part of the equipment, including any type of boom, except when the employee is at or near draw-works when the equipment is running, in the cab, or on the deck.

(6) For assembly or disassembly work, the employer shall provide and ensure the use of fall protection equipment for employees who are on a walking or working surface with an unprotected side or edge more than 15 feet above a lower level, except when the employee is at or near draw-works when the equipment is running, in the cab, or on the deck.

(7) The following apply to anchorage criteria:

(a) Construction safety standard part 45 “Fall Protection,” 1926.502(d)(15) and 1926.502(e)(2), as referenced in R 408.41003a, shall apply to equipment covered by this standard only to the extent delineated in subrule (7)(b) of this rule.

(b) The following apply to anchorages for personal fall arrest and positioning device systems:

(i) Personal fall arrest systems shall be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in construction safety standard part 45 “Fall Protection,” 1926.502(d)(15), as referenced in R 408.41003a, would not be met.

(ii) Positioning device systems shall be anchored to any apparently substantial part of the equipment unless a competent person, from a visual inspection, without an engineering analysis, would conclude that the criteria in construction safety standard part 45 “Fall Protection,” 1926.502(e)(2), as referenced in R 408.41003a, would not be met.

(iii) Attachable anchor devices, portable anchor devices that are attached to the equipment, shall meet the anchorage criteria in construction safety standard part 45 “Fall Protection,” 1926.502(d)(15) for personal fall arrest systems and 1926.502(e)(2) for positioning device systems, as referenced in R 408.41003a.

(c) Anchorages for fall restraint systems. Fall restraint systems shall be anchored to any part of the equipment that is capable of withstanding twice the maximum load that an employee may impose on it during reasonably anticipated conditions of use.

(8) The following apply to tower cranes:

(a) For work other than erecting, climbing, and dismantling, the employer shall provide and ensure the use of fall protection equipment for employees who are on a walking or working surface with an unprotected side or edge more than 6 feet above a lower level, except when the employee is at or near draw-works when the equipment is running, in the cab, or on the deck.

(b) For erecting, climbing, and dismantling work, the employer shall provide and ensure the use of fall protection equipment for employees who are on a walking or working surface with an unprotected side or edge more than 15 feet above a lower level.

(9) [Reserved.]

(10) Anchoring to the load line. A personal fall arrest system may be anchored to the crane or derrick's hook, or other part of the load line, where all of the following requirements are met:

(a) A qualified person has determined that the set-up and rated capacity of the crane or derrick, including the hook, load line, and rigging, meets or exceeds the requirements in construction safety standard part 45 "Fall Protection," R 1926.502(d)(15), as referenced in R 408.41003a.

(b) The equipment operator shall be at the work site and shall be informed that the equipment is being used for this purpose.

(c) No load shall be suspended from the load line when the personal fall arrest system is anchored to the crane or derrick's hook or other part of the load line.

(11) Training. The employer shall train each employee who may be exposed to fall hazards while on, or hoisted by, equipment covered by this standard on both of the following:

(a) The requirements in this part that address fall protection.

(b) The applicable requirements in construction safety standard part 45 "Fall Protection," R 1926.500 and R 1926.502, as referenced in R 408.41003a.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

#### R 408.41021a Hoisting personnel.

Rule 1021a. (1) The requirements of this rule are in addition to the other requirements in this standard and apply when 1 or more employees are hoisted. The use of equipment to hoist employees shall be prohibited except where the employer demonstrates that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions. This subrule shall not apply to work covered by construction safety standard part 28 "Personnel Hoisting in Steel Erection," as referenced in R 408.41003a.

(2) The following apply to use of personnel platforms:

(a) When using equipment to hoist employees, the employees shall be in a personnel platform that meets the requirements of subrule (6) of this rule.

(b) Exceptions. A personnel platform shall not be required for hoisting employees under the following conditions:

(i) Into and out of drill shafts that are up to and including 8 feet in diameter. See subrule (16) of this rule for requirements for hoisting these employees.

(ii) In pile driving operations. See subrule (17) of this rule for requirements for hoisting these employees.

(iii) Solely for transfer to or from a marine worksite in a marine-hoisted personnel transfer device. See subrule (19) of this rule for requirements for hoisting these employees.

(iv) In storage-tank (steel or concrete), shaft and chimney operations. See subrule (20) of this rule for requirements for hoisting these employees.

(3) The following apply to equipment set-up:

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

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

(4) The following apply to equipment criteria:

(a) Capacity: Use of suspended personnel platforms. The total load with the platform loaded, including the hook, load line and rigging, shall not exceed 50% of the rated capacity for the radius and configuration of the equipment, except during proof testing.

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

(c) Capacity: Hoisting personnel without a personnel platform. When hoisting personnel without a personnel platform pursuant to subrule (2)(b) of this rule, the total load, including the hook, load line, rigging and any other equipment that imposes a load, shall not exceed 50% of the rated capacity for the radius and configuration of the equipment, except during proof testing.

(d) Load and boom hoist drum brakes, swing brakes, and locking devices, such as pawls or dogs, shall be engaged when the occupied personnel platform is in a stationary working position.

(5) The following apply to devices:

(a) Equipment, except for derricks and articulating cranes, with a variable angle boom shall be equipped with both of the following:

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

(ii) A boom hoist limiting device.

(b) Articulating cranes shall be equipped with a properly functioning automatic overload protection device.

(c) Equipment with a luffing jib shall be equipped with both of the following:

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

(ii) A jib hoist limiting device.

(d) An employer shall ensure that a crane that has a telescoping boom is equipped with a device to indicate clearly to the operator, at all times, the boom's extended length, or shall ensure that an accurate determination of the load radius to be used during the lift is made before hoisting personnel.

(e) An employer shall ensure the use of a positive acting device to prevent contact between the load block or overhaul ball and the boom tip, anti-2-blocking device, or a system that shall be used to deactivate the hoisting action before damage occurs in a 2-blocking situation, 2-block damage prevention feature.

(f) The load line hoist drum shall have a system or device on the powertrain, other than the load hoist brake, that regulates the lowering rate of the speed of the hoist mechanism, controlled load lowering. Free-fall is prohibited.

(g) Proper operation required. Personnel hoisting operations shall not begin unless the devices listed in subrule (5) of this rule 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. See R 408.41019b for tag-out and related requirements.

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

(6) Personnel platform criteria. A work platform shall comply with all of the following requirements:

(a) 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.

(b) The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.

(c) Be designed and constructed by qualified personnel who are designated by, and responsible to, the employer.

(d) A welder who welds work platforms shall comply with the requirements of the American Welding Society (AWS) standards AWS standard "IHS AWSC Structural Welding Code," 2000 edition, AWS standard D14.1 "Welding of Industrial and Mill Cranes and Other Material Handling Equipment," 1997 edition, AWS standard B1.10 "Guide for the Nondestructive Inspection of Welds," 1986 edition, and AWS standard D14.4 "Class and Application of Welded Joints for Machinery Equipment," 1997 edition. These standards are adopted by reference in R 408.41003a.

(e) The personnel platform, excluding the guardrail system and personal fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least 5 times the maximum intended load.

(f) The personnel platform shall be equipped with a guardrail system that meets the requirements of construction safety standard part 45 "Fall Protection," as referenced in R 408.41003a, and shall be enclosed at least from the toeboard to mid-rail with either solid construction material or expanded metal that have openings not greater than 1/2 inch (1.27 cm). Points to which personal fall arrest systems are attached shall meet the anchorage requirements in construction safety standard part 45 "Fall Protection."

(g) A grab rail shall be installed inside the entire perimeter of the personnel platform except for access gates/doors.

(h) Access gates or doors. If installed, access gates or doors of all types, including swinging, sliding, folding, or other types, shall not swing outward. If due to the size of the personnel platform, such as a 1-person platform, it is infeasible for the door to swing inward and allow safe entry for the platform occupant, then the access gate or door may swing outward. Access gates and doors shall be equipped with a device that prevents accidental opening.

(i) A platform gate shall be securely fastened during all travel, and shall be opened only during egress from, or access to, the work platform. The platform shall be used only for positioning employees at otherwise inaccessible locations to perform work and shall not be used as an elevator.

(j) Headroom shall be sufficient to allow employees to stand upright in the platform.

(k) In addition to the use of hard hats, employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects. The platform overhead protection shall not obscure the view of the operator or platform occupants, such as wire mesh that has openings up to 1/2 inch, unless full protection is necessary.

(l) The employer shall ensure that all rough edges exposed to contact by employees are surfaced or smoothed to prevent injury to employees from puncture or lacerations.

(m) Have a permanently affixed sign that shall specify all of the following information:

(i) Maximum number of passengers.

(ii) Work platform identification number.

(iii) Maximum rated load.

(iv) Weight of the platform.

(n) Be easily identifiable by high-visibility color or marking.

(7) All of the following apply to personnel platform loading:

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

(b) Both of the following apply to 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 subrule (7)(c) of this rule may be in the platform for trial lifts.

(c) Materials and tools shall comply with both of the following:

(i) Be secured to prevent displacement.

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

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

(8) All of the following apply to attachment and rigging:

(a) The following apply to 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 the following:

(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 shall be of the alloy anchor type, and include either of the following:

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

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

(iii) Where other detachable devices are used, they shall be of the type that can be closed and locked to the same extent as the devices addressed in subrules (8)(a)(i) and (ii) of this rule. These devices shall be closed and locked when attached.

(iv) The load line of a crane that is used to raise or lower a work platform shall be equipped with a swivel to reduce the wire rope-induced rotation of the work platform, unless the use of the swivel is not recommended by the wire rope manufacturer.

(v) Wire rope clips shall be prohibited.

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

(c) Rigging hardware, including wire rope, shackles, rings, master links, and other rigging hardware, and hooks shall be capable of supporting, without failure, at least 5 times the maximum intended load applied or transmitted to that component. Where rotation resistant rope is used, the slings shall be capable of supporting without failure at least 10 times the maximum intended load.

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

(e) 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. The bridles and associated rigging shall not have been used for any purpose other than hoisting personnel.

(9) The following apply to trial lift and inspection:

(a) A trial lift of an unoccupied personnel platform that is loaded at least to the anticipated lift weight shall be made from ground level, or any other location where employees will enter the platform, to each location to which the personnel platform is to be hoisted and positioned. The trial lift shall be performed immediately before placing personnel on the platform. The competent person shall determine that all systems, controls, and safety devices are activated and functioning properly, that interferences do not exist, and that all configurations necessary to reach the work locations will allow the operator to remain under the 50% limit of the hoist's rated capacity. Materials and tools to be used during the actual lift can be loaded in the platform as provided in subrule (7)(c) of this rule for the trial lift. A single trial lift may be performed at 1 time for all locations that are to be reached from a single setup position.

(b) The trial lift shall be repeated before hoisting employees when the crane or derrick is moved and set up in a new location or returned to a previously used location. The trial lift shall be repeated when the lift route is changed, unless the competent person determines that the route change is not significant and the route change would not affect the safety of hoisted employees.

(c) The competent person shall comply with all the following:

(i) Determine that the lift will not exceed 50% of the equipment's rated capacity at any time during the lift.

(ii) Confirm that the load radius to be used during the lift has been accurately determined.

(iii) Conduct a visual inspection of the crane or derrick, rigging, personnel platform, and the crane or derrick base support or ground immediately after the trial lift to determine whether the testing has exposed a defect or produced an adverse effect upon a component or structure.

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

(d) Immediately prior to each lift the platform shall be hoisted a few inches with the personnel, materials, and tools on board and inspected by a competent person to ensure that it is secure and properly balanced. The following conditions shall be determined by a competent person to exist before the lift of personnel proceeds:

(i) Multiple part lines are not twisted around each other.

(ii) The primary attachment is centered over the platform.

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

(iv) Hoist ropes shall be free of deficiencies in accordance with R 408.41013a(1).

(e) Any condition found during the trial lift and subsequent inspection that fails to meet a requirement of this standard or otherwise creates a safety hazard shall be corrected before hoisting personnel. See R 408.41019b for tag-out and related requirements.

(10) All of the following apply to load testing:

(a) Before a work platform is used after fabrication, it shall be load-tested to 2 times the maximum intended load or rated capacity.

(b) A work platform shall also be load-tested as follows:

(i) Annually, if used on a regular basis.

(ii) Before use, if the interval of time between use is more than 1 year.

(iii) After the crane or work platform has been moved to another location on the jobsite.

(c) A load test shall follow the maximum intended lift of the work platform.

(d) After any repair or modification, a platform shall be retested to 2 times its rated capacity.

(e) A record of the load test shall be maintained by the employer for the life of the platform.

(11) Both of the following apply to proof testing:

(a) At each jobsite, before hoisting employees on the personnel platform and after any repair or modification, the platform and rigging shall be proof tested, as required in subrule (10) of this rule, to 125% of the platform's rated capacity by holding it in a suspended position for 5 minutes with the test load evenly distributed on the platform. Proof testing may be done concurrently with the trial lift. After proof testing, a competent person shall inspect the platform and rigging. If a deficiency is found, it shall be corrected and another proof test shall be conducted. Personnel hoisting shall not be conducted until the proof testing requirements are satisfied.

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

(12) All of the following apply to work practices:

(a) Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform. The maximum rate of travel of a work platform shall be 100 feet per minute. Free-falling shall be prohibited when using the platform to lower personnel.

(b) Platform occupants shall comply with all of the following:

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

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

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

(iv) Not leave the suspended work platform, except for a structural steel connector or a pile driver. If a structural steel connector or a pile driver leaves the suspended platform, a gate shall be provided as prescribed in subrule (6)(e) of this rule. The gate shall comply with the requirements of construction safety standard part 45 "Fall Protection," as referenced in R 408.41003a. The gate shall be securely fastened during all travel and opened only during access to, or egress from, the work platform.

(v) 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 the employer can demonstrate that securing to the structure would create a greater hazard.

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

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

(e) The operator of the crane shall remain at the controls with the engine running when an occupied work platform is in the suspended position.

(f) A crane that is used to raise or lower a work platform shall be set level on a firm base and shall have the travel lock engaged.

(g) Platforms without controls. When the platform is not equipped with controls, the equipment operator shall remain at the equipment controls, on site, and in view of the equipment, at all times while the platform is occupied.

(h) Platforms with controls. When the platform is equipped with controls, all of the following shall be met at all times while the platform is occupied:

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

(ii) The equipment operator shall be at a set of equipment controls that include boom and swing functions of the equipment, and shall be on site and in view of the equipment.

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

(i) All of the following apply to environmental conditions:

(i) Wind. When wind speed, sustained or gusts, exceeds 20 miles per hour at the personnel platform, a qualified person shall determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not safe, the lifting operation shall not begin. If the lifting operation is already in progress, it shall be terminated.

(ii) Other weather and environmental conditions. A qualified person shall determine if, in light of indications of dangerous weather conditions or other impending or existing danger, it is not safe to lift personnel. If it is not safe, the lifting operation shall not begin. If the lifting operation is already in progress, it shall be terminated.

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

(k) All of the following apply to fall protection:

(i) Except when over water, employees occupying the personnel platform shall be provided and use a personal fall arrest system. The system shall be attached to a structural member within the personnel platform. When working over or near water, the requirements of construction safety standard part 6 "Personal Protective Equipment," as referenced in R 408.41003a, shall apply.



(ii) The fall arrest system, including the attachment point or anchorage used to comply with subrule(12)(l)(i) of this rule, shall meet the requirements in construction safety standard part 45 “Fall Protection,” as referenced in R 408.41003a.

(l) All of the following apply to other load lines:

(i) When a crane is being used to raise or lower persons on a work platform, another load shall not be attached to the work platform and another load shall not be raised or lowered at the same time by the same crane.

(ii) Factory-produced boom-mounted personnel platforms that incorporate a winch as original equipment. Loads may be hoisted by this winch while employees occupy the personnel platform only where the load on the winch line does not exceed 500 pounds and does not exceed the rated capacity of the winch and platform.

(m) All of the following apply to traveling—equipment other than derricks:

(i) Hoisting of employees while the equipment is traveling is prohibited, except for either subparagraph (A) or (B) of this paragraph:

(A) Equipment that travels on fixed rails.

(B) When the employer demonstrates that there is no less hazardous way to perform the work.

(C) This exception does not apply to rubber-tired equipment.

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

(A) Equipment 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) Equipment travel shall be limited to boom length.

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

(E) A complete trial run must 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 subrule (9) of this rule which tests the lift route.

(n) Traveling—derricks. Derricks shall be prohibited from traveling while personnel are hoisted.

(13) [Reserved.]

(14) All of the following apply to pre-lift meeting:

(a) The employer shall hold a pre-lift meeting to review the appropriate requirements and procedures to be followed. The meeting shall be held before the trial lift at each new work location and shall be repeated for any employees who are newly assigned to the operation.

(b) All of the following entities shall attend the pre-lift meeting:

(i) The crane operator.

(ii) The signalperson, if necessary for the lift.

(iii) Employees to be lifted.

(iv) The person who is responsible for the task to be performed.

(15) 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 shall be prohibited, except for work covered by construction safety standard part 16 "Power Transmission and Distribution," as referenced in R 408.41003a.

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

(a) The employee shall be in either a personnel platform or on a boatswain's chair.

(b) If using a personnel platform, subrules (1) to (15) of this rule shall apply.

(c) If using a boatswain's chair all of the following requirements shall be met:

(i) The following subrules shall apply: (1), (3), (4)(a), (4)(c), (4)(d), (6)(a), (6)(c), (7)(a), (7)(b)(i), (7)(c)(i), (7)(f), (8), (9), (12)(a), (12)(h), (12)(j), (12)(k), (12)(m)(i), (14), (15) of this rule. Where the terms "personnel platform" or "platform" are used in these subrules, they shall be substituted with the term "boatswain's chair."

(ii) A signal person shall be stationed at the shaft opening.

(iii) The employee shall be hoisted in a slow, controlled descent and ascent.

(iv) The employee shall use personal fall protection equipment, including a full body harness, attached independent of the crane or derrick.

(v) The fall protection equipment shall meet the applicable requirements in construction safety standard part 45 "Fall Protection," as referenced in R 408.41003a.

(vi) The boatswain's chair, excluding the personal fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least 5 times the maximum intended load.

(vii) Not more than 1 person shall be hoisted at a time.

(17) Hoisting personnel for pile driving operations. When hoisting an employee in pile driving operations all of the following requirements shall be met:

(a) The employee shall be in a personnel platform or boatswain's chair.

(b) For lattice boom cranes the cable shall be clearly marked so that it can easily be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, *or* use a spotter who is in direct communication with the operator to inform the operator when this point is reached. For telescopic boom cranes the cable shall be clearly marked so that it can be easily seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, *and* use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(c) If using a personnel platform, subrules (2) to (15) of this rule shall apply.

(d) If using a boatswain's chair, all of the following requirements shall be met:

(i) The following subrules shall apply: (1), (3), (4)(a), (4)(c), (4)(d), (6)(a), (6)(c), (7)(a), (7)(b)(i), (7)(c)(i), (7)(f), (8), (9), (12)(a), (12)(h), (12)(j), (12)(k), (12)(m)(i), (14), (15) of this rule. Where the terms "personnel platform" or "platform" are used in these subrules, they shall be substituted with the term "boatswain's chair."

(ii) The employee shall be hoisted in a slow, controlled descent and ascent.

(iii) The employee shall use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhaul ball.

(iv) The fall protection equipment shall meet the applicable requirements in construction safety standard part 45 "Fall Protection," as referenced in R 408.41003a.

(v) The boatswain's chair, excluding the personal fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least 5 times the maximum intended load.

(vi) Not more than 1 person shall be hoisted at a time.

(18) [Reserved.]

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

(a) The employee shall be in either a personnel platform or a marine-hoisted personnel transfer device.

(b) If using a personnel platform, subrules (1) to (15) of this rule shall apply.

(c) If using a marine-hoisted personnel transfer device, all of the following requirements shall be met:

(i) The following subrules shall apply: (1), (3)(b), (4)(a), (4)(c), (4)(d), (6)(a), (6)(b), (6)(c), (6)(j)(iv), (7)(a), (7)(f), (8), (9), (11), (12)(a), (12)(j), (12)(k), (12)(m)(i), (12)(n), (14), (15) of this rule. Where the terms "personnel platform" or "platform" are used in these subrules, they shall be substituted with the term "marine-hoisted personnel transfer device."

(ii) The transfer device shall be used only for transferring workers.

(iii) The number of workers occupying the transfer device shall not exceed the maximum number it was designed to hold.

(iv) Each employee shall wear a U.S. Coast Guard personal flotation device approved for industrial use.

(20) Hoisting personnel for steel or concrete storage-tanks, shaft and chimney operations. When hoisting an employee in steel or concrete storage tanks, shaft and chimney operations, the following requirements shall be met:

(a) The employee shall be in a personnel platform except when the employer can demonstrate that use of a personnel platform is infeasible. In this case, a boatswain's chair shall be used.

(b) If using a personnel platform, subrules (1) to (15) of this rule shall apply.

(c) If using a boatswain's chair, all of the following requirements shall be met:

(i) The following subrules shall apply: (1), (3), (4)(a), (4)(c), (4)(d), (6)(a), (6)(c), (7)(a), (7)(b)(i), (7)(c)(i), (7)(f), (8), (9), (12)(a), (12)(h), (12)(j), (12)(k), (12)(m)(i), (14), (15) of this rule. Where the terms "personnel platform" or "platform" are used in these subrules, they shall be substituted with the term "boatswain's chair."

(ii) The employee shall be hoisted in a slow, controlled descent and ascent.

(iii) The employee shall use personal fall protection equipment, including a full body harness, attached independent of the crane or derrick. When there is no adequate structure for attachment of personal fall arrest equipment as required in construction safety standard part 45 "Fall Protection," 1926.502(d)(15), as referenced in R 408.41003a, the attachment shall be to the lower load block or overhaul ball.

(iv) The fall protection equipment shall meet the applicable requirements in construction safety standard part 45 "Fall Protection," as referenced in R 408.41003a.

(v) The boatswain's chair, excluding the personal fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least 5 times the maximum intended load.

(vi) Not more than 1 person shall be hoisted at a time.

History: 1995 AACS; 2012 AACS.

R 408.41021b Work platforms; derrick hoist machine requirements.

Rule 1021b. (a) A derrick shall comply with the provisions of ASME standard B30.7 “Base-mounted Drum Hoists,” 1994 edition, which is adopted by reference in R 408.41003a, and be inspected on the jobsite by the employer to assure compliance. A record of the inspection shall be available on the jobsite.

(b) A derrick shall have full power for raising and lowering the work platform. Free-spooling is prohibited.

(c) The controls of a derrick shall be deadman controls that will return the machine to neutral and engage the drum brakes.

(d) A derrick shall be positioned so that the distance between the drum and foot block will allow proper spooling of wire rope.

(e) A derrick base shall be properly aligned and anchored on 4 corners to prevent movement. A 3 or 4 drum-hoist may be anchored by only the 2 rear corners of the base when the cables from the drums extend horizontally to the foot block, and the anchors are designed by a registered professional engineer, to resist all cable loads applied to the hoist.

(f) The foot block of a derrick shall be anchored to prevent displacement and be supported to maintain proper alignment.

(g) All wire rope running lines shall be guarded from the drum of the hoist to the foot block and vertically where accidental contact is possible.

(h) A proper fleet angle shall be maintained between the foot block and the drum of the base-mounted drum hoist.

(i) The employer shall ensure that a hoist house for a derrick has a roof to protect the operator from falling objects and is enclosed to protect the operator from the weather.

History: 2012 AACS.

R 408.41022a Work area control.

Rule 1022a. (1) The following apply to swing radius hazards:

(a) The requirements in subrule (1)(b) of this rule shall apply when there are accessible areas in which the equipment’s rotating superstructure, whether permanently or temporarily mounted, poses a reasonably foreseeable risk of either of the following:

(i) Striking and injuring an employee.

(ii) Pinching or crushing an employee against another part of the equipment or another object.

(b) To prevent employees from entering these hazard areas, the employer shall do all of the following:

(i) Train each employee assigned to work on or near the equipment in how to recognize struck-by and pinch or crush hazard areas posed by the rotating superstructure.

(ii) Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas. Exception: When the employer can demonstrate that

it is neither feasible to erect such barriers on the ground nor on the equipment, the hazard areas shall be clearly marked by danger signs and high visibility markings on the equipment that identify the hazard areas. In addition, the employer shall train each employee to understand what these markings signify.

(iii) A danger sign, as prescribed in construction safety standard part 22 “Signals, Signs, Tags, and Barricades,” as referenced in R 408.41003a, shall be affixed to the rear and sides of the house and counterweight. The additional lettering on the danger sign shall indicate that the counterweight is swinging.

(c) Both of the following apply to protecting employees in the hazard area:

(i) Before an employee goes to a location in the hazard area that is out of view of the operator, the employee, or someone instructed by the employee, shall ensure that the operator is informed that he or she is going to that location.

(ii) When the operator knows that an employee went to a location covered by subrule (1)(a) of this rule, the operator shall not rotate the superstructure until the operator is informed in accordance with a prearranged system of communication that the employee is in a safe position.

(2) When any part of a crane or derrick is within the working radius of another crane or derrick, the controlling entity shall institute a system to coordinate operations. If there is no controlling entity, the employer, if there is only 1 employer operating the multiple pieces of equipment, or employers, shall institute this system.

History: 1995 AACS; 2012 AACS.

R 408.41023a Keeping clear of the load.

Rule 1023a. (1) Hoisting routes that minimize the exposure of employees to hoisted loads shall be used. An employee shall not be permitted under a suspended load.

(2) No employee shall be within the fall zone of a suspended load that is not being moved, except for employees engaged in any of the following:

(a) Hooking, unhooking or guiding a load.

(b) Initially attaching the load to a component or structure.

(c) Operating a concrete hopper or concrete bucket.

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

(a) The materials being hoisted shall be rigged to prevent unintentional displacement.

(b) Hooks with self-closing latches or their equivalent shall be used. Exception: “J” hooks are permitted to be used for setting wooden trusses.

(c) The materials shall be rigged by a qualified rigger.

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

(5) During a tilt-up or tilt-down operation both of the following shall be met:

(a) No employee shall be directly under the load.

(b) Only employees essential to the operation are permitted in the fall zone, but not directly under the load. An employee is essential to the operation if the employee is

conducting 1 of the following operations and the employer can demonstrate it is infeasible for the employee to perform that operation from outside the fall zone:

(i) Physically guide the load.

(ii) Closely monitor and give instructions regarding the load's movement.

(iii) Either detach it from or initially attach it to another component or structure including, but not limited to, making an initial connection or installing bracing. Note: Boom free fall shall be prohibited when an employee is in the fall zone of the boom or load, and load line free fall shall be prohibited when an employee is directly under the load. See R 408.41024a.

(6) The rotational speed of a crane, derrick, or excavation equipment shall be such that the center of the load shall not swing out beyond the radius of the point sheave in use. A tag line shall be used when rotation of the load would be hazardous.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41024a Free fall and controlled load lowering.

Rule 1024a. (1) All of the following apply to boom free fall prohibitions:

(a) The use of equipment in which the boom is designed to free fall, live boom, shall be prohibited in each of the following circumstances:

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

(ii) An employee is being hoisted.

(iii) The load or boom is directly over a power line or over any part of the area extending the Table A, of R 408. 41016b, clearance distance to each side of the power line; or any part of the area extending the Table A clearance distance to each side of the power line is within the radius of vertical travel of the boom or the load.

(iv) The load is over a shaft, except where there are no employees in the shaft.

(v) The load is over a cofferdam, except where there are no employees in the fall zone of the boom or the load.

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

(b) The use of equipment in which the boom is designed to free fall, live boom, is permitted only when none of the circumstances listed in subrule (1)(a) of this rule are present and either of the following applies:

(i) The equipment was manufactured prior to October 31, 1984.

(ii) The equipment is a floating crane or derrick or a land crane or derrick on a vessel or flotation device.

(2) Preventing boom free fall. When the use of equipment with a boom that is designed to free fall, live boom, is prohibited, the boom hoist shall have a secondary mechanism or device designed to prevent the boom from falling if the primary system used to hold or regulate the boom hoist fails, as follows:

(a) Friction drums shall have both of the following:

(i) A friction clutch and, in addition, a braking device, to allow for controlled boom lowering.

(ii) 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.

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

(c) Neither clutches nor hydraulic motors shall be considered brake or locking devices for purposes of this standard.

(d) Hydraulic boom cylinders shall have an integrally mounted holding device.

(3) Preventing uncontrolled retraction. Hydraulic telescoping booms shall have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure.

(4) Load line free fall. In each of the following circumstances, controlled load lowering shall be required and free fall of the load line hoist shall be prohibited:

(a) An employee is directly under the load.

(b) An employee is being hoisted.

(c) The load is directly over a power line, or over any part of the area extending the Table A, of R 408.41016b, clearance distance to each side of the power line, or any part of the area extending the Table A clearance distance to each side of the power line is within the radius of vertical travel of the load.

(d) The load is over a shaft.

(e) The load is over a cofferdam, except when there are no employees in the fall zone of the load.

History: 1995 AACS; 2012 AACS.

#### R 408.41025a Derricks.

Rule 1025a. (1) This rule contains supplemental requirements for derricks, whether temporarily or permanently mounted. All provisions of this standard apply to derricks unless specified otherwise.

(2) All of the following apply to operation procedures:

(a) R 408.41019b shall apply, except for R 408.41019b(3).

(b) Load chart contents. Load charts shall contain at least all the following information:

(i) Rated capacity at corresponding ranges of boom angle or operating radii.

(ii) Specific lengths of components to which the rated capacities apply.

(iii) Required parts for hoist reeving.

(iv) Size and construction of rope, which also may be included in the operating manual.

(c) Load chart location. An employer shall ensure that a durable and legible rating chart is at the operation station for all derricks.

(3) All of the following apply to construction:

(a) General requirements consist of the following:

(i) Derricks shall be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's or builder's procedures and within its rated capacity.

(ii) Welding of load sustaining members shall conform to recommended practices in ANSI/AWS D14.3 "Specification for Welding Earthmoving and Construction Equipment," 1994 edition, which is adopted by reference in R 408.41003a, or AWS D1.1/D1.1M "Structural Welding Code – Steel Updates Every 5 Years," 2002 edition, which is adopted by reference in R 408.41003a.

(b) All of the following apply to guy derricks:

(i) The minimum number of guys shall be 6, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations.

(ii) Guy derricks shall not be used unless the employer has the following guy information from the manufacturer or a qualified person when not available from the manufacturer:

(A) The number of guys.

(B) The spacing around the mast.

(C) The size, grade, and construction of rope to be used for each guy.

(iii) For guy derricks manufactured after December 18, 1970, in addition to the information required in subdivision (b)(ii) of this subrule, the employer shall have the following guy information from the manufacturer or a qualified person, when not available from the manufacturer:

(A) The amount of initial sag or tension.

(B) The amount of tension in guy line rope at anchor.

(iv) The mast base shall permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack.

(v) The mast cap shall comply with all of the following:

(A) Permit the mast to rotate freely.

(B) Withstand tilting and cramping caused by the guy loads.

(C) Be secured to the mast to prevent disengagement during erection.

(D) Be provided with means for attaching guy ropes.

(c) All of the following apply to stiffleg derricks:

(i) The mast shall be supported in the vertical position by at least 2 stifflegs. One end of each stiffleg shall be connected to the top of the mast and the other end securely anchored.

(ii) The stifflegs shall be capable of withstanding the loads imposed at any point of operation within the load chart range.

(iii) The mast base shall comply with both of the following:

(A) Permit the mast to rotate freely, when necessary.

(B) Permit deflection of the mast without binding.

(iv) The mast shall be prevented from lifting out of its socket when the mast is in tension.

(v) The stiffleg connecting member at the top of the mast shall comply with all of the following:

(A) Permit the mast to rotate freely, when necessary.

(B) Withstand the loads imposed by the action of the stifflegs.

(C) Be secured so as to oppose separating forces.

(d) All of the following apply to gin pole derricks:

(i) Guy lines shall be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. Exception: When the size, spacing, or both, of guy lines do not result in the gin pole being stable in both boomed and vertical positions, the employer shall ensure that the derrick is not used in an unstable position.

(ii) The base of the gin pole shall permit movement of the pole, when necessary.



(iii) The gin pole shall be anchored at the base against horizontal forces, when such forces are present.

(e) Chicago boom derricks. The fittings for stepping the boom and for attaching the topping lift shall be arranged to comply with all of the following:

(i) Permit the derrick to swing at all permitted operating radii and mounting heights between fittings.

(ii) Accommodate attachment to the upright member of the host structure.

(iii) Withstand the forces applied when configured and operated in accordance with the manufacturer's or builder's procedures and within its rated capacity.

(iv) Prevent the boom or topping lift from lifting out under tensile forces.

(4) All of the following apply to anchoring and guying:

(a) Load anchoring data developed by the manufacturer or a qualified person shall be used.

(b) Guy derricks.

(i) The mast base shall be anchored.

(ii) The guys shall be secured to the ground or other firm anchorage.

(iii) The anchorage and guying shall be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application.

(c) All of the following apply to stiffleg derricks:

(i) The mast base and stifflegs shall be anchored.

(ii) The mast base and stifflegs shall be designed to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular stiffleg spacing and slope specified for the application.

(5) All of the following apply to swingers and hoists:

(a) The boom, swinger mechanisms, and hoists shall be suitable for the derrick work intended and shall be anchored to prevent displacement from the imposed loads.

(b) All of the following apply to hoists:

(i) Base mounted drum hoists shall meet the requirements in the following sections of ASME B30.7 "Base Mounted Drum Hoists," 2001 edition, which is adopted by reference in R 408.41003a:

(A) Section 7-1.1 ("Load ratings and markings").

(B) Section 7-1.2 ("Construction"), except: 7-1.2.13 ("Operator's cab"); 7-1.2.15 ("Fire extinguishers").

(C) Section 7-1.3 ("Installation").

(D) Applicable terms in section 7-0.2 ("Definitions").

(ii) Load tests for new hoists. The employer shall ensure that new hoists are load tested to a minimum of 110% of rated capacity, but not more than 125% of rated capacity, unless otherwise recommended by the manufacturer. This requirement shall be met when the manufacturer has conducted this testing.

(iii) Repaired or modified hoists. Hoists that have had repairs, modifications, or additions affecting their capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary. If it is necessary, load testing shall be conducted in accordance with subdivision (b)(ii) and (iv) of this subrule.

(iv) Load test procedure. Load tests required by subdivision (b)(ii) or (iii) of this subrule shall be conducted to comply with all of the following:

(A) The test load shall be hoisted a vertical distance to assure that the load is supported by the hoist and held by the hoist brake or brakes.

(B) The test load shall be lowered, stopped, and held with the brake or brakes.

(C) The hoist shall not be used unless a competent person determines that the test has been passed.

(6) All of the following apply to operational aids:

(a) R 408.41019a shall apply, except for R 408.41019a(4)(a), R 408.41019a(5)(a), and R 408.41019a(5)(d).

(b) Boom angle aid. A boom angle indicator shall not be required. If the derrick is not equipped with a functioning boom angle indicator, the employer shall ensure that 1 of the following is met:

(i) The boom hoist cable shall be marked with caution and stop marks. The stop marks shall correspond to maximum and minimum allowable boom angles. The caution and stop marks shall be in view of the operator, or a spotter who is in direct communication with the operator.

(ii) An electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, shall be used.

(c) All of the following apply to load weight or capacity devices:

(i) Derricks manufactured more than 1 year after November 8, 2010 with a maximum rated capacity over 6,000 pounds shall have at least 1 of the following: a load weighing device, a load moment or rated capacity indicator, or a load moment or rated capacity limiter. Temporary alternative measures: The weight of the load shall be determined from a source recognized by the industry, such as the load's manufacturer, or by a calculation method recognized by the industry, such as calculating a steel beam from measured dimensions and a known per foot weight, or by other equally reliable means. This information shall be provided to the operator prior to the lift. See R 408.41019b(14) for additional requirements.

(ii) A load weight or capacity device that is not working properly shall be repaired not later than 30 days after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 days of the occurrence of the deficiency and the part is not received in time to complete the repair in 30 days, the repair shall be completed within 7 days of receipt of the parts.

(7) All of the following apply to post-assembly approval and testing—new or reinstalled derricks:

(a) All of the following apply to anchorages:

(i) Anchorages, including the structure to which the derrick is attached, if applicable, shall be approved by a qualified person.

(ii) If a rock or hairpin anchorage is used, the qualified person shall determine if any special testing of the anchorage is needed. If so, it shall be tested accordingly.

(b) Functional test. Prior to initial use, new or reinstalled derricks shall be tested by a competent person with no hook load to verify proper operation. This test shall include all of the following:

(i) Lifting and lowering the hook or hooks through the full range of hook travel.

(ii) Raising and lowering the boom through the full range of boom travel.

(iii) Swinging in each direction through the full range of swing.

- (iv) Actuating the anti two-block and boom hoist limit devices, if provided.
- (v) Actuating locking, limiting, and indicating devices, if provided.
- (c) Load test. Prior to initial use, new or reinstalled derricks shall be load tested by a competent person. The test load shall meet all of the following requirements:
  - (i) Test loads shall be at least 100% and not more than 110% of the rated capacity, unless otherwise recommended by the manufacturer or qualified person. The test load shall not be less than the maximum anticipated load.
  - (ii) The test shall consist of all of the following:
    - (A) Hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake or brakes.
    - (B) Swinging the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load.
    - (C) Booming the derrick up and down within the allowable working radius for the test load.
    - (D) Lowering, stopping, and holding the load with the brake or brakes.
  - (iii) The derrick shall not be used unless the competent person determines that the test has been passed.
- (d) Documentation. Tests conducted under this paragraph shall be documented. The document shall contain the date, test results and the name of the tester. The document shall be retained until the derrick is retested or dismantled, whichever occurs first. All of these documents shall be available, during the applicable document retention period, to all persons who conduct inspections in accordance with R 408.41012a.
- (8) Load testing repaired or modified derricks. Derricks that have had repairs, modifications, or additions affecting the derrick's capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary. If a load test is needed, it shall be conducted and documented in accordance with subrule (7) of this rule.
- (9) [Reserved.]
- (10) Power failure procedures. If power fails during operations, the derrick operator shall safely stop operations, which shall include all of the following:
  - (a) Setting all brakes or locking devices.
  - (b) Moving all clutch and other power controls to the off position.
- (11) Both of the following apply to use of winch heads:
  - (a) Ropes shall not be handled on a winch head without the knowledge of the operator.
  - (b) While a winch head is being used, the operator shall be within reach of the power unit control lever.
- (12) [Reserved.]
- (13) Both of the following apply to securing the boom:
  - (a) When the boom is being held in a fixed position, dogs, pawls, or other positive holding mechanisms on the boom hoist shall be engaged.
  - (b) When taken out of service for 30 days or more, the boom shall be secured by 1 of the following methods:
    - (i) Laid down.
    - (ii) Secured to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block.
    - (iii) For guy derricks, lifted to a vertical position and secured to the mast.
    - (iv) For stiffleg derricks, secured against the stiffleg.

- (14) The process of jumping the derrick shall be supervised by the A/D director.
- (15) Derrick operations shall be supervised by a competent person.
- (16) Inspections. In addition to the requirements in R 408.41012a, the following additional items shall be included in the inspections:
- (a) Daily: Guys for proper tension.
  - (b) Both of the following items shall be included in annual inspections:
    - (i) Gudgeon pin for cracks, wear, and distortion.
    - (ii) Foundation supports for continued ability to sustain the imposed loads.
- (17) Qualification and Training. The employer shall train each operator of a derrick on the safe operation of equipment the individual will operate. R 408.41008a of this standard shall not apply.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41025b Base-mounted drum hoists.

Rule 1025b. (a) Exposed moving parts on base mounted hoists, such as gears, projecting screws, setscrews, chain, cables, chain sprockets, and reciprocating or rotating parts, shall be guarded.

(b) All controls used during the normal operating cycle shall be located within easy reach of the operator's station. Electric motor-operated hoists shall have a means to stop remotely operated hoists if the controls are ineffective.

(c) Electric motor-operated hoists shall be equipped with both of the following items:

(i) A device that will disconnect all motors from the line upon power failure and that will not permit any motor to be restarted until the controller handle is brought to the "off" position.

(ii) Where applicable, an overspeed-prevention device.

(d) All base-mounted drum hoists shall comply with R 408.41025a(5)(b)(i).

History: 2012 AACS.

R 408.41026a Supplemental requirements for multiple-crane or derrick lifts.

Rule 1026a. (1) Plan development. Before beginning a crane or derrick operation in which more than 1 crane or derrick will be supporting the load, the operation shall be planned. The planning shall meet all of the following requirements:

(a) Be developed by a qualified person.

(b) Be designed to ensure that the requirements of this standard are met.

(c) When the qualified person determines that engineering expertise is needed for the planning, the employer shall ensure that it is provided.

(2) Both of the following apply to plan implementation:

(a) The multiple-crane or derrick lift shall be directed by a lift director who meets the criteria for both a competent person and a qualified person, or a competent person who is assisted by 1 or more qualified persons.

(b) The lift director shall review the plan in a meeting with all workers who will be involved with the operation.

History: 1995 AACS; 2012 AACS.

R 408.41027a Design, construction, and testing.

Rule 1027a. (1) This rule applies to equipment that has a manufacturer-rated hoisting or lifting capacity of more than 2,000 pounds.

(2) Mobile cranes, including crawler and truck, and locomotive cranes manufactured prior to November 8, 2010 shall meet at least 1 of the following applicable requirements for design, construction, and testing:

(a) ANSI/ASME B30.5 “Mobile and Locomotive Cranes,” 1994 edition, which is adopted by reference in R 408.41003a,

(b) PCSA Standard No. 4 “Mobile Power Crane and Excavator and Hydraulic Crane Standards,” 1983 edition, which is adopted by reference in R 408.41003a.

(c) The requirements in subrule (3) of this rule.

(d) The applicable DIN standards that were in effect at the time of manufacture.

(3) Mobile cranes, including crawler and truck, and locomotive cranes manufactured on or after November 8, 2010 shall meet the following portions of ANSI/ASME B30.5 “Mobile and Locomotive Cranes,” 2004 edition, which is adopted by reference in R 408.41003a, as applicable:

(a) In section 5–1.1.1 (“Load Ratings—Where Stability Governs Lifting Performance”), paragraphs (a)—(d) (including subparagraphs).

(b) In section 5–1.1.2 (“Load Ratings—Where Structural Competence Governs Lifting Performance”), paragraph (b).

(c) Section 5–1.2 (“Stability (Backward and Forward)”).

(d) In section 5–1.3.1 (“Boom Hoist Mechanism”), subdivisions (a), (b)(1) and (2) of this subrule, except that when using rotation resistant rope, R 408.41014a(5)(d)(ii) applies.

(e) In section 5–1.3.2 (“Load Hoist Mechanism”), subdivision (a)(2) to (a)(4) (including subparagraphs), (b) (including subparagraphs), (c) (first sentence only) and (d).

(f) Section 5–1.3.3 (“Telescoping Boom”).

(g) Section 5–1.4 (“Swing Mechanism”).

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

(i) In section 5–1.6 (“Controls”), all provisions except 5–1.6.1 (c).

(j) Section 5–1.7.4 (“Sheaves”).

(k) Section 5–1.7.5 (“Sheave sizes”).

(l) In section 5–1.9.1 (“Booms”), paragraph (f).

(m) Section 5–1.9.3 (“Outriggers”).

(n) Section 5–1.9.4 (“Locomotive Crane Equipment”).

(o) Section 5–1.9.7 (“Clutch and Brake Protection”).

(p) In section 5–1.9.11 (“Miscellaneous equipment”), paragraphs (a), (c), (e), and (f).

(4) Prototype testing: mobile cranes, including crawler and truck, and locomotive cranes manufactured on or after November 8, 2010 shall meet the prototype testing requirements in Test Option A or Test Option B of this rule. Tower cranes manufactured on or after November 8, 2010 shall meet the prototype testing requirements in British European

Standards BS EN 14439 “Cranes – Safety – Tower Cranes,” 2006 edition, which is adopted by reference in R 408.41003a.

Note: Prototype testing of crawler, locomotive and truck cranes manufactured prior to November 8, 2010 shall conform to subdivision (a) of this subrule.

(a) Test Option A.

(i) The following shall apply to equipment with cantilevered booms, such as hydraulic boom cranes: All the tests listed in SAE J1063 “Cantilevered Boom Crane Structures – Method of Test,” November 1993 edition Table 1, which is adopted by reference in R 408.41003a, shall be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J1063 “Cantilevered Boom Crane Structures – Method of Test,” November 1993 edition Table 2, which is adopted by reference in R 408.41003a, shall be met.

(ii) The following applies to equipment with pendant supported lattice booms: All the tests listed in SAE J987 “Lattice Boom Cranes – Method of Test,” June 2003 Table 1, which is adopted by reference in R 408.41003a, shall be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J987 “Lattice Boom Cranes – Method of Test,” June 2003 Table 2, which is adopted by reference in R 408.41003a, shall be met.

(b) Test Option B. The testing and verification requirements of BS EN 13000 “Cranes – Mobile Cranes,” 2004 edition, which is adopted by reference in R 408.41003a, shall be met. In applying BS EN 13000 “Cranes – Mobile Cranes,” 2004 edition, all of the following additional requirements shall be met:

(i) The following shall apply to equipment with cantilevered booms, such as hydraulic boom cranes: The analysis methodology, computer modeling, shall demonstrate that all load cases listed in SAE J1063 “Cantilevered Boom Crane Structures – Method of Test,” November 1993 edition, which is adopted by reference in R 408.41003a, meet the strength margins listed in SAE J1063 “Cantilevered Boom Crane Structures – Method of Test,” November 1993 edition Table 2.

(ii) The following shall apply to equipment with pendant supported lattice booms: The analysis methodology, computer modeling, shall demonstrate that all load cases listed in SAE J987 “Lattice Boom Cranes – Method of Test,” June 2003 edition, which is adopted by reference in R 408.41003a, meet the strength margins listed in SAE J987 “Lattice Boom Cranes – Method of Test,” June 2003 Table 2.

(iii) Analysis verification. The physical testing requirements under SAE J1063 “Cantilevered Boom Crane Structures – Method of Test,” November 1993 edition, which is adopted by reference in R 408.41003a, and SAE J987 “Lattice Boom Cranes – Method of Test,” June 2003 edition, which is adopted by reference in R 408.41003a, shall be met unless the reliability of the analysis methodology, computer modeling, has been demonstrated by a documented history of verification through strain gauge measuring or strain gauge measuring in combination with other physical testing.

(5) All equipment covered by this standard shall meet all of the following requirements:

(a) Rated capacity and related information. The information available in the cab, as specified in R 408.41019b(3), regarding “rated capacity” and related information shall include, at a minimum, the following information:

(i) A complete range of the manufacturer’s equipment rated capacities, as follows:

(A) At all manufacturer approved operating radii, boom angles, work areas, boom lengths and configurations, jib lengths and angles or offset.

(B) Alternate ratings for use and nonuse of option equipment which affects rated capacities, such as outriggers, stabilizers, and extra counterweights.

(ii) A work area chart for which capacities are listed in the load chart. Note: An example of this type of chart is in ANSI/ASME B30.5 "Mobile and Locomotive Cranes," 2004 edition, section 5-1.1.3, Figure 11.

(iii) The work area figure and load chart shall clearly indicate the areas where no load is to be handled.

(iv) Recommended reeving for the hoist lines shall be shown.

(v) Recommended parts of hoist reeving, size, and type of wire rope for various equipment loads.

(vi) Recommended boom hoist reeving diagram, where applicable; size, type and length of wire rope.

(vii) Tire pressure, where applicable.

(viii) Caution or warnings relative to limitations on equipment and operating procedures, including an indication of the least stable direction.

(ix) Position of the gantry and requirements for intermediate boom suspension, where applicable.

(x) Instructions for boom erection and conditions under which the boom, or boom and jib combinations, may be raised or lowered.

(xi) Whether the hoist holding mechanism is automatically or manually controlled, whether free fall is available, or any combination of these.

(xii) The maximum telescopic travel length of each boom telescopic section.

(xiii) Whether sections are telescoped manually or with power.

(xiv) The sequence and procedure for extending and retracting the telescopic boom section.

(xv) Maximum loads permitted during the boom extending operation, and any limiting conditions or cautions.

(xvi) Hydraulic relief valve settings specified by the manufacturer.

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

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

(d) All of the following apply to latching hooks:

(i) Hooks shall be equipped with latches, except where the requirements of subdivision (d)(ii) of this subrule are met.

(ii) Hooks without latches, or with latches removed or disabled, shall not be used unless both of the following occur:

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

(B) Routes for the loads are preplanned to ensure that no employee is required to work in the fall zone except for employees necessary for the hooking or unhooking of the load.

(iii) The latch shall close the throat opening and be designed to retain slings or other lifting devices or accessories in the hook when the rigging apparatus is slack.

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

(f) An accessible fire extinguisher shall be on the equipment.

(g) Cabs. Equipment with cabs shall meet all of the following requirements:

(i) Cabs shall be designed with a form of adjustable ventilation and method for clearing the windshield for maintaining visibility and air circulation. Examples of means for adjustable ventilation include air conditioner or window that can be opened for ventilation and air circulation; examples of means for maintaining visibility include heater to prevent windshield icing, defroster, fan, windshield wiper.

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

(iii) All of the following apply to windows:

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

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

(C) Windows shall be made of safety glass or material with similar optical and safety properties, that introduce no visible distortion or otherwise obscure visibility that interferes with the safe operation of the equipment.

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

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

(h) 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 employees, is possible in the performance of normal duties.

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

(j) Hydraulic and pneumatic lines shall be protected from damage to the extent feasible.

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

(l) Friction mechanisms. When friction mechanisms, such as brakes and clutches, are used to control the boom hoist or load line hoist, they shall comply with both of the following:

(i) Be of a size and thermal capacity sufficient to control all rated loads with the minimum recommended reeving.

(ii) Be adjustable to permit compensation for lining wear to maintain proper operation.



(m) 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.

(6) The employer's obligations under subrules (2) to (4) and (5)(g) to (m) of this rule are met when the equipment has not changed, except in accordance with R 408.41028a, and when an employer can refer to documentation from the manufacturer showing that the equipment has been designed, constructed and tested in accordance with those subrules.

History: 1995 AACS; 2012 AACS.

#### R 408.41028a Equipment modifications.

Rule 1028a. (1) Modifications or additions which affect the capacity or safe operation of the equipment shall be prohibited except when the requirements of subrule (1)(a), (b), (c), (d), or (e) are met.

(a) All of the following apply to manufacturer review and approval:

(i) The manufacturer shall approve the modifications or additions in writing.

(ii) The load charts, procedures, instruction manuals and instruction plates, tags, or decals shall be modified as necessary to reflect the modification or addition.

(iii) The original safety factor of the equipment shall not be reduced.

(b) Manufacturer refusal to review request. The manufacturer shall be provided a detailed description of the proposed modification or addition, and shall be asked to approve the modification or addition. If a manufacturer declines to review the technical merits of the proposal or fails to acknowledge or initiate the review of the request within 30 days, all of the following shall be met:

(i) A registered professional engineer who is a qualified person with respect to the equipment involved shall do both of the following:

(A) Approve the modification or addition and specify the equipment configurations to which that approval applies.

(B) Modify load charts, procedures, instruction manuals and instruction plates, tags, or decals as necessary to reflect the modification or addition.

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

(c) Unavailable manufacturer. If the manufacturer is unavailable the requirements of subdivision (b)(i) and (ii) of this subrule shall be met.

(d) Manufacturer does not complete the review within 120 days of the request. The manufacturer shall be provided a detailed description of the proposed modification or addition and shall be asked to approve the modification or addition. If the manufacturer agreed to review the technical merits of the proposal, but failed to complete the review of the proposal within 120 days of the date it was provided the detailed description of the proposed modification or addition, then the requirements of subdivision (b)(i) and (ii) of this subrule shall be met.

(e) Multiple manufacturers of equipment designed for use on marine work sites. If the equipment is designed for marine work sites or contains major structural components from more than one manufacturer, then the requirements of subdivision (b)(i) and (ii) of this subrule shall be met.

(2) Modifications or additions which affect the capacity or safe operation of the equipment shall be prohibited when the manufacturer, after a review of the technical safety merits of the proposed modification or addition, rejects the proposal and explains the reasons for the rejection in a written response. If the manufacturer rejects the proposal but does not explain the reasons for the rejection in writing, the employer may treat this as a manufacturer refusal to review the request under subrule (1)(b) of this rule.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41029a Tower cranes.

Rule 1029a. (1) This rule contains supplemental requirements for tower cranes. All rules of this standard apply to tower cranes unless specified otherwise.

(2) All of the following apply to erecting, climbing and dismantling:

(a) R 408.41015a shall apply to tower cranes except as otherwise specified. The term “assembly/disassembly” shall be replaced by “erecting, climbing and dismantling,” and the term “disassembly” shall be replaced by “dismantling” when applying R 408.41015a to tower cranes.

(b) Dangerous areas, self-erecting tower cranes. In addition to the requirements in R 408.41015a(2)(e) for self-erecting tower cranes, employees shall not be in or under the tower, jib, or rotating portion of the crane during erecting, climbing, and dismantling operations until the crane is secured in a locked position and the competent person in charge indicates it is safe to enter this area, unless the manufacturer’s instructions direct otherwise. Then, only the necessary personnel shall be permitted in this area.

(c) Foundations and structural supports. Tower crane foundations and structural supports, including both the portions of the structure used for support and the means of attachment, shall be designed by the manufacturer or a registered professional engineer.

(d) Addressing specific hazards. The requirements in R 408.41015a(2)(h)(i) to (ix) shall apply. In addition, the A/D director shall address all of the following:

(i) Foundations and structural supports. The A/D director shall determine that tower crane foundations and structural supports are installed in accordance with their design.

(ii) Loss of backward stability. Backward stability before swinging self erecting cranes or cranes on traveling or static undercarriages shall be maintained.

(iii) Wind speed. Wind shall not exceed the speed recommended by the manufacturer. When manufacturer does not specify this information, the speed shall be determined by a qualified person.

(e) Plumb tolerance. Towers shall be erected plumb to the manufacturer’s tolerance and verified by a qualified person. When the manufacturer does not specify plumb tolerance, the crane tower shall be plumb to a tolerance of at least 1:500, approximately 1 inch in 40 feet.

(f) Multiple tower crane jobsites. On jobsites where more than 1 fixed jib (hammerhead) tower crane is installed, the cranes shall be located so that no crane can come in contact with the structure of another crane. Cranes are permitted to pass over one another.

(g) Climbing procedures. Prior to, and during, all climbing procedures, including inside climbing and top climbing, the employer shall do both of the following:

(i) Comply with all manufacturer prohibitions.

(ii) Have a registered professional engineer verify that the host structure is strong enough to sustain the forces imposed through the braces, brace anchorages, and supporting floors.

(h) Both of the following apply to counterweights or ballasts:

(i) Equipment shall not be erected, dismantled, or operated without the amount and position of counterweight, ballast, or both, in place as specified by the manufacturer or a registered professional engineer familiar with the equipment.

(ii) The maximum counterweight, ballast, or both specified by the manufacturer or registered professional engineer familiar with the equipment shall not be exceeded.

(3) Signs. The size and location of signs on tower cranes shall be installed as specified by the manufacturer. When these specifications are unavailable, a registered professional engineer familiar with the type of equipment involved shall approve in writing the size and location of any signs.

(4) All of the following apply to safety devices:

(a) R 408.41018a shall not apply to tower cranes.

(b) All of the following safety devices are required on all tower cranes unless otherwise specified:

(i) Boom stops on luffing boom type tower cranes.

(ii) Jib stops on luffing boom type tower cranes, if equipped with a jib attachment.

(iii) Travel rail end stops at both ends of travel rail.

(iv) Travel rail clamps on all travel bogies.

(v) Integrally mounted check valves on all load supporting hydraulic cylinders.

(vi) A hydraulic system pressure limiting device.

(vii) All of the following brakes, which automatically set in the event of pressure loss or power failure, shall be required:

(A) A hoist brake on all hoists.

(B) Swing brake.

(C) Trolley brake.

(D) Rail travel brake.

(viii) Deadman control or forced neutral return control, hand, levers.

(ix) Emergency stop switch at the operator's station.

(x) Trolley end stops shall be provided at both ends of travel of the trolley.

(c) Proper operation required. Operations shall not begin unless the devices listed in this rule are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations. The equipment shall be taken out of service, and operations shall not resume until the device is again working properly. See R 408.41019b(5). Alternative measures shall not be used.

(5) Before leaving a hammerhead tower crane unattended, the operator shall, in addition to the requirements specified in R 408.41019b(4), do all of the following:

(a) Set the trolley brakes and other locking devices and bring the hook block to its highest position.

(b) Secure the crane to prevent accidental travel.

(c) Set rail clamps, where provided.

(d) Release the swing brake to allow weathervaning, unless a 360-degree rotation is not possible. When restraining a crane from swinging freely, the manufacturer's recommendations shall be followed.

(6) Before leaving a portal, tower, or pillar crane unattended, the operator shall, in addition to the requirements specified in R 408.41019b(4), do all of the following:

(a) Lower the boom to the boom rest or otherwise fasten it securely to prevent displacement due to wind loads or other outside forces, unless this is contrary to the manufacturer's recommendations.

(b) Set the brakes and other locking devices and bring the hook block to its highest position.

(c) Secure the crane to prevent accidental travel.

(d) Set rail clamps, where provided.

(7) All of the following apply to operational aids:

(a) R 408.41019a shall not apply to tower cranes.

(b) The devices listed in this subrule shall be required on all tower cranes covered by this standard, unless otherwise specified.

(c) Operations shall not begin unless the operational aids are in proper working order, except when the employer meets the specified temporary alternative measures. More protective alternative measures specified by the tower crane manufacturer, if any, shall be followed. See R 408.41019b(5) for additional requirements.

(d) 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. If a replacement part is no longer available, the use of a substitute device that performs the same type of function shall be permitted and shall not be considered a modification under R 408.41028a.

(e) Category I operational aids and alternative measures. Operational aids listed in this subrule that are not working properly shall be repaired not later than 7 calendar days after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency, the repair shall be completed within 7 calendar days of receipt of the parts. All of the following apply:

(i) Trolley travel limiting device. The travel of the trolley shall be restricted at both ends of the jib by a trolley travel limiting device to prevent the trolley from running into the trolley end stops. Temporary alternative measures shall comply with either of the following:

(A) The trolley rope shall be marked so it can be seen by the operator at a point that will give the operator sufficient time to stop the trolley prior to the end stops.

(B) A spotter who is in direct communication with the operator shall be used when operations are conducted within 10 feet of the outer or inner trolley end stops.

(ii) Boom hoist limiting device. The range of the boom shall be limited at the minimum and maximum radius. Temporary alternative measures shall comply with either of the following:

(A) Clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the boom hoist within the minimum and maximum boom radius.

(B) Use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(iii) Anti two-blocking device. The tower crane shall be equipped with a device which automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip or fixed upper block or similar component. The

device or devices shall prevent this damage at all points where two-blocking could occur. Temporary alternative measures shall comply with either of the following:

(A) Clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking.

(B) Use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(iv) Hoist drum lower limiting device. Tower cranes manufactured after November 8, 2011, shall be equipped with a device that prevents the last 2 wraps of hoist cable from being spooled off the drum. Temporary alternative measures shall comply with either of the following:

(A) Mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist prior to last 2 wraps of hoist cable being spooled off the drum.

(B) Use a spotter who is in direct communication with the operator to inform the operator when this point is reached.

(v) Load moment limiting device. The tower crane shall have a device that prevents moment overloading. Temporary alternative measures shall comply with either of the following:

(A) A radius indicating device shall be used.

(B) If the tower crane is not equipped with a radius indicating device, the radius shall be measured to ensure the load is within the rated capacity of the crane. In addition, the weight of the load shall be determined from a source recognized by the industry, such as the load's manufacturer, or by a calculation method recognized by the industry, such as calculating a steel beam from measured dimensions and a known per foot weight, or by other equally reliable means. This information shall be provided to the operator prior to the lift.

(vi) Hoist line pull limiting device. The capacity of the hoist shall be limited to prevent overloading, including each individual gear ratio if equipped with a multiple speed hoist transmission. Temporary alternative measure: The operator shall ensure that the weight of the load does not exceed the capacity of the hoist, including for each individual gear ratio if equipped with a multiple speed hoist transmission.

(vii) Rail travel limiting device. The travel distance in each direction shall be limited to prevent the travel bogies from running into the end stops or buffers. Temporary alternative measure: A spotter who is in direct communication with the operator shall be used when operations are conducted within 10 feet of either end of the travel rail end stops. The spotter shall inform the operator of the distance of the travel bogies from the end stops or buffers.

(viii) Boom hoist drum positive locking device and control. The boom hoist drum shall be equipped with a control that will enable the operator to positively lock the boom hoist drum from the cab. Temporary alternative measure: The device shall be manually set when required if an electric, hydraulic, or automatic control is not functioning.

(f) Category II operational aids and alternative measures. The following operational aids that are not working properly shall be repaired not later than 30 calendar days after the deficiency occurs. Exception: If the employer documents that it has ordered the necessary parts within 7 calendar days of the occurrence of the deficiency and the part is not

received in time to complete the repair in 30 calendar days, the repair shall be completed within 7 calendar days of receipt of the parts. The following apply:

(i) The following apply to boom angle or hook radius indicators:

(A) Luffing boom tower cranes shall have a boom angle indicator readable from the operator's station.

(B) Hammerhead tower cranes manufactured after November 8, 2011 shall have a hook radius indicator readable from the operator's station.

(C) Temporary alternative measure: Hook radii or boom angle shall be determined by measuring the hook radii or boom angle with a measuring device.

(ii) Trolley travel deceleration device. The trolley speed shall be automatically reduced prior to the trolley reaching the end limit in both directions. Temporary alternative measure: The employer shall post a notice in the cab of the crane notifying the operator that the trolley travel deceleration device is malfunctioning and instructing the operator to take special care to reduce the trolley speed when approaching the trolley end limits.

(iii) Boom hoist deceleration device. The boom speed shall be automatically reduced prior to the boom reaching the minimum or maximum radius limit. Temporary alternative measure: The employer shall post a notice in the cab of the crane notifying the operator that the boom hoist deceleration device is malfunctioning and instructing the operator to take special care to reduce the boom speed when approaching the minimum or maximum radius limits.

(iv) Load hoist deceleration device. The load speed shall be automatically reduced prior to the hoist reaching the upper limit. Temporary alternative measure: The employer shall post a notice in the cab of the crane notifying the operator that the load hoist deceleration device is malfunctioning and instructing the operator to take special care to reduce the load speed when approaching the upper limits.

(v) Wind speed indicator. A device shall be provided to display the wind speed and shall be mounted above the upper rotating structure on tower cranes. On self erecting cranes, it shall be mounted at or above the jib level. Temporary alternative measures shall comply with either of the following:

(A) Use of wind speed information from a properly functioning indicating device on another tower crane on the same site.

(B) A qualified person estimates the wind speed.

(vi) Load indicating device. Cranes manufactured after November 8, 2011 shall have a device that displays the magnitude of the load on the hook. Displays that are part of load moment limiting devices that display the load on the hook meet this requirement. Temporary alternative measure: The weight of the load shall be determined from a source recognized by the industry, such as the load's manufacturer, or by a calculation method recognized by the industry, such as calculating a steel beam from measured dimensions and a known per foot weight, or by other equally reliable means. This information shall be provided to the operator prior to the lift.

(8) All of the following apply to inspections:

(a) R 408.41012a shall apply to tower cranes, except that the term "assembly" is replaced by "erection." R 408.41013a shall apply to tower cranes.

(b) Pre-erection inspection. Before each crane component is erected, it shall be inspected by a qualified person for damage or excessive wear. All of the following apply:

(i) The qualified person shall pay particular attention to components that will be difficult to inspect thoroughly during shift inspections.

(ii) If the qualified person determines that a component is damaged or worn to the extent that it would create a safety hazard if used on the crane, that component shall not be erected on the crane unless it is repaired and, upon reinspection by the qualified person, found to no longer create a safety hazard.

(iii) If the qualified person determines that the component, though not presently a safety hazard, needs to be monitored, the employer shall ensure that the component is checked in the monthly inspections. Any such determination shall be documented, and the documentation shall be available to any individual who conducts a monthly inspection.

(c) Post-erection inspection. In addition to the requirements in R 408.41012(4), the following requirements shall be met:

(i) A load test using certified weights, or scaled weights using a certified scale with a current certificate of calibration, shall be conducted after each erection.

(ii) The load test shall be conducted according to the manufacturer's instructions when available. When these instructions are unavailable, the test shall be conducted according to written load test procedures developed by a registered professional engineer familiar with the type of equipment involved.

(d) Monthly. The following additional items shall be included:

(i) All tower, mast, and other structural bolts, in loose or dislodged condition, from the base of the tower crane up or, if the crane is tied to or braced by the structure, those above the upper-most brace support.

(ii) The upper-most tie-in, braces, floor supports and floor wedges where the tower crane is supported by the structure, for loose or dislodged components.

(e) Annual. In addition to the items that shall be inspected under R 408.41012(7), all turntable and tower bolts shall be inspected for proper condition and torque.

History: 1995 AACS; 2012 AACS.

#### R 408.41030a Overhead and gantry cranes.

Rule 1030a. (1) Overhead and gantry cranes used in construction. All overhead and gantry cranes in use shall comply with the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed in general industry safety standard part 18 "Overhead and Gantry Cranes, as referenced in R 408.41003a, and shall comply with the requirements of R 408.41008a.

(2) All of the following apply to overhead and gantry cranes that are not permanently installed in a facility:

(a) This subrule shall apply to the following equipment when used in construction and not permanently installed in a facility: overhead and gantry cranes, overhead and bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment having the same fundamental characteristics, irrespective of whether it travels on tracks, wheels, or other means.

(b) The following requirements shall apply to equipment identified in subdivision (a) of this subrule:

(i) R 408.41001a, 408.41004a, 408.41005a, 408.41008a through 408.41017a, 408.41019b through 408.41021b, 408.41022a, 408.41023a, 408.41024a(4), 408.41025b, 408.41026a to 408.41028a, 408.41031a, 408.41032a, and 408.41034a.

(ii) The following portions of general industry safety standard part 18 “Overhead and Gantry Cranes, as referenced in R 408.41003a:

(A) R 408.11821(5), 408.11822(1), 408.11822(3) 408.11822(4), 408.11824(10), 408.11827(1), 408.11832(1), 408.11833(3), 408.11843(13), 408.11855(4), 408.11861(1)(b), 408.11865(2)(b), 408.11872(1), and 408.11873(1).

(B) The definitions in general industry safety standard part 18 “Overhead and Gantry Cranes, as referenced in R 408.41003a, except for "hoist" and "load." For those words, the definitions in this standard shall apply.

(C) R 408.11821(3), but only when the equipment identified in subdivision (a) of this subrule was manufactured before September 19, 2001.

(iii) For equipment manufactured on or after September 19, 2001, the following sections of ASME B30.2 “Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist),” 2005 edition, which is adopted by reference in R 408.41003a, shall apply: 2–1.3.1; 2–1.3.2; 2–1.4.1; 2–1.6; 2–1.7.2; 2–1.8.2; 2–1.9.1; 2–1.9.2; 2–1.11; 2–1.12.2; 2–1.13.7; 2–1.14.2; 2–1.14.3; 2–1.14.5; 2–1.15.; 2–2.2.2; 2–3.2.1.1. In addition, 2–3.5 shall apply, except in 2–3.5.1(b), “29 CFR 1910.147” is substituted for “ANSI Z244.1.”

History: 1995 AACS; 2012 AACS.

R 408.41031a Floating and land cranes or derricks on barges.

Rule 1031a. (1) This rule contains supplemental requirements for floating cranes or derricks and land cranes or derricks on barges, pontoons, vessels or other means of flotation device. The rules of this standard shall apply to floating cranes or derricks and land cranes or derricks on barges, pontoons, vessels or other means of flotation, unless specified otherwise. The requirements of this rule shall not apply when using jacked barges when the jacks are deployed to the river, lake, or sea bed and the barge is fully supported by the jacks.

(2) General requirements. The requirements in subrules (3) to (11) of this rule shall apply to both floating cranes or derricks and land cranes or derricks on barges, pontoons, vessels or other means of flotation.

(3) An operator shall not leave a floating crane or derrick unattended until notified by the A/D director that it is safe to do so. Before leaving, the operator shall in addition to the requirements specified in R 408.41019b(4), do both of the following:

(a) Lower the boom to the boom rest or the deck of the barge and fasten it securely to prevent displacement due to wind loads or other outside forces.

(b) Engage manual locking devices in the absence of automatic holding equipment on derricks and engage swing brakes, boom brakes, and other locking devices on cranes.

(4) If power fails during operation, the equipment operator shall do all of the following:

(a) Set all brakes and locking devices.

(b) Move all clutch or other power controls to the off or neutral position.

(c) Communicate with the A/D director in charge of equipment operations.



- (d) If practical, and applicable, land the load under brake control.
- (5) All of the following apply to work area control:
  - (a) The requirements of R 408.41022a shall apply, except for R 408.41022a(1)(b)(ii).
  - (b) The employer shall do either of the following:
    - (i) Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas.
    - (ii) Affix to the rear and sides of the house and counterweight a danger sign, as prescribed in construction safety standard part 22 “Signals, Signs, Tags, and Barricades,” as referenced in R 408.41003a. The additional lettering on the danger sign shall indicate that the counterweight is swinging.
  - (6) Keeping clear of the load. R 408.41023a shall not apply.
  - (7) Additional safety devices. In addition to the safety devices listed in R 408.41018a, the following safety devices shall be required:
    - (a) Barge, pontoon, vessel or other means of flotation list and trim device. The safety device shall be located in the cab or, when there is no cab, at the operator’s station.
    - (b) Positive equipment house lock.
    - (c) Wind speed and direction indicator. A competent person shall determine if wind is a factor that needs to be considered. If wind needs to be considered, a wind speed and direction indicator shall be used.
  - (8) Both of the following shall apply to operational aids:
    - (a) An anti two-block device shall be required only when hoisting personnel or hoisting over an occupied cofferdam or shaft.
    - (b) R 408.41019a(5)(d) shall not apply to dragline, clamshell, grapple, magnet, drop ball, container handling, concrete bucket, and pile driving work performed under this rule.
  - (9) Accessibility of procedures applicable to equipment operation. If the crane or derrick has a cab, the requirements of R 408.41019b(3) shall apply. If the crane or derrick does not have a cab, the employer shall ensure that both of the following are met:
    - (a) Rated capacities, load charts, are posted at the operator’s station. If the operator’s station is moveable, such as with pendant-controlled equipment, the load charts shall be posted on the equipment.
    - (b) Procedures, other than the load charts, applicable to the operation of the equipment, recommended operating speeds, special hazard warnings, instructions and operator’s manual, shall be readily available on board the vessel or flotation device.
  - (10) Inspections. In addition to meeting the requirements of R 408.41012a for inspecting the crane or derrick, the employer shall inspect the barge, pontoons, vessel, or other means of flotation used to support a floating crane or derrick or land crane or derrick, and ensure all of the following:
    - (a) Shift. For each shift inspection, the means used to secure or attach the equipment to the vessel or flotation device is in proper condition, including wear, corrosion, loose or missing fasteners, defective welds, and, when applicable, insufficient tension.
    - (b) Monthly. For each monthly inspection all of the following shall be met:
      - (i) The means used to secure or attach the equipment to the vessel or flotation device is in proper condition, including inspection for wear, corrosion, and, when applicable, insufficient tension.
      - (ii) The vessel or flotation device is not taking on water.

- (iii) The deckload is properly secured.
- (iv) The vessel or flotation device is watertight based on the condition of the chain lockers, storage, fuel compartments, and hatches.
- (v) The firefighting and lifesaving equipment is in place and functional.
- (c) The shift and monthly inspections shall be conducted by a competent person, resulting in the following:
  - (i) If any deficiency is identified, an immediate determination shall be made by a qualified person whether the deficiency constitutes a hazard.
  - (ii) If the deficiency is determined to constitute a hazard, the vessel or flotation device shall be removed from service until the deficiency has been corrected.
- (d) Annual external vessel or flotation device inspection. For each annual inspection all of the following shall be met:
  - (i) The external portion of the barge, pontoons, vessel, or other means of flotation used shall be inspected annually by a qualified person who has expertise with respect to vessels or flotation devices and that the inspection shall include all of the following items:
    - (A) The items identified in subdivisions (a) and (b) of this subrule.
    - (B) Cleats, bitts, chocks, fenders, capstans, ladders, and stanchions, for significant corrosion, wear, deterioration, or deformation that could impair the function of these items.
    - (C) External evidence of leaks and structural damage. Evidence of leaks and damage below the waterline may be determined through internal inspection of the vessel or flotation device.
    - (D) Four-corner draft readings.
    - (E) Firefighting equipment for serviceability.
  - (ii) Rescue skiffs, lifelines, work vests, life preservers and ring buoys shall be inspected for proper condition.
  - (iii) If any deficiency is identified, an immediate determination shall be made by the qualified person whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly inspections resulting in the following:
    - (A) If the qualified person determines that the deficiency constitutes a hazard, the vessel or flotation device shall be removed from service until it has been corrected. See requirements in R 408.41019b(6).
    - (B) If the qualified person determines that, though not presently a hazard, the deficiency needs to be monitored, the deficiency shall be checked in the monthly inspections.
- (e) Four-year internal vessel or flotation device inspection. For each 4 year inspection the following shall be included:
  - (i) A marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels or flotation devices surveys the internal portion of the barge, pontoons, vessel, or other means of flotation.
  - (ii) If the surveyor identifies a deficiency, an immediate determination shall be made by the surveyor as to whether the deficiency constitutes a hazard or, though not yet a hazard, needs to be monitored in the monthly or annual inspections, as appropriate. Both of the following apply:
    - (A) If the surveyor determines that the deficiency constitutes a hazard, the vessel or flotation device shall be removed from service until it has been corrected.

(B) If the surveyor determines that, though not presently a hazard, the deficiency needs to be monitored, the deficiency shall be checked in the monthly or annual inspections, as appropriate.

(f) Documentation. The monthly and annual inspections required in subrule (8)(b) and (d) of this rule shall be documented in accordance with R 408.41012(6)(c) and R 408.41012(7)(g). The 4-year inspection required in subrule (8)(e) of this rule shall be documented in accordance with R 408.41012(7)(g), except that the documentation for that inspection shall be retained for a minimum of 4 years. All of these documents shall be made available, during the applicable document retention period, to all persons who conduct inspections in accordance with R 408.41012a.

(11) [Reserved.]

(12) Working with a diver. The employer shall meet the following additional requirements when working with a diver in the water:

(a) If a crane or derrick is used to get a diver into and out of the water, it shall not be used for any other purpose until the diver is back on board. When used for more than 1 diver, a crane or derrick shall not be used for any other purpose until all divers are back on board.

(b) The operator shall remain at the controls of the crane or derrick at all times.

(c) In addition to the requirements in R 408.41011b to R 408.41011e, either of the following shall be met:

(i) A clear line of sight shall be maintained between the operator and tender.

(ii) The signals between the operator and tender shall be transmitted electronically.

(d) The means used to secure the crane or derrick to the vessel or flotation device, as specified in subrule (16)(e) of this rule, shall not allow any amount of shifting in any direction.

(13) All of the following apply to manufacturer's specifications and limitations:

(a) The employer shall ensure that the barge, pontoons, vessel, or other means of flotation shall be capable of withstanding imposed environmental, operational and in-transit loads when used in accordance with the manufacturer's specifications and limitations.

(b) The employer shall ensure that the manufacturer's specifications and limitations with respect to environmental, operational, and in transit loads for a barge, pontoon, vessel, or other means of flotation shall not be exceeded or violated.

(c) When the manufacturer's specifications and limitations are unavailable, the employer shall ensure that the specifications and limitations established by a qualified person with respect to environmental, operational, and in-transit loads for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.

(14) [Reserved.]

(15) Floating cranes or derricks. For equipment designed by the manufacturer or employer for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation, all of the following shall be met:

(a) Both of the following apply to load charts:

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

(ii) The employer shall ensure that load charts take into consideration a minimum wind speed of 40 miles per hour.

(b) The employer shall ensure that the requirements for maximum allowable list and maximum allowable trim, as specified in Table 13a of this rule, are met.

TABLE 13a

Rated capacity (degrees)	Maximum allowable list (degrees)	Maximum allowable trim
Equipment designed for marine use by permanent attachment (other than derricks):		
25 tons or less .....	5	5
Over 25 tons .....	7	7
Derricks designed for marine use by permanent attachment:		
Any rated capacity ....	10	10

(c) The employer shall ensure that the equipment is stable under the conditions specified in Tables 13b and 13c of this rule. Note: Freeboard means the vertical distance between the water line and the main deck of the vessel.

TABLE 13b

Operated at (ft)	Wind speed (mph)	Minimum freeboard
Rated capacity .....	60	2
Rated capacity plus 25% .....	60	1
High boom, no load .....	60	2

TABLE 13c

Operated at	Wind speed
For backward stability of the boom:	
High boom, no load, full back list (least stable condition).	90 mph.

(d) If the equipment is employer made, it shall not be used unless the employer has documents demonstrating that the load charts and applicable parameters for use meet the requirements of subdivisions (a) to (c) of this subrule. These documents shall be signed

by a registered professional engineer who is a qualified person with respect to the design of this type of equipment, including the means of flotation.

(e) The employer shall ensure that the barge, pontoons, vessel, or other means of flotation used comply with all of the following:

(i) Are structurally sufficient to withstand the static and dynamic loads of the crane or derrick when operating at the crane or derrick's maximum rated capacity with all planned and actual deck loads and ballasted compartments.

(ii) Have a subdivided hull with 1 or more longitudinal watertight bulkheads for reducing the free-surface effect.

(iii) Have access to void compartments to allow for inspection and pumping.

(16) Land cranes or derricks. For land cranes or derricks used on barges, pontoons, vessels, or other means of flotation, the employer shall ensure all of the following:

(a) The rated capacity of the equipment, including but not limited to modification of load charts, applicable for use on land is reduced to do the following:

(i) Account for increased loading from list, trim, wave action, and wind.

(ii) Be applicable to a specified location or locations on the specific barge, pontoons, vessel or other means of flotation that will be used, under the environmental conditions expected and encountered.

(iii) The conditions required in subdivisions (c) and (d) of this subrule are met.

(b) The rated capacity modification required in subdivision (a) of this subrule shall be performed by the equipment manufacturer, or a qualified person who has expertise with respect to both land crane or derrick capacity and the stability of vessels or flotation devices.

(c) For list and trim, the following apply:

(i) The maximum allowable list and the maximum allowable trim for the barge, pontoon, vessel or other means of flotation shall not exceed the amount necessary to ensure that the conditions in subdivision (d) of this subrule are met. In addition, the maximum allowable list and the maximum allowable trim shall not exceed the least of the following: 5 degrees, the amount specified by the crane or derrick manufacturer, or, when an amount is not specified, the amount specified by the qualified person.

(ii) The maximum allowable list and the maximum allowable trim for the land crane or derrick shall not exceed the amount specified by the crane or derrick manufacturer, or, when an amount is not specified, the amount specified by the qualified person.

(d) The following requirements shall be met:

(i) All deck surfaces of the barge, pontoons, vessel, or other means of flotation used shall be above water.

(ii) The entire bottom area of the barge, pontoons, vessel, or other means of flotation used shall be submerged.

(e) Physical attachment, corraling, rails system and centerline cable system shall meet the requirements in Option (1), Option (2), Option (3), or Option (4) of this subrule. Whichever option is used shall also meet the requirements of paragraph (v) of this subdivision.

(i) Option (1)—Physical attachment. The crane or derrick shall be physically attached to the barge, pontoons, vessel or other means of flotation. Methods of physical attachment include crossed-cable systems attached to the crane or derrick and vessel or flotation device, bolting or welding the crane or derrick to the vessel or flotation device, strapping

the crane or derrick to the vessel or flotation device with chains, or other methods of physical attachment.

(ii) Option (2)—Corralling. The crane or derrick shall be prevented from shifting by installing barricade restraints, such as a corraling system. Employers shall ensure that corraling systems do not allow the equipment to shift by any amount in any direction.

(iii) Option (3)—Rails. The crane or derrick shall be prevented from shifting by being mounted on a rail system. Employers shall ensure that rail clamps and rail stops are used unless the system is designed to prevent movement during operation by other means.

(iv) Option (4)—Centerline cable system. The crane or derrick shall be prevented from shifting by being mounted to a wire rope system. The employer shall ensure that the wire rope system meets the following requirements:

(A) The wire rope and attachments are of sufficient size and strength to support the side load of crane or derrick.

(B) The wire rope is attached physically to the vessel or flotation device.

(C) The wire rope is attached to the crane or derrick by appropriate attachment methods, such as shackles or sheaves, on the undercarriage, and that the method used shall allow the crew to secure the crane or derrick from movement during operation and to move the crane or derrick longitudinally along the vessel or flotation device for repositioning.

(D) Means are installed to prevent the crane or derrick from passing the forward or aft end of the wire rope attachments.

(E) The crane or derrick is secured from movement during operation.

(v) The systems or means used to comply with Option (1), Option (2), Option (3), or Option (4) of this subrule shall be designed by a marine engineer, registered professional engineer familiar with floating crane or derrick design, or qualified person familiar with floating crane or derrick design.

(f) Exception. For mobile auxiliary cranes used on the deck of a floating crane or derrick, the requirement specified by subdivision (e) of this subrule to use Option (1), Option (2), Option (3), or Option (4) shall not apply when the employer demonstrates implementation of a plan and procedures that meet the following requirements:

(i) A marine engineer or registered professional engineer familiar with floating crane or derrick design develops and signs a written plan for the use of the mobile auxiliary crane.

(ii) The plan is designed so that the applicable requirements of this rule shall be met despite the position, travel, operation, and lack of physical attachment, or corraling, use of rails or cable system, of the mobile auxiliary crane.

(iii) The plan specifies the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate, and the parameters and limitations of such movements and operation.

(iv) The deck is marked to identify the permitted areas for positioning, travel, and operation.

(v) The plan specifies the dynamic and environmental conditions that shall be present for use of the plan.

(vi) If the dynamic and environmental conditions in paragraph (v) of this subdivision are exceeded, the mobile auxiliary crane shall be attached physically or corralled according to Option (1), Option (2) or Option (4) of subdivision (e) of this subrule.

(g) The barge, pontoons, vessel, or other means of flotation used shall comply with the following:

(i) Be structurally sufficient to withstand the static and dynamic loads of the crane or derrick when operating at the crane's or derrick's maximum rated capacity with all anticipated deck loads and ballasted compartments.

(ii) Have a subdivided hull with 1 or more longitudinal watertight bulkheads for reducing the free surface effect.

(iii) Have access to void compartments to allow for inspection and pumping.

(17) An employer shall comply with the applicable requirements for the protection of employees who work on marine vessels specified in construction safety standard part 13. "Mobile Equipment," as referenced in R 408.41003a.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41032a Dedicated pile drivers.

Rule 1032a. (1) The provisions of this standard shall apply to dedicated pile drivers, except as specified in this section.

(2) R 408.41019a(4)(c) shall not apply.

(3) R 408.41019a(5)(d) shall apply only to dedicated pile drivers manufactured after November 8, 2011.

(4) In R 408.41027, only subrules (4) and (5) shall apply to dedicated pile drivers.

History: 1995 AACS; 2012 AACS.

R 408.41033a Sideboom cranes.

Rule 1033a. (1) The provisions of this standard apply, except R 408.41017a, R 408.41018a, R 408.41019a, and R 408.41008a.

(2) R 408.41024a applies, except R 408.41024a(1)(b)(i). Sideboom cranes in which the boom is designed to free fall, live boom, are permitted only if manufactured prior to November 8, 2010.

(3) Sideboom cranes mounted on wheel or crawler tractors shall meet all of the following requirements of ASME B30.14 "Side Boom Tractors," 2004 edition, which is adopted by reference in R 408.41003a:

(a) Section 14-1.1 ("Load Ratings").

(b) Section 14-1.3 ("Side Boom Tractor Travel").

(c) Section 14-1.5 ("Ropes and Reeving Accessories").

(d) Section 14-1.7.1 ("Booms").

(e) Section 14-1.7.2 ("General Requirements—Exhaust Gases").

(f) Section 14-1.7.3 ("General Requirements—Stabilizers (Wheel-Type Side Boom Tractors)").

(g) Section 14-1.7.4 ("General Requirements—Welded Construction").

(h) Section 14-1.7.6 ("General Requirements—Clutch and Brake Protection").

(i) Section 14-2.2.2 ("Testing—Rated Load Test"), except that it shall apply only to equipment that has been altered or modified.

(j) In section 14-3.1.2 ("Operator Qualifications"), paragraph (a), except the phrase "When required by law."

(k) In section 14–3.1.3 (“Operating Practices”), paragraphs (e), (f)(1)—(f)(4), (f)(6), (f)(7), (h), and (i).

(l) In section 14–3.2.3 (“Moving the Load”), paragraphs (j), (l), and (m).

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41034a Equipment with a rated hoisting or lifting capacity of 2,000 pounds or less.

Rule 1034a. This rule specifies requirements for employers using equipment with a maximum rated hoisting or lifting capacity of 2,000 pounds or less.

(1) The employer using this equipment shall comply with the following provisions:

- (a) R 408.41001a.
- (b) R 408.41004a and R 408.41005a.
- (c) R 408.41011b to 408.41011e.
- (d) R 408.41012a(4).
- (e) R 408.41013a to R 408.41014a.
- (f) R 408.41015a(1).
- (g) R 408.41015a(4).
- (h) R 408.41016a to R 408.41016d.
- (i) R 408.41017a.
- (j) R 408.41019c.
- (k) R 408.41020a.
- (l) R 408.41023a, except for R 408.41023a(3)(c).
- (m) R 408.41024a.
- (n) R 408.41025a.
- (o) R 408.41026a.
- (p) R 408.41028a.
- (q) R 408.41029a.
- (r) R 408.41030a.
- (s) R 408.41031a.

(2) Assembly or disassembly.

(a) In addition to complying with R 408.41015a(1) and (4), the employer shall also comply with R 408.41034a(2)(b) and (c).

(b) Components and configuration. The employer shall ensure the following:

(i) The selection of components, and the configuration of the equipment, that affect the capacity or safe operation of the equipment complies with 1 of the following:

(A) Manufacturer’s instructions, recommendations, limitations, and specifications. When these documents and information are unavailable, a registered professional engineer familiar with the type of equipment involved shall approve, in writing, the selection and configuration of components.

(B) Approved modifications that meet the requirements of R 408.41028a.

(ii) Post-assembly inspection. Upon completion of assembly, the equipment shall be inspected to ensure that it complies with subrule (2)(b)(i). See R 408.41012(4) for post-assembly inspection requirements.



(c) Manufacturer prohibitions. The employer shall comply with applicable manufacturer prohibitions.

(3) Operation—procedures.

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

(b) Unavailable operation procedures. The employer shall comply with the following:

(i) When the manufacturer's procedures are unavailable, develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(ii) Ensure that procedures for the operational controls are developed by a qualified person.

(iii) Ensure that procedures related to the capacity of the equipment are developed and signed by a registered professional engineer who is familiar with the equipment.

(c) Accessibility. The employer shall ensure all of the following:

(i) The load chart is available to the operator at the control station.

(ii) Procedures applicable to the operation of the equipment, recommended operating speeds, special hazard warnings, instructions, and operator's manual are readily available for use by the operator.

(iii) When rated capacities are available at the control station only in electronic form and a failure occurs that makes the rated capacities inaccessible, the operator immediately ceases operations or follows safe shut-down procedures until the rated capacities, in electronic or other form, are available.

(4) Safety devices and operational aids.

(a) The employer shall ensure that safety devices and operational aids that are part of the original equipment are maintained in accordance with manufacturer procedures.

(b) Anti two-blocking. The employer shall ensure that equipment covered by this section manufactured more than 1 year after November 8, 2010 have either an anti two-block device that meets the requirements of R 408.41019a(4)(c) or is designed so that in the event of a two-block situation no damage or load failure will occur, such as by using a power unit that stalls in response to a two-block situation.

(5) Operator qualifications. The employer shall train each operator, prior to operating the equipment, on the safe operation of the type of equipment the operator will be using.

(6) Signal person qualifications. The employer shall train each signal person in the proper use of signals applicable to the use of the equipment.

(7) [Reserved.]

(8) Inspections. The employer shall ensure that equipment is inspected in accordance with manufacturer procedures.

(9) [Reserved.]

(10) Hoisting personnel. The employer shall ensure that equipment covered by this standard is not used to hoist personnel.

(11) Design. The employer shall ensure that the equipment is designed by a qualified engineer.

History: 2012 AACS.

R 408.41041a Excavating equipment; operating rules generally.

Rule 1041a. (1) An employer shall assure that a prospective operator, before being assigned as an operator of excavation equipment, has been trained in all of the following areas:

- (a) The capabilities of equipment and attachments.
  - (b) The purpose, use, and limitations of controls.
  - (c) The making of daily inspections.
  - (d) Practice in operating assigned equipment to perform the functions necessary for required jobs.
  - (e) Applicable state standards and company rules and regulations.
- (2) An operator shall not leave excavation equipment unattended with a load suspended above the ground, floor, or platform during working operations. A bucket or blade shall not be left suspended above the ground when a machine is unattended.
- (3) The provisions of subrule (2) shall not prohibit leaving job-related equipment hanging on the hook to prevent theft or vandalism during the hours the project is shut down.
- (4) Windows of any excavation equipment shall be equipped with safety glass or its equivalent. Visual distortions which are caused by broken or defective glass and which would affect the safe operation of the equipment when in use shall be corrected.
- (5) Where necessary for rigging or servicing, a ladder or steps shall be provided to give access to a cab roof.
- (6) Handholds and steps shall be provided on all lifting and digging equipment for access to the cab. Platforms and walkways shall have slip-resistant surfaces, and guardrails as prescribed in construction safety standards Part 21 "Guarding of Walking and Working Areas," and construction safety standards Part 45 "Fall Protection," as referenced in R 408.41003a.
- (7) Fuels shall be transported, stored, and handled as prescribed in construction safety standard Part 18 "Fire Protection and Prevention," as referenced in R 408.41003a.
- (8) An employee shall not be permitted under a suspended load.
- (9) Excavation equipment shall not be loaded beyond the rated load.
- (10) When loads that are limited by hydraulic or structural competence rather than by stability are to be handled, the person who is responsible for the job shall ascertain that the weight of a load approaching rated capacity has been determined and does not exceed the capacity of the equipment.
- (11) In moving a load, an operator shall avoid sudden acceleration or deceleration of a moving boom that would cause a swinging action by the load.
- (12) A load shall be secured and balanced before the load is lifted more than 6 inches.
- (13) A load shall not be moved in a manner that could contact obstructions.
- (14) A tag line shall be used when rotation of the load would be hazardous.
- (15) Excavation equipment shall not be used for dragging a load sideways.
- (16) Before moving excavation equipment that is carrying a load, an on-site supervisor or an operator, or both, shall determine all of the following:
- (a) The position to carry the load.
  - (b) The boom location.
  - (c) The ground conditions.
  - (d) The travel route.
  - (e) The speed of movement.

(f) The location of overhead wires.

(17) While being moved from one jobsite to another, excavation equipment shall comply with both of the following provisions:

(a) The boom shall be carried in line with the direction of movement.

(b) The superstructure shall be secured against rotation, except when negotiating a turn with an operator in the cab or the boom on a dolly.

(18) Excavation equipment shall not travel with the boom at a height that could allow the boom to bounce back over the cab.

(19) For moving loads with multiple pieces of excavation equipment, the requirements of subrule (22) of this rule shall be met. The load, conditions, and equipment capacities shall be analyzed and a plan of operation shall be formulated.

(20) Clothing, personal belongings, tools, and other articles within a cab or operating enclosure shall be stored in cabinets, boxes, or by other means so as not to interfere with access or operations.

(21) A portable fire extinguisher that has a rating of not less than 10 BC, shall be kept in the cab or operating enclosure. When there is no cab or enclosure, it shall be kept on the jobsite within a 200-foot radius of the equipment and shall be readily available. The operator and maintenance employees shall be trained in the use of the fire extinguisher.

(22) When night operations are carried out, lighting shall illuminate the immediate working area to a minimum of 10 footcandles and shall not interfere with the operator's vision.

(23) An employee shall not ride the bare hook or on a load of material suspended from the hook.

(24) An employer shall comply with the requirements of the power crane and shovel associations' mobile hydraulic crane standard no. 4 "Mobile Power Crane and Excavator and Hydraulic Crane Standards," 1983 edition, as adopted by reference in R 408.41003a.

(25) When working in proximity to power lines, excavation equipment shall maintain clearances as prescribed in Table A and Table T.

(26) If an employee could be struck by the rotating superstructure of excavation equipment, the hazardous area shall be barricaded to prevent an employee from entering and being struck.

(27) If clearances between the rotating or moving structure of constantly moving excavation equipment can create a pinch point for an employee, or if an employee could be struck by the rotating superstructure, an employer, in place of barricades, shall train and instruct each employee to stay out of the danger area and a danger sign, as prescribed in construction safety standards Part 22 "Signals, Signs, Tags, and Barricades," as referenced in R 408.41003a, shall be affixed to the rear and sides of the house and counterweight. The additional lettering on the danger sign shall indicate that the counterweight is swinging.

(28) An employee shall remain clear of excavation equipment at all times unless the employee is operating the equipment.

History: 2012 AACS.

R 408.41051a Inspections generally, excavation equipment.

Rule 1051a. (1) A thorough, annual inspection of all boom equipped excavating equipment shall be made by a qualified person. An employer shall maintain, on the jobsite or attached to the equipment, a copy of the latest equipment inspection record with the date and results for each piece of equipment.

(2) An employer shall designate a qualified person to perform all inspections of excavation equipment as required in R 408.41012a.

History: 1995 AACS; 2012 AACS.

## MATERIAL AND PERSONNEL HOISTS (ELEVATORS)

R 408.41065a Material and personnel hoists generally.

Rule 1065a. (1) An employer shall ensure that an employee who is specifically engaged in installing personnel elevators or hoists is licensed by the state of Michigan in accordance with 1967 PA 227 and 1976 PA 333, MCL 408.801 to 408.824 and MCL 338.2151 to 338.2160 respectively, and the rules of the department of licensing and regulatory affairs relating to elevators.

(2) An employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all material and personnel hoists. If the manufacturer's specifications are not available, then the limitations assigned to the equipment shall be determined by a qualified person who is competent in the field and shall be based on the requirements of ANSI A10.4 "Safety Requirements for Personal Hoists and Employee Elevators for Construction and Demolition Operations," 2004 edition and ANSI A10.5 "Safety Requirements for Material Hoists," 1992 edition, which are adopted by reference in R 408.41003a. A determination shall be documented and recorded. Attachments used shall not exceed the capacity, rating, or scope recommended by the manufacturer.

(3) The employer shall ensure that rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS,

R 408.41066a Employer responsibility.

Rule 1066a. (1) An employer shall limit the operation of material and personnel hoists to the following entities:

(a) An employee who has been trained and qualified to operate the hoisting equipment to which the employee is assigned.

(b) Authorized maintenance personnel when performing their duties.

(2) An employer shall maintain hoisting equipment and accessories in a condition that will not endanger an operator or other employees.

(3) When modifications or changes to personnel hoists are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. The original safety factor of the equipment shall not be reduced.

(4) An employer shall comply with all applicable requirements of this part.

History: 1995 AACS.

R 408.41067a Employee responsibility.

Rule 1067a. (1) An operator shall report any recognized defects of any material and personnel hoisting equipment to the supervisor.

(2) An employee shall not alter or bypass any safety device.

History: 1995 AACS.

R 408.41068a Operator training.

Rule 1068a. Before assignment, an employer shall assure that an operator of a material and personnel hoist has been trained in all of the following areas:

(a) The capabilities of the equipment.

(b) The purpose, use, and limitations of the controls.

(c) How to conduct daily inspections.

(d) Operational practices of the assigned equipment through its functions necessary to perform the required job.

(e) Applicable state standards and company rules and regulations.

History: 1995 AACS.

R 408.41069a Operator conduct.

Rule 1069a. (1) An operator shall not engage in any practice that will divert his or her attention while engaged in operating a material and personnel hoist.

(2) Each operator shall be responsible for those operations under the operator's direct control. When there is any doubt as to safety, the operator shall stop operations and consult with the supervisor before continuing work.

(3) An operator shall not leave the equipment unattended unless it has been secured and rendered inoperable in the operator's absence.

(4) When controls are locked out for maintenance or for repair purposes, an equipment operator shall not start operations until the lock has been removed by the person or persons responsible for the safe operation.

(5) If a malfunction occurs during the operation of the equipment and the door remains locked, the operator and all other personnel shall remain in the cab until the operation is restored.

(6) An operator shall be familiar with the equipment and its proper care. If adjustments or repairs are necessary or if any defects are evident, the operator shall report the repairs or defects to the responsible supervisor and also notify the next operator of the equipment status.

(7) A hoist operator shall ensure that the rated capacity of the hoist is not exceeded.

History: 1995 AACS.

R 408.41070a Signals.

Rule 1070a. A signal communication system shall be provided for use between the material and personnel hoist operator and landings.

History: 1995 AACCS.

R 408.41070b Material hoists.

Rule 1070b. (1) Operating rules for material hoists shall be established and posted at the operator's station of the hoist. The rules shall include a signal system and the applicable manufacturer's specifications for rated operating speed. Rules and notices shall be posted on the car frame in a conspicuous location and shall include the statement "no riders allowed." A person shall not be allowed to ride on a material hoist, except for inspection and maintenance.

(2) All entrances of the hoistway shall be protected by substantial gates that shall guard the full width of the landing entrance from floor to ceiling. A hoistway entrance gate shall be identified as such.

(3) A gate that protects the entrance to a hoistway shall be equipped with a latching device and be not more than 4 inches from the edge of the landing sill. A gate shall extend a minimum of 6 feet 8 inches above the floor.

(4) An overhead protective covering of 2-inch planking or other solid material of equivalent strength shall be provided on the top of every material hoist cage or platform.

(5) An operator's station of a hoisting machine shall have overhead protection equivalent to tight planking that is not less than 2 inches thick. The support for the overhead protection shall be of equal strength.

(6) A hoist tower may be used with or without enclosures on all sides. However, whichever alternative is chosen, all of the following applicable conditions shall be met:

(a) When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of not more than ½-inch mesh of no. 18 united states gauge wire or equivalent, except for a landing access.

(b) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with ½-inch mesh of no. 14 united states gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. An 8-foot high enclosure shall be provided on the unused sides of the hoist tower at ground level.

(c) In either alternative, the cab or platform shall be enclosed as specified in subdivision (b) of this subrule.

(7) A car safety device shall be installed to function in case of rope failure and shall be tested upon installation and at 4-month intervals.

(8) A material hoist tower shall be designed by a licensed professional engineer.

(9) Wire rope shall be in compliance with the requirements of R 408.41013a and R 408.41014a and shall be inspected and removed from service if any condition specified in R 408.1013a and R 408.41014a is present.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS,

## PERSONNEL HOISTS

R 408.41071a Inspections.

Rule 1071a. (1) Before being put into service, a qualified person shall inspect and test all functions of a personnel hoist. An inspection and test is required after a major alteration of an existing installation. All hoists shall be inspected and tested at not more than 90-day intervals.

(2) An employer shall prepare a certification record that includes all of the following information:

(a) The date of the inspection and test of all functions and safety devices that were performed.

(b) The signature of the person who performed the inspection and tests.

(c) A serial number or other identifier for the hoist that was inspected and tested. The most recent certification record shall be maintained on file on the jobsite.

(3) A load safety test, as required by ANSI A10.4 "Safety Requirements for Personnel Hoists and Employee Elevators for Construction and Demolition Operations," 2004 edition, which is adopted by reference in R 408.41003a, shall be performed on a personnel hoist by a licensed elevator contractor in the presence of a state of Michigan elevator inspector every 90 days.

(4) All control mechanisms shall be inspected daily for misadjustments that might interfere with proper operation and for excessive wear of components.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41072a Personnel hoists generally.

Rule 1072a. (1) The rated load capacities and special hazard warnings or instructions for personnel hoists shall be posted conspicuously on cars and platforms.

(2) A hoist tower outside the structure shall be enclosed for the full height on the side or sides used to enter and exit the structure. At the lowest landing, the enclosure on the sides not used to exit or enter the structure shall be enclosed to a height of not less than 10 feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of 10 feet above the level of the floors or scaffolds. (3) A hoistway inside a structure shall be enclosed on all 4 sides throughout the full travel of the hoistway.

(4) A tower shall be anchored to the structure at intervals of not more than 30 feet in height. When tie-ins are not practical, the tower shall be anchored by means of guys which are made of wire rope that is not less than 1/2 of an inch in diameter and which are securely fastened to the anchorage to ensure stability.

(5) Hoistway doors or gates shall be not less than 6 feet 6 inches high, are provided with mechanical locks that cannot be operated from the landing side, and are accessible only to persons on the car.

(6) A car shall be permanently enclosed on all sides and the top, except for sides used for entry and exit and sides that have car gates or doors.

(7) A door or gate shall be provided at each entrance to the car and shall protect the full width and height of the car entrance opening.

(8) An overhead protective covering that consists of 2-inch planking, 3/4-inch plywood, or other solid material of equivalent strength shall be provided on the top of every personnel cab.

(9) Doors or gates shall have electric contacts that do not allow movement of the hoist when a door or gate is open.

(10) A car safety device shall be installed and shall be capable of stopping and holding the car and the rated load when traveling at governor-tripping speed.

(11) A car shall have a capacity and data plate secured in a conspicuous place on the car or crosshead.

(12) Normal and final terminal stopping devices shall be provided. Final terminal stopping devices shall be installed in the hoistway and shall be mechanically operated.

(13) An emergency stop switch shall be provided in the car and marked "STOP."

(14) A wire rope shall be in compliance with all of the following requirements:

(a) Not less than 3 hoisting ropes shall be used with traction hoists.

(b) Hoisting and counterweight wire ropes shall be not less than 1/2 of an inch in diameter.

(c) Not less than 2 ropes shall be used for the counterweights on the rack and pinion.

(d) Safety factors shall be as follows:

#### MINIMUM FACTORS OF SAFETY FOR SUSPENSION WIRE ROPES

Rope speed in factor feet per minute	Minimum factor of safety	Rope speed in feet per minute	Minimum or safety
50	7.60	250	8.90
75	7.75	300	9.20
100	7.95	350	9.50
125	8.10	400	9.75
150	8.25	450	10.00
175	8.40	500	10.25
200	8.60	550	10.45
225	8.75	600	10.70

(e) The following formula shall be used to calculate the allowable gross load:  $L = SN$

L = Allowable gross load

F S = Manufacturer's rated breaking strength

N = Number of parts of rope

F = Safety factor



(15) All personnel hoists used by employees shall be constructed of materials and components that are in compliance with the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in ANSI standard A10.4 "Safety Requirements for Personnel Hoists and Employee Elevators for Construction and Demolition Operations," 1990 edition.

(16) Internal combustion engines shall not be permitted for direct drive.

History: 1995 AACS; 1998-2000 AACS.

R 408.41073a Bridge tower personnel hoists.

Rule 1073a. (1) A personnel hoist that is used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified person competent in the field.

(2) When a hoist tower is not enclosed, the cab shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with not less than 3/4-inch mesh of no.

14 United States gauge wire or equivalent. The hoist car enclosure shall include the required gates for loading and unloading.

(3) A hoist shall be inspected for defects, serviced and maintained on a weekly basis, and repaired as necessary. If the hoisting equipment is exposed to winds of more than 35 miles per hour, it shall be inspected and repaired if necessary by authorized personnel before reuse.

History: 1995 AACS.

R 408.41074a Wire rope.

Rule 1074a. Wire rope, used on personnel hoists shall be taken out of service when any of the following conditions exist:

(a) In running ropes, where 6 randomly distributed broken wires in 1 lay or three broken wires in 1 strand in 1 lay are present.

(b) If abrasion or wear of 1/3 of the original diameter of outside individual wires, kinking, crushing, bird-caging, or any other damage that results in distortion of the rope structure occurs.

(c) If evidence of any heat damage or corrosion from any cause is present.

(d) If reductions from nominal diameter of more than 3/64 of an inch for diameters to and including 3/4 of an inch, 1/16 of an inch for diameters 7/8 of an inch to 1 1/8 inches, inclusive, or 3/32 of an inch for diameters 1 1/4 to 1 1/2 inches, inclusive, are present.

(e) In standing ropes where more than 2 broken wires in 1 lay in sections beyond end connections or more than 1 broken wire at an end connection, occur.

History: 1995 AACS.

R 408.41075a Use of multiple permanent elevators; use of endless belt-type manlifts.

Rule 1075a. (1) When multiple permanent elevators are available and 1 elevator is being used for construction or renovation purposes, that elevator shall be for the exclusive use of construction personnel and shall be operated by a designated operator. The elevator signal system shall be separate from any other elevators.

(2) Endless belt-type manlifts shall not be used for construction.

History: 1995 AACS; 2012 AACS.

#### BASE-MOUNTED DRUM HOISTS

R 408.41077a Rescinded.

History: 1995 AACS; 1998-2000 AACS; 2012 AACS.

R 408.41099a Rescinded.

History: 1995 AACS; 2012 AACS.

APPENDIX A  
Standard Hand Signals


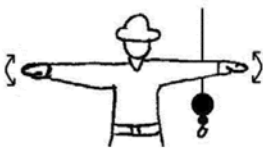


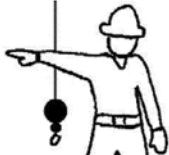
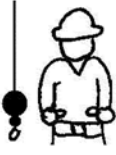


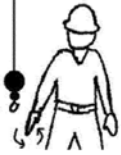


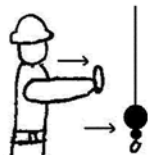
(1) Hand signals.

(a) When using hand signals, the Standard Method shall be used as follows.

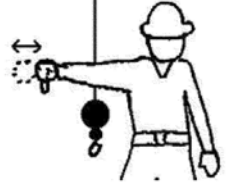
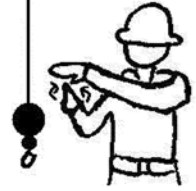




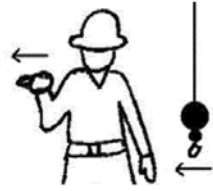
Exception: When use of the Standard Method for hand signals is infeasible, or when an operation or use of an attachment is not covered in the Standard Method, nonstandard hand signals may be used in accordance with the subrule (1)(b).

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

STANDARD METHOD FOR HAND SIGNALS

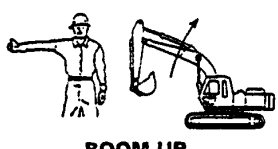
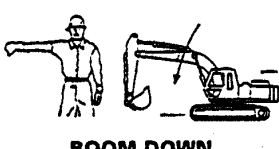
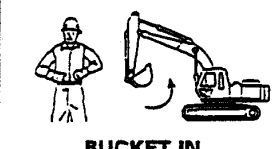
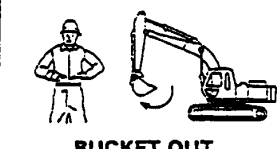

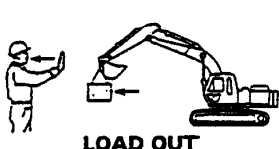
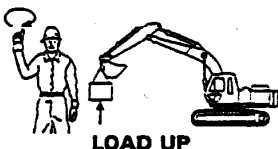
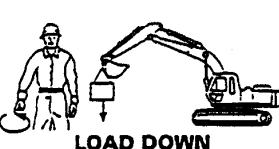
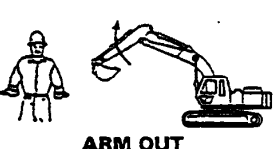
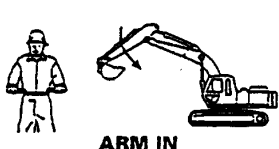
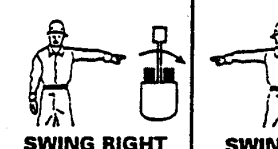
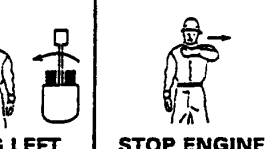

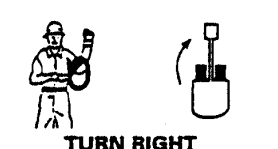
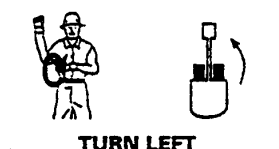
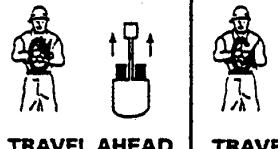


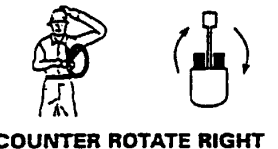
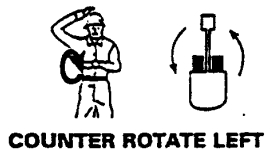



 <p><b>STOP</b> – With arm extended horizontally to the side, palm down, arm is swung back and forth.</p>	 <p><b>EMERGENCY STOP</b> – With both arms extended horizontally to the side, palms down, arms are swung back and forth.</p>	 <p><b>HOIST</b> – With upper arm extended to the side, forearm and index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

## STANDARD METHOD FOR HAND SIGNALS

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

(2) The signals for specified types of excavation equipment shall be as follows:

**STANDARD HAND SIGNALS FOR CONTROLLING CRAWLER EXCAVATOR OPERATIONS**

 <b>BOOM UP</b>	 <b>BOOM DOWN</b>	 <b>BUCKET IN</b>	 <b>BUCKET OUT</b>	
 <b>LOAD IN</b>	 <b>LOAD OUT</b>	 <b>LOAD UP</b>	 <b>LOAD DOWN</b>	
 <b>ARM OUT</b>	 <b>ARM IN</b>	 <b>SWING RIGHT</b>	 <b>SWING LEFT</b>	 <b>STOP ENGINE</b>
 <b>TURN RIGHT</b>	 <b>TURN LEFT</b>	 <b>TRAVEL AHEAD</b>	 <b>TRAVEL BACK</b>	 <b>STOP</b>
 <b>COUNTER ROTATE RIGHT</b>	 <b>COUNTER ROTATE LEFT</b>	 <b>SLOW ANY FUNCTION</b>	 <b>THIS FAR</b>	 <b>EMERGENCY STOP</b>

## NON-MANDATORY APPENDIX B

### Assembly or Disassembly:

#### Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement

1. R 408.41015a(2)(f)(i) provides that when pins, or similar devices, are being removed, employees shall not be under the boom, jib, or other components, except where the requirements of 408.41015a(2)(f)(ii) are met. The exception in 408.41015a(2)(f)(ii) shall apply when the employer demonstrates that site constraints require one or more employees to be under the boom, jib, or other components when pins, or similar devices, are being removed. In this situation, the A/D director shall implement procedures that minimize the risk of unintended dangerous movement and minimize the duration and extent of exposure under the boom.

The following scenario is an example of how the exception applies. A boom cannot be disassembled on the ground because of above ground piping, as might be found in an oil refinery, that precludes lowering the boom to the ground. The boom shall be disassembled in the air, and the employees who remove the pins shall perform that work from an aerial lift with a base that is positioned on one side, the near side, of the boom. To gain access to the pins on the far side, the aerial lift basket shall move under the boom, since, due to lack of room, the aerial lift cannot be repositioned on the far side.

To minimize the risk of unintended dangerous movement while the pins are removed, the A/D director shall use an assist crane that is rigged to support the boom section that is being detached, using particular care to ensure that the section end that is near the employee or employees removing the pins is well supported. The duration and extent of exposure shall be minimized by removing the far side pins first, moving the aerial lift basket as soon as possible to the near side so that the employees are no longer under the boom, and then removing the near side pins.

2. R 408.41015a(2)(h)(vi)(A) provides that, during assembly or disassembly, the center of gravity of the load shall be identified if that is necessary for the method used for maintaining stability. R 408.41015a(2)(h)(vi)(B) states that, 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 shall be used.

An example of the application of R 408.41015a(2)(h)(vi)(B) is as follows. The boom shall be assembled by lowering boom sections sequentially into place using an assist crane. The A/D director's plan shall keep the boom sections stable while they are lowered into place by attaching the assist crane hoist line above the center of gravity of each section. However, in assembling the non-symmetrical top section of the boom, the A/D director is not able to determine where to attach the assist crane hoist line so that it is above the center of gravity. In this situation, before raising the section, all personnel shall be kept clear of the section and the section shall be first raised a few inches to determine whether it tips when raised. If the section did tip, it would indicate it is not rigged over the center of gravity. If this occurs, the hoist line shall be repositioned and the procedure repeated, with employees kept clear of the section while it is raised, until the A/D director determines that it is rigged over the center of gravity and can be moved into place without dangerous movement.

## APPENDIX C

### Operator Certification: Written Examination: Technical Knowledge Criteria

This appendix contains information for employers, accredited testing organizations, and auditors developing criteria for a written examination to test an individual's technical knowledge relating to the operation of cranes.

- (1) General technical information.
  - (a) The functions and limitations of the crane and attachments.
  - (b) Wire rope:
    - (i) Background information necessary to understand the inspection and removal from service criteria in R 408.41013a and R 408.41014a.
    - (ii) Capacity and when multi-part rope is needed.
    - (iii) Relationship between line pull and safe working load.
    - (iv) How to determine the manufacturer's recommended rope for the crane.
  - (c) Rigging devices and their use, such as all of the following:
    - (i) Slings.
    - (ii) Spreaders.
    - (iii) Lifting beams.
    - (iv) Wire rope fittings, such as clips, shackles and wedge sockets.
    - (v) Saddles or softeners.
    - (vi) Clamps.
  - (d) The technical limitations of protective measures against electrical hazards:
    - (i) Grounding.
    - (ii) Proximity warning devices.
    - (iii) Insulated links.
    - (iv) Boom cages.
    - (v) Proximity to electric power lines, radii, and microwave structures.
  - (e) The effects of load share and load transfer in multi-crane lifts.
  - (f) Basic crane terms.
  - (g) The basics of machine power flow systems.
    - (i) Mechanical.
    - (ii) Electrical.
    - (iii) Pneumatic.
    - (iv) Hydraulic.
    - (v) Combination.
  - (h) The significance of the instruments and gauge readings.
    - (i) The effects of thermal expansion and contraction in hydraulic cylinders.
  - (j) Background information necessary to understand the requirements of pre-operation and inspection.
  - (k) How to use the safety devices and operational aids required under R 408.41018a and R 408.41019a.
  - (l) The difference between duty-cycle and lifting operations.
  - (m) How to calculate net capacity for every possible configuration of the equipment using the manufacturer's load chart.
  - (n) How to use manufacturer-approved attachments and their effect on the equipment.
  - (o) How to obtain dimensions, weight, and center of gravity of the load.




- (p) The effects of dynamic loading from all of the following:
  - (i) Wind.
  - (ii) Stopping and starting.
  - (iii) Impact loading.
  - (iv) Moving with the load.
  - (q) The effect of side loading.
  - (r) The principles of backward stability.
- (2) Site information.
  - (a) How to identify the suitability of the supporting ground or surface to support the expected loads of the operation. Elements shall include both of the following:
    - (i) Weaknesses below the surface, such as voids, tanks, and loose fill.
    - (ii) Weaknesses on the surface, such as retaining walls, slopes, excavations, and depressions.
  - (b) Proper use of mats, blocking or cribbing, outriggers, stabilizers, or crawlers.
  - (c) Identification of site hazards such as power lines, piping, and traffic.
  - (d) How to review operation plans with supervisors and other workers, such as the signal person, including how to determine working height, boom length, load radius, and travel clearance.
  - (e) How to determine if there is adequate room for extension of crawlers, outriggers or stabilizers, and counterweights.
- (3) Operations.
  - (a) How to pick, carry, swing and place the load smoothly and safely on rubber tires and on outriggers, stabilizers or crawlers, where applicable.
  - (b) How to communicate at the site with supervisors, the crew, and the signal person.
  - (c) Proper procedures and methods of reeving wire ropes and methods of reeving multiple-part lines and selecting the proper load block, ball, or both.
  - (d) How to react to changes in conditions that affect the safe operation of the equipment.
  - (e) How to shut down and secure the equipment properly when leaving it unattended.
  - (f) Know how to apply the manufacturer's specifications for operating in various weather conditions, and understand how environmental conditions affect the safe operation of the equipment.
  - (g) How to properly level the equipment.
  - (h) How to verify the weight of the load and rigging prior to initiating the lift.
  - (i) How to determine where the load is to be picked up and placed and how to verify the radii.
  - (j) Know basic rigging procedures.
  - (k) How to carry out the shift inspection required in this subpart.
  - (l) Know that the following operations require specific procedures and skill levels:
    - (i) Multi-crane lifts.
    - (ii) Hoisting personnel.
    - (iii) Clamshell or dragline operations.
    - (iv) Pile driving and extracting.
    - (v) Concrete operations, including poured in-place and tilt-up.
    - (vi) Demolition operations.
    - (vii) Operations on water.
    - (viii) Magnet operations.

- (ix) Multi-drum operations.
- (m) Know the proper procedures for operating safely under all of the following conditions:
  - (i) Traveling with suspended loads.
  - (ii) Approaching a two-block condition.
  - (iii) Operating near power lines.
  - (iv) Hoisting personnel.
  - (v) Using other than full outrigger, crawler, or stabilizer extensions.
  - (vi) Lifting loads from beneath the surface of the water.
  - (vii) Using various approved counterweight configurations.
  - (viii) Handling loads out of the operator's vision, "operating in the blind."
  - (ix) Using electronic communication systems for signal communication.
- (n) Know the proper procedures for load control and the use of hand-held tag lines.
- (o) Know the emergency response procedure for the following circumstances:
  - (i) Fires.
  - (ii) Power line contact.
  - (iii) Loss of stability.
  - (iv) Control malfunction.
  - (v) Two-blocking.
  - (vi) Overload.
  - (vii) Carrier or travel malfunction.
- (p) Know how to properly use outriggers and stabilizers in accordance with manufacturer specifications.
- (4) Use of load charts.
  - (a) Know the terminology necessary to use load charts.
  - (b) Know how to ensure that the load chart is the appropriate chart for the equipment in its particular configuration and application.
  - (c) Know how to use load charts, which includes knowing all of the following:
    - (i) The operational limitations of load charts and footnotes.
    - (ii) How to relate the chart to the configuration of the crane, crawlers, outriggers or stabilizers when extended or retracted, jib erected or offset, and various counterweight configurations.
    - (iii) The difference between structural capacity and capacity limited by stability.
    - (iv) What is included in capacity ratings.
    - (v) The range diagram and its relationship to the load chart.
    - (vi) The work area chart and its relationship to the load chart.
    - (vii) Where to find and how to use the "parts-of-line" information.
  - (d) Know how to use the load chart together with the load indicators, load moment devices, or both.



## APPENDIX D

### Clarification of utility owner/operator obligation to provide voltage information.


 **UNITED STATES DEPARTMENT OF LABOR**

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[Standard Interpretations - Table of Contents](#)

• **Standard Number:** [1926.1407](#); [1926.1407\(e\)](#); [1926.1408](#)

**OSHA requirements are set by statute, standards and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at <http://www.osha.gov>.**

October 13, 2011

Charles Kelly, Director  
Industry Human Resource Issues  
Edison Electric Institute  
701 Pennsylvania Avenue, N.W.  
Washington, D.C. 20004

Dear Mr. Kelly:

On October 6, 2010, Edison Electric Institute (EEI) filed a Petition of Review in *EEI vs. the Occupational Safety and Health Administration and Secretary of Labor (OSHA), No. 10-1311 (D.C. Circuit)* challenging various aspects of OSHA's final rule, *Cranes and Derricks in Construction (Subpart CC)*. EEI and OSHA entered a settlement agreement, dated August 22, 2011, in which OSHA agreed to clarify the two Subpart CC requirements below in a letter of interpretation. This letter fulfills that obligation.

(1) 29 CFR §1926.1407(e) states:

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

Thus, §1926.1407(e) allows a utility owner/operator two working days to provide the requested information. For the purposes of this provision, working days include all calendar days except weekends and holidays. See [75 Fed. Reg. 47951](#) (Aug. 9, 2010). For example, if an electric utility receives a request for voltage information on one of its distribution lines on a Friday, it will have until the end of the business day on the following Tuesday to provide the necessary information (assuming there are no holidays in between).

(2) The provisions of §1926.1408 (*Power Line Safety*) allow deenergization as one option for employee protection from electrical hazards of power lines. Employers choosing this option must not proceed with this option if the electric utility does not de-energize the power line, but Subpart CC does not require utility companies to deenergize power lines.

Sincerely,

James G. Maddux, Director  
Directorate of Construction

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