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4123:1-5-04 Mechanical power transmission apparatus.

(A) Scope.

This rule applies to mechanical power transmission apparatus and facilities to transmit power to operating equipment or machine tools. This rule shall not be construed as being applicable to power transmission facilities located within the frame or the equipment and exposure is necessary to its operation or adjustment.

(B) Reserved.

(C) Belts and pulleys.

(1) Horizontal belts (not including conveyors or conveyor belts).

Horizontal belts and pulleys seven feet or less above floor or platform shall be guarded as follows:

- (a) Where both runs of horizontal belts are seven feet or less from floor level, the guard shall extend to at least fifteen inches above the belt or to a standard height, except that where both runs of a horizontal belt are forty-two inches or less from the floor, the belt shall be fully enclosed in accordance with rule 4123:1-5-99 of the Administrative Code. Note: In power or power development plants a standard guard railing may be used in lieu of this requirement.
- (b) If lower part of belt is seven feet or less above platform or floor level and upper part of belt more than seven feet above platform or floor level, the lower part of belt and pulley shall be guarded on bottom, sides, and ends, to a height of seven feet above floor or platform level. Guarding shall be in accordance with rule 4123:1-5-99 of the Administrative Code.
- (c) Horizontal overhead belts more than seven feet above floor or platform shall be guarded for their entire length under the following conditions:
 - (i) If located over passageways or work places and traveling eighteen hundred feet or more per minute;
 - (ii) If center to center distance between pulleys is ten feet or more;
 - (iii) If belt is eight inches or more in width.
- (d) Where passageway is provided between upper and lower parts of belts, the passageway shall be guarded on sides, top and bottom.

(2) Vertical and inclined belts (not including conveyors or conveyor belts).

Vertical and inclined belts and their pulleys seven feet or less above floor or platform level shall be guarded in accordance with rule 4123:1-5-99 of the Administrative Code.

(3) Vee belts.

Vee belts and their pulleys, where exposed to contact, shall be guarded.

(4) Rope drives.

Rope drives and their pulleys, where exposed to contact, shall be guarded.

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(D) Gears, sprockets, link belts, and friction drives.

(1) Set or train of gears.

(a) A set or train of gears is two or more power-driven gears that move and intermesh. This does not apply to adjusting gears which do not normally revolve and are not power operated, or to adjusting gears which require access to the gears for manual manipulation.

(b) Guarding.

All or any part of a set or train of gears seven feet or less above floor or platform level shall be completely guarded or have a band guard around the face of the gear with the side flanges extending inward beyond the root of the teeth. Where there are openings of more than two and one-half inches between arm or through web, the entire gear shall be guarded. Guarding shall be in accordance with rule 4123:1-5-99 of the Administrative Code and shall be securely fastened in place.

(2) Frictional disc, link belt, and sprocket drives.

Frictional disc, link belt, and sprocket drives shall be guarded.

(E) Shafts, collars couplings, and flywheels.

(1) Guarding of horizontal shafting.

(a) All exposed parts of horizontal shafting seven feet or less from floor or working platform, excepting runways used exclusively for oiling or running adjustments, shall be protected by a stationary casing enclosing shafting completely or by a trough enclosing sides and top or sides and bottom of shafting as location requires.

(b) Shafting under bench machines shall be enclosed by a stationary casing, or by a trough at sides and top or sides and bottom as location requires. The sides of the trough shall come within at least six inches of the underside of table, or if shafting is located near the floor, within six inches of the floor. In every case the sides of the trough shall extend at least two inches beyond the shafting or protuberance.

(2) Guarding vertical and inclined shafting.

Vertical and inclined shafting seven feet or less from floor or work platform, excepting maintenance runways, shall be guarded in accordance with rule 4123:1-5-99 of the Administrative Code.

(3) Projecting shaft ends.

(a) Projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by nonrotating caps or safety sleeves.

(b) Unused keyways shall be filled up or covered.

(4) Set screws, keys, and other projections.

Set screws, keys, and other projections, protruding beyond the surface of revolving parts shall be guarded.

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(5) Collars and couplings.

(a) Collars.

All revolving collars, including split collars, shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.

(b) Couplings.

Shaft couplings shall be so constructed as to present no hazard from bolts, nuts, setscrews will, however, be permitted where they are covered with safety sleeves or where they are used parallel with the shafting and are countersunk or else do not extend beyond the flange of the coupling.

(6) Universal joints.

Universal joints shall be guarded.

(7) Revolving face plates and chucks.

Revolving face plates and chucks shall be cylindrical with no projecting parts on the rim unless such projecting parts are guarded. This does not apply to those face plates and chucks revolving less than five revolutions per minute.

(8) Flywheels.

Flywheels located so that any part is seven feet or less above floor or platform shall be guarded in accordance with the requirements of paragraphs (E)(8)(a) to (E)(8)(d)(i)(c) of this rule:

(a) With an enclosure of sheet, perforated, or expanded metal, or woven wire;

(b) With standard guard railings placed not less than fifteen inches nor more than twenty inches from rim. When flywheel extend into a pit or is within twelve inches of the floor, a standard toeboard shall also be provided.

(c) When the upper rim of a flywheel protrudes through a working floor, it shall be entirely enclosed or surrounded by a standard guard railing and toeboard.

(d) Alternate methods.

(i) For flywheels with smooth rims five feet or less in diameter, where the preceding methods cannot be applied, the following may be used:

(a) A disc attached to the flywheel in such manner as to cover the spokes of the wheel on the exposed side and present a smooth surface and edge, at the same time providing means for periodic inspection;

(b) An open space, not exceeding four inches in width, may be left between the outside edge of the disc and the rim of the wheel if desired, to facilitate turning the wheel over;

(c) Where a disc is used, the keys or other dangerous projections not covered by disc shall be cut off or covered.

(ii) Paragraph (E)(8) of this rule does not apply to flywheels with solid web centers.

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4123:1-5-06 Portable explosive-actuated fastening tools.

(A) Reserved.

(B) Reserved.

(C) Design requirements.

(1) High-velocity tools.

Tools of the high-velocity type shall have the following characteristics:

- (a) The muzzle end of the tool shall have a protective shield or guard at least three and one-half inches in diameter, mounted perpendicular to and concentric with the barrel, and designed to confine any flying fragments or particles that might otherwise create a hazard at the time of firing.
- (b) Where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, a special shield, guard, fixture, or jig, designed and built by the manufacturer of the tool being used, which provides this degree of protection, shall be used as a substitute.
- (c) The tool shall be so designed that it cannot be fired unless it is equipped with a standard protective guard or shield, or a special shield, guard, fixture or jig.
- (d) Firing the tool.
 - (i) The firing mechanism shall be so designed that the tool cannot fire during loading or preparation to fire, or if the tool should be dropped while loaded.
 - (ii) The firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.
- (e) The tool shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least five pounds greater than the total weight of the tool.
- (f) The tool shall be so designed that it will not operate when equipped with the standard guard indexed to the center position if any bearing surface of the guard is tilted more than eight degrees from contact with the work surface.
- (g) The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.
- (h) The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

(2) Low-velocity - piston-type tools.

Tools of the low-velocity piston type shall have the following characteristics:

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- (a) The muzzle end of the tool shall be designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spall shield, when supplied, shall be utilized with each tool.
- (b) Firing the tool.
 - (i) The tool shall be designed so that it shall not in ordinary usage propel or discharge a stud, pin, or fastener, while loading or during preparation to fire, or if the tool should be dropped while loaded.
 - (ii) Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.
- (c) The tool shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least five pounds greater than the total weight of the tool.
- (d) The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.
- (e) The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

(D) Minimum instructions for qualifying operators.

Instructions to operators in order to teach them the use of portable explosive-actuated fastening tools shall include, but shall not be limited to, the following items:

- (1) Before using a tool, the operator shall inspect it to determine to his satisfaction that it is clean, that all moving parts operate freely, and that the barrel is free from obstruction.
- (2) When a tool develops a defect during use, the operator shall immediately cease to use it, until it is properly repaired.
- (3) Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employee, and hands should be kept clear of the open barrel end.
- (4) No tools shall be loaded unless being prepared for immediate use, nor shall an unattended tool be left loaded.
- (5) In case of a misfire, the operator shall hold the tool in the operating position for at least thirty seconds. He shall then try to operate the tool a second time. He shall wait another thirty seconds, holding the tool in the operating position; then he shall proceed to remove the explosive load in strict accordance with the manufacturer's instructions. Misfired cartridges should be placed carefully in a metal container filled with water, and returned to the supervisor for disposal.
- (6) The tool shall never be left unattended in a place where it would be available to unauthorized persons.
- (7) Fasteners shall not be driven into very hard or brittle materials, including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, living rock, face brick, or hollow tile.

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- (8) Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
- (9) Driving distance from edge
 - (a) Fasteners shall not be driven directly into materials such as brick or concrete closer than three inches from the unsupported edge or corner, or into steel surfaces closer than one-half inch from the unsupported edge or corner, unless a special guard, fixture, or jig, is used.
 - (b) Exception: Low-velocity tools may drive no closer than two inches from an edge in concrete or one-fourth inch in steel.
 - (c) When fastening other materials, such as a two- by four-inch wood section, to a concrete surface, it is permissible to drive a fastener of no greater than seven-thirty-seconds-inch shank diameter not closer than two inches from the unsupported edge or corner of the work surface.
- (10) Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.
- (11) No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.
- (12) Tools shall not be used in an explosive or flammable atmosphere.
- (13) All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.
- (14) Any tool found not in proper working order shall be immediately removed from service. The tool shall be inspected at regular intervals and shall be repaired in accordance with the manufacturer's specifications.

(E) Strength of charge - identification.

All explosive charges (cartridges and shells) to be used in portable explosive-actuated tools shall be marked by color, in accordance with table 4123:1-5-06(E) to this rule, "Identification of Cased Loads," to designate the strength of the charge.

Table 4123:1-5-06(E)

IDENTIFICATION OF CASED LOADS

	Color Identification		
Power Level	Case Color	Load Color	Nominal Velocity (= 45 f.p.s.)
1	Brass	Gray	300
2	Brass	Brown	390
3	Brass	Green	480
4	Brass	Yellow	570
5	Brass	Red	660

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6	Brass	Purple	750
7	Nickel	Gray	840
8	Nickel	Brown	930
9	Nickel	Green	1020
10	Nickel	Yellow	1110
11	Nickel	Red	1200
12	Nickel	Purple	1290

Note: The nominal velocity applies to 3/8-inch diameter 350-grain ballistic slug fired in a test device and has no reference to actual fastener velocity developed in any specific size or type of tool.

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4123:1-5-11 Forging machines, other power machines and machine tools, hydraulic and pneumatic presses, and power press brakes.

(A) Reserved.

(B) Reserved.

(C) Forging machines.

(1) Hammers and presses.

(a) The ram shall be blocked when dies are being changed or other work is being done on the hammer. Blocks or wedges shall be made of material, the strength and construction of which shall meet or exceed the specifications and dimensions shown in table 4123:1-5-11(C) to this rule.

(b) Tongs shall be of sufficient length to enable the employee to keep himself in the clear in case of kickback and the tongs shall not have sharp handle ends.

(c) Oil swabs, or scale removers, or other devices to remove scale, shall be provided. These devices shall be long enough to enable an employee to reach the full length of the die without placing hands or arms between the dies.

(2) Power-driven hammers.

(a) Safety cylinder head.

Every steam or airhammer shall have a safety cylinder head to act as a cushion if the rod should break or pull out of the ram.

(b) Stop valve - shutoff valve.

Steam hammers shall be provided with a quick closing emergency valve in the admission pipe line at a convenient location. This valve shall be closed and locked in the off position while the hammer is being adjusted, repaired, or serviced, or when the dies are being changed.

(c) Cylinder draining.

The steam hammer cylinder shall be constructed with a self-draining arrangement, or a quick-acting type drain cock shall be provided, which should be piped to a sump or drain pipe. If it discharges into the air, it shall be located so as not to endanger employees.

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Table 4121:1-5-11(C)

STRENGTH AND DIMENSIONS FOR WOOD RAM PROPS

Size of timber inches ¹	Sq. in. in cross section	Minimum allowable crushing strength parallel to grain p.s.i. ²	Maximum static load within short column range ³	Safety Factor	Maximum recommended weight of forging hammer for timber used	Maximum allowable length of timber, inches
4 x 4	16	5,000	80,000	10	8,000	44
6 x 6	36	5,000	180,000	10	18,000	66
8 x 8	64	5,000	320,000	10	32,000	88
10 x 10	100	5,000	500,000	10	50,000	100
12 x 12	144	5,000	720,000	10	72,000	132

¹Actual dimension.

²Adapted from US Department of Agriculture Technical Bulletin 478. Hardwoods recommended are those whose ultimate crushing strengths in compression parallel to grain are 5,000 p.s.i. (pounds per square inch) or greater.

³Slenderness ratio formula for short columns is $L/d = 11$, where L = length of timber in inches and d = least dimension in inches; this ratio should not exceed 11.

(3) Air-lift hammers.

Air-lift hammers shall be provided with two drain cocks; one on main head cylinder, and one on clamp cylinder.

(4) Board-type drophammers.

(a) Guarding.

A suitable enclosure shall be provided to prevent damaged or detached boards from falling. The board enclosure shall be securely fastened to the hammer.

(b) Releasing lever.

Means shall be provided to prevent releasing lever from falling in case the front rod or releasing lever breaks.

(c) Front rod (friction rod).

Means shall be provided to prevent the front rod (friction rod) from falling in case it breaks.

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(d) Protection over workplace.

A screen or other guard shall be installed over the workplace of hammer operator at the normal operating position.

(e) Board clamp rod.

Means shall be provided to prevent the board clamp rod from falling in case it breaks.

(5) Forging presses.

The employer shall provide and require the use of safety blocks for use whenever dies are being adjusted or repaired in all forging presses.

(6) Mechanically-operated hammers.

(a) Where only one hand is used for holding materials.

On mechanically-operated hammers where only one hand is used for holding the material, a safety stop, dog, or catch shall be provided which shall prevent the hammer from coming down until such device has been released and held out of the way by the other hand; or a hand lever instead of the foot treadle shall be provided for tripping the hammer.

(b) Where neither hand is used for holding material.

On hammers where neither hand is used for holding the material:

(i) A safety stop or tripping lever shall be provided which will require the use of both hands to trip the hammer; or

(ii) A pull guard shall be provided.

(D) Other power machines and machine tools.

(1) Upsetting machines.

Tension and safety springs shall be covered to prevent the bolt or nut from being thrown out in case of breakage.

(2) Bulldozers.

A guard shall be provided which will prevent employees from stepping between the dies.

(3) Power shears

(a) Alligator shears.

(i) Alligator shears facing an aisle or passageway shall be located a minimum of four feet therefrom, unless guarded.

(ii) A guard shall be installed which shall prevent a kickup. This requirement shall not apply to alligator shears which operate automatically or by remote control on production lines.

(b) Squaring shears.

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Squaring shears, where material is fed or removed by hand, shall have the blade guarded at feed and discharge sides of the shear.

(4) Hollow spindle lathes, cutting-off machines, etc.

On hollow spindle lathes, cutting-off machines or any machine used on bar stock, pipe tubing, etc., where the material is revolved by power, substantial troughs or guards shall be provided which will prevent the operator or other employees from coming in contact with the projecting unused portion of the revolving material.

(5) Machines with reciprocating tables.

Machines with reciprocating tables shall have the openings guarded; guards shall also be provided at each end and the sides of the table if the clearance of the table, which includes the work being machined and its chuck does not exceed twenty-four inches.

(6) Die casting machines.

Danger zones on die casting machines shall be guarded.

(7) Hopper fed machinery.

(a) All hopper fed machinery, such as rotaries, die machines, and extruders, shall have the entire opening protected with substantial grid type guards to prevent access of the employee's hands into the danger zone, or the hopper shall be extended high enough to prevent entry into moving parts. The guards shall be permanently attached to the hopper. If the hopper is removable, it shall be provided with an interlock device so that the machine cannot operate when the hopper is removed.

(b) Exception.

Machinery covered expressly by requirements contained in other codes of specific requirements of the Ohio bureau of workers' compensation.

(8) Guillotine cutters.

(a) All power guillotine cutters where the blade is exposed to contact shall be equipped with a two-hand control device.

(b) Exception.

Machinery covered expressly by requirements contained in other codes of specific requirements of the Ohio bureau of workers' compensation.

(9) Tumblers.

Power driven tumblers, rattlers, drums, barrels, containers, or similar machines that rotate, spin, or rock shall be guarded on an area or individual basis. The guard shall be interlocked with the drive mechanism so that the machine cannot operate unless the guard or enclosure is in place.

(10) Nip points.

(a) Means shall be provided to protect employees exposed to contact with nip points created by power

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driven in-running rolls, rollover platen, or other flat surface material being wound over roll surface.

(b) Exception.

Machinery covered expressly by requirements contained in other codes of specific requirements of the Ohio bureau of workers' compensation.

(11) Food mixers.

All power driven food mixers shall be equipped with a two-hand control device to keep agitator in motion under power when bowl is opened more than one-fifth of its total opening.

(12) Fastening machines.

All power driven fixed fastening machinery, such as riveting machines, wire stitchers, staplers, sewing machines, and similar fastening machinery shall be guarded.

(13) Knives.

(a) All power driven knives or cutting blades, such as reciprocating knives, endless band knives, flying knives, slicer blades, and similar cutting machines, where exposed to contact, shall be guarded except for the necessary working portion of the blade while being used.

(b) Exception.

Machinery covered expressly by requirements contained in other codes of specific requirements of the Ohio bureau of workers' compensation.

(E) Hydraulic or pneumatic presses.

Every hydraulic or pneumatic (air-powered) press shall be constructed, or shall be guarded, to prevent the hands or fingers of the operator from entering the danger zone during the operating cycle. Acceptable methods of guarding are:

- (1) "Fixed barrier guard" - an enclosure to prevent hands or fingers from entering the danger zone;
- (2) "Gate guard" - a movable gate operated with a tripping device to interpose a barrier between the operator and the danger zone and to remain closed until the down stroke has been completed;
- (3) "Two-hand control" - an actuating device which requires the simultaneous use of both hands outside the danger zone during the entire closing cycle of the press;
- (4) Pull guard - attached to hands or wrists and activated by closing of press so that movement of the ram will pull the operator's hands from the danger zone during the operating cycle;
- (5) Restraint or hold-back guard - with attachments to the hands or wrists of the operator to prevent hands or fingers entering the danger zone during the operating cycle;
- (6) Other practices, means or methods which will provide safeguards, preventing the hands or fingers of the operator from entering the danger zone during the operating cycle and which are equivalent in result to one of the types specified above.

(F) Power press brake (when used as a power press).

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The requirements of rule 4123:1-5-10 of the Administrative Code shall be applicable to power press brakes when used for other than bending.

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4123:1-5-14 Power-driven cranes and hoists.

(A) Reserved.

(B) Reserved

(C) Overhead electric traveling cranes.

The term "overhead electric traveling crane" shall mean a crane consisting of a bridge mounted on trucks which runs on rails and the hoisting mechanism mounted on a trolley which moves transversely across the bridge, and may be controlled from a cab or from remote or pendant controls.

(1) Equipment.

(a) Brakes.

Holding brakes for hoist motors shall have not less than the following percentage of the full load hoisting torque at the point where the brake is applied.

One hundred twenty-five per cent when used with a control braking means other than mechanical.

One hundred per cent when used in conjunction with a mechanical control braking means.

One hundred per cent each if two holding brakes are provided.

(b) Footwalk.

A footwalk with standard guard railing and toeboards shall be placed along the cab access side of the bridge.

(c) Rail stops.

Rail stops shall be provided at both ends of crane runway and at ends of trolley travel.

(d) Bumpers.

A crane shall be provided with bumpers or other automatic means providing equivalent effect, unless the crane travels at a slow rate of speed and has a faster deceleration rate due to the use of sleeve bearings, or is not operated near the ends of bridge and trolley travel, or is restricted to a limited distance by the nature of the crane operation and there is no hazard of striking any object in this limited distance, or is used in similar operating conditions.

The bumpers shall be capable of stopping the crane (not including the lifted load) at an average rate of deceleration not to exceed three ft/s/s when traveling in either direction at twenty percent of the rated load speed.

A trolley shall be provided with bumpers or other automatic means of equivalent effect, unless the trolley travels at a slow rate of speed, or is not operated near the ends of bridge and trolley travel, or is restricted to a limited distance of the runway and there is no hazard of striking any object in this limited distance, or is used in similar operating conditions.

The bumpers shall be capable of stopping the trolley (not including the lifted load) at an average rate of deceleration not to exceed 4.7 ft/s/s when traveling in either direction at one-third of the rated

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load speed.

(e) Warning device.

On cab-operated cranes, a warning device or signal shall be provided for use in warning personnel of crane travel.

(2) Cabs.

(a) Enclosed cabs.

Enclosed crane cabs shall be provided with windows in front and on both sides.

(b) Open cabs.

Open cabs shall be provided with standard guard railing, and toeboard, and gate. If the opening height is inadequate for a standard guard railing, a chain or angle iron shall be used to guard the opening.

(c) Means of escape.

Means of escape shall be provided for operators of overhead cranes.

(d) Cabs subjected to excessive heat.

Cabs of cranes subjected to excessive heat from below shall have floors insulated with a noncombustible material.

(e) Guarding of current-carrying parts.

All current-carrying parts in crane cabs shall be guarded.

(3) Limiting devices.

A hoist limiting device shall be provided for each hoist to limit the upward travel.

(D) Electric jib cranes.

(1) The term "electric jib crane" shall mean a crane designed for lifting or lowering a load within the scope of a horizontal circle spanned by a rotating arm or jib equipped with a stationary or traveling hoist block.

(2) Equipment.

(a) Holding brake.

Holding brakes for hoist motors shall have not less than the following percentage of the full load hoisting torque at the point where the brake is applied.

(i) One hundred twenty-five per cent when used with a control braking means other than mechanical.

(ii) One hundred per cent when used in conjunction with a mechanical control braking means.

(iii) One hundred per cent each if two holding brakes are provided.

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Holding brakes on hoists shall be applied automatically when power is removed.

(b) Rail stops.

Rail stops shall be provided at the outer end of jib boom.

(c) Hoist limiting device.

A hoist limiting device shall be provided for each hoist.

(E) Electric single rail cranes and hoists.

(1) The term "electric single rail crane and hoist" shall mean a hoist with or without an operator's cab, suspended from a single overhead track or rail.

(2) Equipment.

(a) Trolley stop.

A stop shall be provided at all switches and turntables which will prevent the trolley from running off should the rail switch be turned to "open" or left in an open position.

(b) Rail stops.

Rail stops shall be provided at the ends of crane runway.

(c) Hoist limiting device.

A hoist limiting device shall be provided for each hoist.

(d) Braking system - all power-driven hoists.

Holding brakes for hoist motors shall have not less than the following percentage of the full load hoisting torque at the point where the brake is applied.

- (i) One hundred twenty-five per cent when used with a control braking means other than mechanical.
- (ii) One hundred twenty-five per cent when used with a control braking means other than mechanical.
- (iii) One hundred per cent when used in conjunction with a mechanical control braking means.
- (iv) One hundred percent each if two holding brakes are provided.

Holding brakes on hoists shall be applied automatically when power is removed.

(F) Electric gantry cranes.

(1) The term "electric gantry crane" shall mean a crane with the bridge mounted on structural legs which may be mobile on rails or stationary. One leg may be at ground level, the other may be elevated or both legs may be at ground level.

(2) Equipment.

(a) Bridge track wheels.

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All bridge track wheels shall be equipped with sweeps.

(b) Bumpers, stops, and rail stops.

- (i) A crane shall be provided with bumpers or other automatic means providing equivalent effect, unless the crane travels at a slow rate of speed and has a faster deceleration rate due to the use of sleeve bearings, or is not operated near the ends of bridge and trolley travel, or is restricted to a limited distance by the nature of the crane operation and there is no hazard of striking any object in this limited distance, or is used in similar operating conditions

The bumpers shall be capable of stopping the crane (not including the lifted load) at an average rate of deceleration not to exceed three ft/s/s when traveling in either direction at twenty per cent of the rated load speed.

A trolley shall be provided with bumpers or other automatic means of equivalent effect, unless the trolley travels at a slow rate of speed, or is not operated near the ends of bridge and trolley travel, or is restricted to a limited distance of the runway and there is no hazard of striking any object in this limited distance, or is used in similar operating conditions.

The bumpers shall be capable of stopping the trolley (not including the lifted load) at an average rate of deceleration not to exceed 4.7 ft/s/s when traveling in either direction at one-third of the rated load speed.

- (ii) Rail stops shall be installed on both ends of trolley travel.

(c) Anchor or rail blocking device.

An anchor or rail blocking device shall be installed on all gantry cranes which are exposed to external weather.

(d) Hoist limiting device.

A hoist limiting device shall be installed on each hoist.

(G) Specific requirements applicable to all paragraphs of this rule.

(1) Defective safety devices or load-carrying equipment.

Defective crane safety devices or load-carrying equipment shall be repaired or replaced.

(2) Access ladders, stairways, and/or walkways.

Crane access ladders, stairways, and/or walkways shall be provided on all cranes.

(3) Maximum capacity.

The maximum capacity recommended by the manufacturer shall be posted on each crane.

(4) Warning signs.

Warning signs, "out-of-order" signs, or warning devices shall be placed on each crane under repair.

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4123:1-5-16 Cutting and welding.

(A) Reserved.

(B) Reserved.

(C) Responsibility.

(1) The employer shall verbally and through demonstration instruct the employee in the safe operation and maintenance of cutting and welding equipment.

(2) It shall be the duty of the employee to operate such equipment in accordance with such instructions.

(D) Maximum pressure.

Under no condition shall acetylene be generated, piped (except in approved cylinder manifolds), or utilized at a pressure in excess of fifteen pounds per square inch gauge pressure.

(E) Gas welding and cutting.

(1) Equipment.

Only approved equipment, such as torches, regulators, or pressure-reducing valves, acetylene generators, manifolds, cylinders, and containers shall be used.

(2) Cylinders and containers.

(a) Marking.

Compressed gas cylinders shall be legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling and shall not be readily removed.

(b) Storage.

(i) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of twenty feet or by a noncombustible barrier at least five feet high, having a fire resistance rating of at least one-half hour.

(ii) Cylinders, when not in use, shall be protected from any heat-radiating objects or open flame which could cause the cylinders to rupture or could cause the fusible plug to melt.

(c) Valve protection caps.

(i) All cylinders with a water weight capacity of over thirty pounds shall be equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve.

(ii) Employees shall be responsible for using valve protection caps when cylinders are moved from place to place or put in storage.

(iii) Where carriers are provided for moving cylinders which are connected for use, capping shall not be required but employees shall be responsible for seeing that cylinder valves are closed and pressure is released from regulators, hoses and torches.

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(d) Regulator protection.

Welders and cutters shall be instructed to close valves on oxygen and acetylene cylinders and bleed off hose pressure at the end of each workshift, to prevent malfunction of the regulators.

(e) Transporting cylinders by crane or derrick.

When cylinders are hoisted, they shall be secured on a cradle, slingboard, or pallet. They shall not be hoisted or transported by means of magnets or choker slings.

(f) Facilities for securely fastening cylinders; responsibility.

The employer shall provide facilities for securely fastening cylinders of compressed gas in an upright position.

(3) Hose and hose connections.

(a) Hose.

(i) Identification.

The color red shall be used for acetylene and other fuel gas hose. The color green shall be used for oxygen hose. The color black shall be used for inert gas and air hose.

(ii) Hose in which flashback has occurred.

Any length of hose in which a flashback has occurred and burned in the hose shall be taken out of service. Flash-back protection shall be provided by an approved device that will prevent flame from passing into the fuel-gas system.

(iii) Single hose with more than one gas passage.

The use of a single hose having more than one gas passage, in which a wall failure would permit the flow of one gas into the other gas passage, shall not be permitted.

(iv) Hoses taped together - limitation.

When parallel lengths of oxygen and acetylene hoses are taped together for convenience and to prevent tangling, not more than four inches out of twelve inches shall be covered by tape.

(v) Damaged or defective hose.

Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall have the damaged portion removed, repaired or replaced.

(b) Hose connections and couplings.

(i) Hose connections for oxygen and fuel gas shall be distinguished from each other. Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than three hundred pounds per square inch.

(ii) Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a

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straight pull without rotary motion.

(c) Pressure reducing regulators.

- (i) Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.
- (ii) Pressure-reducing regulators shall be used only for the gas and pressures for which they are intended.

(F) Electric welding.

(1) Approved equipment.

Only approved electric welding equipment shall be used.

(2) Design.

No connections for portable control devices such as push buttons to be carried by the operator shall be connected to an alternating current circuit of higher than one hundred twenty volts. Exposed metal parts of portable control devices operating on circuits above fifty volts shall be grounded by a grounding conductor in the control cable.

(3) Installation of arc welding equipment.

Installation, including power supply, shall be in accordance with the manufacturer's specifications.

(a) The frame or case of the welding machine (except engine-driven machines) shall be grounded under the conditions and according to the manufacturer's specifications.

(b) Supply.

- (i) All direct current machines shall be connected with the same polarity.
- (ii) All alternating current machines shall be connected to the same phase of the supply circuit and with the same instantaneous polarity.

(c) Switches.

Proper switching equipment for shutting down the machine shall be provided.

(4) Electrode holders.

(a) Insulation. Electrode holders shall be insulated to protect the operator against shock.

(b) When not in use.

Electrode holders when not in use shall be so placed that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks.

(c) Cables with splices.

Cables with splices within ten feet of the holder shall not be used.

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(5) Maintenance.

(a) Defective equipment.

The operator shall report any equipment or defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured. Repairs shall be made only by authorized qualified personnel.

(b) Cables.

Cables with damaged insulation or exposed bare conductors shall be replaced. Joining lengths of work and electrode cables shall be done by the use of connecting means specifically intended for the purpose. The connecting means shall have insulation adequate for the service conditions.

(6) Installation and operation of resistance welding equipment.

(a) Thermal protection.

Ignitron tubes used in resistance welding equipment shall be equipped with a thermal protection switch.

(b) Guarding.

Controls of all automatic or air and hydraulic clamps shall be arranged or guarded to prevent the operator from accidentally activating them.

(c) Spot and seam welding machines (nonportable).

(i) Voltage.

All external weld initiating control circuits shall operate on low voltage, not over one hundred twenty volts.

(ii) Capacitor welding.

Stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over five hundred fifty volts) shall be insulated and protected by complete enclosures, all doors of which shall be provided with interlocks and contacts wired into the control circuit (similar to elevator interlocks). Such interlocks or contacts shall be so designed as to interrupt power and short circuit all capacitors when the door or panel is open. A manually operated switch or positive device shall be installed, in addition to the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors.

(iii) Interlocks.

All doors and access panels of all resistance welding machines and control panels shall be kept locked and interlocked to prevent access by unauthorized employees, to live portions of the equipment.

(iv) Guarding.

All press welding machine operations, where there is a possibility of the operator's fingers being

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under the point of operation, shall be guarded by the use of a device such as an electronic eye safety circuit, two-hand controls or protection similar to that prescribed for power press operations (see rule 4123:1-5-10 of the Administrative Code).

(v) Disengaging from power supply.

Means shall be provided at each machine, within easy reach of the operator, for disengaging it from its power supply. This shall not apply to rolling departments of iron and steel mills nor to electrical power generation or conversion equipment.

(vi) Safety blocks or pins.

The employer shall provide and enforce the use of safety blocks or pins so that whenever safety blocks or pins are inserted in the platen or ram, the press becomes inoperative.

(vii) Grounding.

The secondary of all welding transformers used in multi-spot, projection, and seam welding machines shall be grounded. This may be done by permanently grounding one side of the welding secondary current circuit, or a center tapped grounding reactor connected across the secondary or the use of a safety disconnect switch in conjunction with the welding control are acceptable alternatives. Safety disconnect shall be arranged to open both sides of the line when welding current is not present.

(d) Portable welding machines.

(i) Counterbalance.

All portable welding guns shall have counterbalancing devices for supporting the gun unless the design of the gun makes counterbalancing unnecessary.

(ii) Safety chains.

All portable welding guns, transformers and related equipment that is suspended from overhead structures, I-beams, trolleys, etc., shall be equipped with safety chains or cables. Safety chains or cables shall be capable of supporting the total shock load in the event of failure of any component of the supporting system.

(iii) Clevis.

When trolleys are used to support portable welding equipment, with a forged steel clevis for the attachment of safety chains, each clevis shall be capable of supporting the total shock load of the suspended equipment in the event of trolley failure.

(iv) Switch guards.

All initiating switches located on the portable welding gun shall be equipped with guards capable of preventing accidental initiation through contact with fixturing, operator's clothing, etc. Initiating switch voltage shall not exceed twenty-four volts.

(v) Grounding.

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The secondary and the case of all portable welding transformers shall be grounded. Secondary grounding shall be by:

- (a) Center tapped secondary, or
 - (b) A center tapped grounding reactor connected across the secondary.
- (vi) Butt (flash) welding equipment.

Butt welding machines shall be equipped with a hood to control flying flash. In cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, ventilation shall be provided in accordance with rule 4123:1-5-18 of the Administrative Code.

(7) Welding or cutting of containers.

No welding, cutting, or work utilizing a torch shall be performed on used drums, barrels, tanks, or other containers until they have been cleaned and purged of materials which when subjected to heat might produce flammable or toxic vapors.

(8) Eye and ear protection.

See rule 4123:1-5-17 of the Administrative Code, "Personal protective equipment."

(G) Protection from sparks or falling objects.

- (1) Cutting or welding shall be permitted only in areas that are or have been made fire safe.
- (2) Screens or shields shall be provided for the protection of employees or combustible materials exposed to sparks or falling objects.

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4123:1-5-23 Electrical conductors and equipment.

- (A) Unless the electrical conductors or equipment to be worked on are isolated from all possible sources of voltage or are effectively grounded, the employer shall provide protective equipment approved for the voltage involved, such as rubber gloves with protectors, rubber sleeves, hot line tools, line hose, line guards, insulator hoods, blankets, and access boards. Employees shall be instructed in the use of such tools and equipment and, when working on or when working within contact distance of an energized conductor, shall use such tools and equipment.
- (B) Effective grounding devices shall be provided when work is performed on deenergized circuits or equipment. Employees shall be instructed in the use of such grounding devices.
- (C) Protective devices and equipment shall be stored in a clean, dry compartment or box that will protect such equipment from punctures, snags, or moisture.
- (D) Minimum clearance.
- Before an employee moves or operates power cranes, shovels, backhoes or any other type of material hoisting equipment within ten feet of an energized electrical conductor, the employer shall:
- (1) Assure that the conductor is deenergized and grounded, or
 - (2) Assure that the conductor is moved, or
 - (3) Assure that the conductor is guarded from accidental contact and an employee is designated to act as signalman to direct the operator in the movement of the equipment, or
 - (4) Assure that an insulated boom or an insulated type guard about the boom or arm of the equipment and a dielectric insulator link between the load and the block are installed and an employee is designated to act as signalman to direct the operator in the movement of the equipment.
- (E) Approach distances to exposed energized conductors and equipment.
- (1) The requirements of this paragraph apply only to the electric utility and clearance tree-trimming industries.
 - (2) No employee shall be required to approach or take any conductive object closer to any electrically energized power conductors and equipment than prescribed in table 4123:1-5-23(E) to this rule unless:
 - (a) The employee is insulated or guarded from the energized parts (insulating gloves rated for the voltage involved shall be considered adequate insulation); or
 - (b) The energized parts are insulated or guarded from the employee and any other conductive object at a different potential; or
 - (c) The power conductors and equipment are deenergized and grounded.
- (F) Approach distances to exposed energized conductors and equipment.
- (1) The requirements of this paragraph apply only to the telecommunications industry.
 - (2) No employee shall be required to approach or take any conductive object closer to any electrically

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energized power conductors and equipment than prescribed in table 4123:1-5-23(F) to this rule unless:

- (a) The employee is insulated or guarded from the energized parts (insulating gloves rated for the voltage involved shall be considered adequate insulation); or
- (b) The energized parts are insulated or guarded from the employee and any other conductive object at a different potential; or
- (c) The power conductors and equipment are deenergized and grounded.

Table 4123:1-5-23(E)

ALTERNATING CURRENT - MINIMUM DISTANCES	
Voltage Range (phase to phase) kilovolt	Minimum Working and Clear Hot Stick Clearance
2.1 to 15	2 ft. 0 in.
15.1 to 35	2 ft. 4 in.
35.1 to 46	2 ft. 6 in.
46.1 to 72.5	3 ft. 0 in.
72.6 to 121	3 ft. 4 in.
133 to 145	3 ft. 6 in.
161 to 169	3 ft. 8 in.
230 to 242	5 ft. 0 in.
345 to 362	*7 ft. 0 in.
500 to 552	*11 ft. 0 in.
700 to 765	*15 ft. 0 in.

*NOTE: For 345-362kv. 500-552kv. and 700-765kv. the minimum working distance and the minimum clear hot stick distance may be reduced provided that such distances are not less than the shortest distance between the energized part and a grounded surface.

Table 4123:1-5-23(F)

Approach Distances to Exposed Energized Overhead Power Lines and Parts	
Voltage range (phase to phase, RMS)	Approach distance (inches)
300 V and less	(1)
Over 300V, not over 750V	12
Over 750V not over 2kV	18
Over 2kV, not over 15kV	24
Over 15kV, not over 37kV	36
Over 37kV, not over 87.5kV	42
Over 87.5kV, not over 121kV	48
Over 121kV, not over 140kV	54

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¹ Avoid contact.

(G) The requirements of paragraph (E) of this rule shall not apply to employees in insulated vehicle-mounted elevating and rotating work platforms.

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4123:1-5-99 Table of standard materials and dimensions.

Where required by Chapter 4123:1-5 of the Administrative Code, the following table to this rule shall be used.

Table of standard materials and dimensions*

Material	Distance of opening from hazard zone	Maximum width of opening allowable	Minimum gauge (U.S. Standard) or thickness	M he gu fl pl
	Inches	Inches		
Woven wire	Under 4	*see table below	No. 16	
	4-15		No. 12	
Expanded metal	Under 4	* see table below	No.18	
			No. 13	
Perforated metal	Under 4	* see table below	No. 20	
	4-15		No.14	
Sheet metal	Under 4	* see table below	No. 22	
	4-15		No. 22	
Wood or metal strip not crossed	Under 4	* see table below	Wood ¾ Metal No. 16	
	4-15		Wood ¾ Metal No. 16	
Standard guard railing*	Minimum 15	-	-	
	Maximum 20			

Distance of opening from hazard zone (inches)	
0.5 to 1.5	0.25
Over 1.5 to 2.5	0.3725

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Over 2.5 to 3.5	0.5
Over 3.5 to 5.5	0.625
Over 5.5 to 6.5	0.75
Over 6.5 to 7.5	0.875
Over 7.5 to 12.5	1.25
Over 12.5 to 15.5	1.5
Over 15.5 to 17.5	1.875
Over 17.5 to 31.5	2.125