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4123:1-5-01 Scope and definitions.

(A) Scope.

The purpose of this chapter of the Administrative Code is to provide reasonable safety for life, limb, and health of employees. In cases of practical difficulty or unnecessary hardship, the Ohio bureau of workers' compensation may grant exceptions from the literal requirements of the rules of this chapter to permit the use of other devices or methods when, in the opinion of the bureau, the equivalent protection is thereby secured.

The specific requirements of this chapter are requirements upon an employer for the protection of such employer's employees and no others and apply to all workshops and factories subject to the Workers' Compensation Act (sections 4123.01 to 4123.99 of the Revised Code). Specific requirements of other chapters of the Administrative Code adopted by the Ohio bureau of workers' compensation shall apply to the particular industry covered by any such other chapter, and, to the extent of conflict between this chapter and such other chapter, the latter shall govern, but in all other respects this chapter shall be deemed to apply and the other to be a supplement of this chapter.

Installations or constructions built or contracted for prior to the effective date (shown at the end of each rule) of any requirement shall be deemed to comply with the provisions of these requirements if such installations or constructions comply either with the provisions of these requirements ~~if~~ or with the provisions of any applicable specific requirement which was in effect at the time contracted for or built.

(B) Definitions.

- (1) "Access board (hot board)": a platform designed to be fastened to a pole or structure and having dielectric properties equal to dry wood.
- (2) "Adjustable barrier guard": a barrier requiring adjustment for each job setup or die setup.
- (3) "Aerial device": any vehicle-mounted telescoping or articulating device which is used to position personnel at job sites.
- (4) "Air contaminants": ~~hazardous concentrations of fibrosis-producing or toxic dusts, toxic fumes, toxic mists, toxic vapors, or toxic gases~~ dust, mist, fume, gas or vapor, or any combination ~~of them~~ thereof when suspended in the atmosphere.
- (5) "Air-lift hammer": (see "gravity hammers").
- (6) "Angle of repose": the greatest angle above the horizontal plane at which unexcavated material will lie without sliding.
- (7) "Anti-repeat": the part of the clutch/brake control system designed to limit a mechanical power press to a single stroke if the tripping means is held on the operating position. Anti-repeat requires release of all tripping mechanisms before another stroke can be initiated. Anti-repeat is also called "single stroke reset" or "reset circuit."
- (8) "Approved": accepted or certified by a nationally recognized testing agency, such as "Underwriters' Laboratories," "Factory Mutual Engineering Corporation," or an authorized governmental agency.

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- (9) "Approved storage facility (magazine)": a facility for the storage of explosive materials covered by a license or permit issued under authority of the appropriate governmental agencies.
- (10) "Bearer": a horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.
- (11) "Blast area": the area in which explosives loading and blasting operations are being conducted.
- (12) "Blaster": a person qualified to be in charge of and responsible for the loading and firing of a blast.
- (13) "Blasting agent": any material or mixture consisting of a fuel and oxidizer used for blasting, but not classified as explosives, and in which more of the ingredients are classified as an explosive provided the finished (mixed) product cannot be detonated with a no. 8 test blasting cap when unconfined.
- (14) "Blasting cap": (see "detonator").
- (15) "Board-type drop hammer": (see "gravity hammers").
- (16) "Boatswain's chair": a seat supported by slings attached to a suspended rope, designed to accommodate one employee in a sitting position.
- (17) "Bolster plate": the plate attached to the top of the bed of a power press having drilled holes or T-slots for attaching the lower die or die shoe.
- (18) "Brace":
- (a) Scaffold
 - A tie that holds one scaffold member in a fixed position with respect to another member.
 - (b) Trench
 - The horizontal members of the shoring system with ends bearing against the uprights or stringers.
- (19) "Brake (mechanical power press)": the mechanism used to stop and hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.
- (20) "Brake monitor": a sensor designed, constructed, and arranged to monitor the effectiveness of a mechanical power press braking system.
- (21) "Bulldozers": stationary power-driven machines used chiefly for bending operations. They have a movable head operated by links attached to the main drive gears and moving in a horizontal plane.
- (22) "Circuit" a conductor or system of conductors through which an electric current flows or may flow.
- (23) "Cleats": ladder crosspieces of rectangular cross-sections placed on edge on which an employee may step in ascending or descending.
- (24) "Climbers": lineman's tools used on the legs and feet to enable the lineman to climb wooden poles.
- (25) "Clutch": the coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

DRAFT - NOT FOR FILING

- (26) "Collector" (see "~~seperator~~ [separator](#)").
- (27) "Conductor": metallic material suitable for carrying an electric current.
- (28) "Confined space": ~~an enclosure not intended for continuous employee occupancy, having limited means of ingress and egress and poor natural ventilation and which may contain hazardous contaminants or be oxygen deficient.~~ Must meet all of the following three criteria:
- (a) Is large enough and so configured that an employee can bodily enter and perform assigned work;
 - (b) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults and pits are spaces that may have limited means of entry.); and
 - (c) Is not designed for continuous employee occupancy.
- (29) "Contact distance (electrical)": that distance within which contact in doing the work or contact in the event of reaching, slipping, or falling may possibly occur.
- (30) "Control system": sensors, manual input, and mode selection elements, interlocking and decision-making circuitry, and output elements to a mechanical power press operating mechanism.
- (31) "Counterbalance": the mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments on a power press.
- (32) "Coupler": a device for locking together the component parts of a tubular metal scaffold.
- (33) "Cutting-off wheels": organically bonded wheels designed for use with power-driven equipment for a multitude of operations variously known as cutting, cutting-off, grooving, slotting, coping, jointing, etc.
- (34) "Danger zone": the point of operation where a known hazard exists.
- (35) "Deenergized": free from any electrical connection to a source of potential different from that of the earth.
- (36) "Designated employee": an employee selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.
- (37) "Detonating cord": a flexible cord containing a center core of high explosives and used to initiate other explosives.
- (38) "Detonator": any device containing a detonating charge that is used for initiating detonation in an explosive; the term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuse, detonating cord delay connectors, and non-electric instantaneous and delay blasting caps.
- (39) "Dielectric": a nonconductor of electric current which will not absorb moisture, such as ~~fiberglas~~ fiberglass, or equivalent.
- (40) "Die setting": the process of placing or removing dies in or from a power press, and the process of adjusting the dies, other tooling, and safeguarding means to cause them to function properly and safely.

*****DRAFT - NOT FOR FILING*****

- (41) "Die shoe": a plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly, and, when used, is bolted or clamped to the bolster plate or the face of the slide.
- (42) "Dockboard (bridge plate)": a movable plate (usually metal) for bridging the gap between motor vehicle or freight car and a dock or loading platform.
- (43) "Energized": anything connected to an electrical source having a greater potential than that of the earth.
- (44) "Excavation": any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reason of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.
- (45) "Exhaust system": includes suction systems, hoods, ducts, fans, separators, receptacles, and other parts necessary for the proper installation and operation thereof.
- (46) "Explosive": any chemical compound or mixture that is intended for the purpose of producing an explosion.
- (47) "Exposed to contact": the location of the material or object which, during the course of operation, is accessible to an employee in performance of the employee's regular or assigned duty.
- (48) "Face of slide": the bottom surface of the slide to which the punch or upper die of a power press is generally attached.
- (49) "Factor of safety": the ratio between the ultimate breaking stress and the working stress of the material, structure, or device. For example, the term "factor of safety of four" means that the material, structure, or device shall be constructed of such strength that the maximum load will be one-fourth the designed ultimate breaking load. Where other factors of safety appear, they shall apply in the same manner. The standard of "The American Society for Testing and Materials (ASTM)" shall be used in determining the strength of material except as otherwise provided herein.
- (50) "Feed rolls": in-running rolls which perform no other function than to feed material to the point of operation.
- (51) "Feeding": the process of placing or removing material within or from the point of operation. This may be done automatically, semi-automatically, or manually.
- (52) "Fire-resistance rating": the measured time in hours or fractions thereof that the material or construction will withstand fire exposure, as determined by fire tests conducted in conformity with recognized standards.
- (53) "Fire-resistive construction": a method of construction which prevents or retards the passage of hot gases or flames as defined by the fire-resistance rating.
- (54) "Flanges": collars, discs, or plates between which grinding wheels are mounted and are referred to as adaptor, sleeve, or back-up type.
- (55) "Floor hole": an opening measuring less than twelve inches but more than one inch in its least dimension in any floor, pavement, or yard.

*****DRAFT - NOT FOR FILING*****

- (56) "Floor opening": an opening measuring twelve inches or more in its least dimension, in any floor, platform, pavement, or yard.
- (57) "Foot control (part revolution clutch press)": the foot-operated control mechanism designed to be used with a clutch or clutch/brake control system.
- (58) "Foot pedal (full revolution clutch press)": the foot-operated lever designed to operate the mechanical linkage that trips a full revolution clutch.
- (59) "Forging": the product of work on metal formed to a desired shape by impact or pressure in hammers, forging machines (upsetters), presses, rolls, and related forming equipment.
- (60) "Forging presses": a class of forging equipment wherein the shaping of metal between dies is performed by mechanical or hydraulic pressure.
- (61) "Full revolution clutch (mechanical power press)": a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.
- (62) "Fumes": small solid particles formed by the condensation of vapors of solid materials.
- (63) "Gas": a formless fluid which tends to occupy an entire space uniformly at ordinary temperatures and pressures.
- (64) "Gate" or "movable barrier device": a movable barrier arranged to enclose the point of operation before a power stroke can be started.
- (65) "Grab bars": individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder.
- (66) "Gravity hammers": A class of forging hammer wherein energy for forging is obtained by the mass and velocity of a freely falling ram and the attached upper die. Examples: board-type drop hammers and air-lift hammers.
- (67) "Ground":
 - (a) "Ground connection": the equipment used in establishing a path between an electric circuit or equipment and earth. A ground connection consists of a ground conductor, a ground electrode, and the earth which surrounds the electrode.
 - (b) "Grounded": connected to earth by a ground connection.
 - (c) "Grounded effectively": connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the building up of voltages which may result in undue hazard to connected equipment or to employees.
- (68) "Grounding conductor": a conductor which is used to connect the equipment or the wiring system with a grounding electrode or electrodes.
- (69) "Guard": the covering, fencing, railing, or enclosure which shields an object from accidental contact. (See also "safety guard.")
- (70) "Guarded": means that the object is covered, fenced, railed, enclosed, or otherwise shielded from

DRAFT - NOT FOR FILING

accidental contact.

- (71) "Guide post": the pin attached to the upper or lower die shoe, operating within the bushing on the opposing die shoe, to maintain the alignment of the upper and lower dies of a power press.
- (72) "Handhold (handgrip)": a device attached to a manlift which can be grasped by the passenger to provide a means of maintaining balance.
- (a) "Closed type": a cup-shaped device into which the passenger may place his fingers, open at the top in the direction of travel of the step for which it is to be used, and closed at the bottom.
- (b) "Open type": one which has a handgrip surface fully exposed and capable of being encircled by the passenger's fingers.
- (73) "Handrail": a ~~single bar or pipe supported on brackets from a wall, floor, or partition, as on a stairway ramp~~ a lengthwise member mounted directly on the wall, floor or partition by means of brackets that will furnish an adequate handhold for anyone grasping it to avoid falling.
- (74) "Hazardous concentrations (as applied to air contaminants)": concentrations ~~which are known to be in excess of those which would not normally result in injury to an employee's health~~ of air contaminants which are in excess of established occupational exposure limits.
- (75) "Head protection devices":
- (a) "Bump cap or hat": a thin-shelled plastic headgear worn to provide protection to the head from bumps or lacerations but does not meet the requirements for protective helmets.
- (b) "Crown straps": that part of the suspension which passes over the head.
- (c) "Hair enclosure": a hat or cap (other than a protective helmet or bump cap) or a hairnet specifically designed to protect the wearer from entanglement in moving parts of machines, equipment, or from exposure to sparks, hot metal, or ignition.
- (d) "Protective helmet": a rigid headgear also known as a safety or hard hat, or as a safety or hard cap, that is worn to provide protection for the head, or portions thereof, against impact, flying articles, or electric shock, or any combination thereof, and which is held in place by a suitable suspension.
- (e) "Suspension": the internal cradle of a protective helmet or bump cap which holds it in place on the head and is made up of the headband and crown straps.
- (76) "Hood": that part of an exhaust system into which the contaminated air or dust, fumes, mist, vapor, or gas first enters.
- (77) "Hot line (live line) tools": those tools which are especially designed for work on energized high voltage conductors and equipment.
- (78) "Inch": an intermittent motion imparted to the slide (on mechanical power presses using part revolution clutches) by momentary operation of the inch operating means.
- (79) "Kickouts": accidental release or failure of a shore or brace used in trenching.

DRAFT - NOT FOR FILING

(80) "Ladder":

- (a) "Extension ladder": a portable ladder, adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum length of the sections measured along the side rails.
- (b) "Extension trestle ladder": a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with an effective means for locking the ladders together. The size is designated by the length of the trestle ladder base.
- (c) "Fixed ladder": a ladder permanently attached to a structure, building, or equipment.
 - (i) "Ladder cage": an enclosure which encircles the climbing space of the ladder and is securely fastened to the side rails of the ladder or to the structure.
 - (ii) "Ladder well": a permanent complete enclosure around a fixed ladder, which is securely fastened to the walls of the well.
- (d) "Individual-rung ladder": a fixed ladder, each rung of which is individually attached to a structure, building, equipment, or manhole.
- (e) "Platform stepladder": a modification of a portable stepladder with a working platform provided near the top.
- (f) "Rail ladder": a fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment.
- (g) "Sectional ladder": a portable ladder, nonadjustable in length, consisting of two or more sections so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.
- (h) "Side-rolling ladder": one from which an employee getting off at the top must step attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also its plane of motion.
- (i) "Side-step ladder": one from which an employee getting off at the top must step sideways in order to reach the landing.
- (j) "Single ladder": a portable, nonadjustable ladder consisting of only one section.
- (k) "Stepladder": a self-supporting portable ladder, nonadjustable in length, having flat steps or treads and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side.
- (l) "Through ladder": one from which an employee getting off at the top must step through the rails in order to reach the landing.
- (m) "Trestle ladder": a self-supporting portable ladder, nonadjustable in length, consisting of two sections hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(81) "Lanyard": a flexible line of rope, ~~suitable for supporting one person. One end is fastened to a safety belt~~

DRAFT - NOT FOR FILING

~~or harness and the other end is secured to a substantial object or a~~ wire rope, or strap, which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

- (82) "Leading wire": an insulated wire used between the electric power source and the electric blasting cap circuit.
- (83) "Ledger (stringer)": a horizontal scaffold member which extends from post to post and which supports the putlogs or bearer forming a tie between the posts.
- (84) "Lifeline": a ~~rope, suitable for supporting one person, to which a lanyard is attached~~ component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline) and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.
- (85) "Limit switch": a device on a manlift for the purpose of cutting off the power to the motor and applying the brake to stop the carrier in the event that a loaded step passes the terminal landing.
- (86) "Magazine": (see "approved storage facility").
- (87) "Manlift": a device consisting of a power-driven endless belt with steps or platforms and handholds attached to it for the transportation of personnel from floor to floor.
- (88) "Mist": small droplets of materials that are ordinarily liquid at normal temperature and pressure.
- (89) "Nominal": in name or form, but not in fact; for example, a piece of lumber described as four inches by four inches but which, in fact, meets a standard which is less.
- (90) "Non-current carrying": not intended to be energized.
- (91) "Off-hand grinding": the grinding of any material or part which is held in the operator's hand.
- (92) "Operator": any employee assigned or authorized to work at the specific equipment.
- (93) "Part revolution clutch": a type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide a full stroke.
- (94) "Pinch, nip, or shear point": the point or points at which it is possible to be caught between the moving parts of a machine, or between the material and the moving part or parts of a machine.
- (95) "Pitch": the included angle between the horizontal and the ladder measured from the opposite side of the ladder from the climbing side.
- (96) "Platform": a working space for employees elevated above the surrounding floor or ground.
- (97) "Point of operation": the area where material is actually positioned and work is being performed during any process.
- (98) "Polishing wheels": wheels designed for use with power-driven equipment to apply a luster or polish to materials.

DRAFT - NOT FOR FILING

- (99) "Portable explosive-actuated fastening tool": a tool which depends upon an explosive charge to propel or discharge a stud, pin, or fastener, for the purpose of impinging it upon, affixing it to, or penetrating another object or material.
- (a) "High-velocity tool": a tool or machine which, when used with a load, propels or discharges a stud, pin, or fastener at velocities in excess of three hundred feet per second.
- (b) "Low-velocity tool": a tool or machine which, when used with a load, propels or discharges a stud, pin, or fastener at velocities not in excess of three ~~hundred~~hundred feet per second.
- (100) "Power shears": power-driven machines used for cutting bars, slabs, sheets, or other material.
- (101) "Presence sensing device": a device that creates a sensing field or area and deactivates the clutch control of a power press when an operator's hand or any part of his body is within such field or area.
- (102) "Press": a powered machine that shears, punches, forms, or assembles metal or other material by means of cutting, shaping, or by combination dies attached to slides. A press consists of a stationary bed or anvil, and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.
- (103) "Primed cartridge": a cartridge of explosives to which a detonator has been attached as a means of firing.
- (104) "Protective shield or guard": a device, attached to the muzzle end of a portable explosive-actuated fastening tool, which is designed to confine flying particles.
- (105) "Pull-out device": a mechanism attached to the operator's hands and connected to the upper die or slide of a power press, that is designed, when properly adjusted, to withdraw the operator's hands as the dies close when the operator's hands are inadvertently within the point of operation.
- (106) "Railing": a vertical barrier erected above exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of employees.
- (107) "Rated load (roof car suspended platforms)": the combined weight of employees, tools, equipment, and other material which the working platform is designed to lift.
- (108) "Rated speed": the speed for which a tool or piece of equipment is designed.
- (109) "Repeat": an unintended or unexpected successive stroke of a power press resulting from a malfunction.
- (110) "Respiratory devices":
- (a) "Air-purifying respirator device": a ~~device which removes contaminants from the atmosphere and used only in atmospheres containing sufficient oxygen to sustain life (at least 19.5 per cent by volume at sea level) and within specified concentration limitations to the specific device~~ respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element. These ~~are~~ include:
- (i) "Mechanical-filter respirator": a ~~device~~ respirator which provides respiratory protection against particulate matter, such as nonvolatile dust, mists, or metal fumes.

DRAFT - NOT FOR FILING

- (ii) "~~Chemical-cartridge respirator~~": a ~~device which provides respiratory protection against certain specific gases and vapors in concentrations not in excess of 0.1 per cent by volume~~ respirator equipped with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passing through the air-purifying element.
- (iii) "~~Gas mask~~": a ~~device which provides respiratory protection against certain specific gases and vapors in concentrations no greater than that specified on the canister label.~~
- (b) "~~Supplied-air device~~ respirator": a ~~device, other than self-contained breathing apparatus, which delivers breathing air for an indefinite period of time through a supply hose connected to the wearer's facepiece~~ an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.
- (c) "~~Self-contained breathing apparatus~~": a ~~device which provides complete breathing protection for a limited period of time based on the amount of breathing air or its equivalent supplied and the breathing demand of the wearer~~ an atmosphere-supplying respirator for which the source of breathing air is designed to be carried by the user.

~~The basic types of self-contained breathing apparatus are:~~

~~(i) Closed-circuit devices (rebreathers):~~

~~(a) Compressed oxygen type.~~

~~(b) Chemical oxygen type.~~

~~(c) Liquid oxygen type.~~

~~(ii) Open-circuit devices (supply and exhaust):~~

~~(a) Demand type.~~

~~(b) Pressure demand type.~~

(111) "Roof car": (see "scaffolds").

(112) "Roof car suspended platform": (see "scaffolds").

(113) "Roof-powered platform": (see "scaffolds").

(114) "Runway": a passageway for employees elevated above the surrounding floor or ground level.

(115) "Safety belt" or "~~safety harness~~ body belt harness": a ~~device worn around the body which by reason of devices to which it is attached will limit an employee's fall~~ a strap with means both for securing it around the waist and for attaching it to a lanyard, lifeline, or deceleration device.

(116) "Safety block": a prop that, when inserted between the upper and lower dies of a power press or between the bolster plate and the face of the slide, prevents the slide from falling of its own dead weight.

(117) "Safety guard (grinding wheel)": a device designed to restrain the pieces of a grinding wheel in the

DRAFT - NOT FOR FILING

event the wheel is broken in operation.

- (118) "Safety harness": ~~(see "safety belt").~~ or "body harness": a design of straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.
- (119) "Scaffold":
- (a) ~~"Manually propelled mobile~~ Mobile scaffold": a ~~portable rolling scaffold supported by casters_~~ powered or unpowered, portable, caster or wheel-mounted supported scaffold.
 - ~~(b) "Mobile": manually propelled.~~
 - ~~(c) "Mobile tubular welded sectional folding scaffold": a sectional folding metal scaffold either of ladder frame or inside stairway design, substantially built of prefabricated welded sections, which consist of end frames, platform frame, inside inclined stairway frame and braces, or hinged connected diagonal and horizontal braces, capable of being folded into a flat package when the scaffold is not in use.~~
 - ~~(d)~~ (b) "Mobile work platform": generally a fixed work level, one frame high, on casters or wheels, with bracing diagonally from platform to vertical frame.
 - ~~(e)~~ (c) "Roof car": a structure for the suspension of a working platform, providing for its horizontal movement to working positions.
 - ~~(f)~~ (d) "Roof car suspended platform": equipment to provide access to the exterior of a building consisting of a suspended power-operated working platform, a roof car, and the operating and control devices.
 - ~~(g)~~ (e) "Roof-powered platform": the working platform of a roof car suspended platform having the raising and lowering mechanism located on a roof car.
 - ~~(h)~~ (f) "Self-powered platform": a working platform, of a roof car suspended platform, having the raising and lowering mechanism located on the working platform.
 - ~~(i)~~ (g) "Swinging scaffold": a power- or manually operated platform suspended by two or more lines and independent of the building except for attachment at the roof or parapet.
 - ~~(j)~~ (h) "Tube and coupler scaffold": an assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and special couplers which serve to connect the uprights and to join the various members.
 - ~~(k)~~ (i) "Tubular welded frame scaffold": a sectional panel, or frame metal scaffold substantially built up of prefabricated welded sections which consist of posts and horizontal bearer with intermediate members. Panels or frames shall be braced with diagonal or cross braces.
 - ~~(l)~~ (j) "Two-point suspension scaffolds": a scaffold suspended from overhead supports, the platform of which is supported by stirrups or hangers at two points to permit raising or lowering.
- (120) "Securely fastened": the object or thing referred to shall be substantially fixed in place.

*****DRAFT - NOT FOR FILING*****

- (121) "Self-powered platform": (see "scaffold").
- (122) "Separator (collector)": that part of an exhaust system, the purpose of which is to separate material from the air which conveys it.
- (123) "Shaft": an excavation made from the surface of the ground the longer axis of which forms an angle with the vertical of no more than forty-five degrees.
- (124) "Shall": to be construed as mandatory.
- (125) "Sheet pile": a pile, or sheeting, that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
- (126) "Sides," "walls," or "faces": the vertical or inclined earth surfaces formed as a result of trenching or excavation work.
- (127) "Single-stroke mechanism (mechanical power press)": an arrangement used on a full revolution clutch to limit the travel of the slide to one complete stroke at each engagement of the clutch.
- (128) "Slide": the main reciprocating member of a power press. A slide is also called a ram, plunger, or platen.
- (129) "Sling": an assembly which connects the load to the material handling equipment.
- (130) "Split-rail switch": an electric limit switch operated mechanically by the rollers of manlift steps. It consists of an additional hinged or "split" rail, mounted on the regular guide rail, over which the step rollers pass. It is springloaded in the "split" position. If the step supports no load, the rollers will "bump" over the switch; if a loaded step should pass over the section, the split rail will be forced straight, tripping the switch and opening the electrical circuit.
- (131) "Standard guard railing": a substantial barrier, constructed in accordance with paragraph (E) of rule 4123:1-5-02 of the Administrative Code.
- (a) "Top rail": the top lateral member of a standard guard railing.
- (b) "Intermediate rail": the lateral member or members of a standard guard railing, installed at intervals of no more than twenty-one inches.
- (132) "Steam hammers": a type of drop hammer where the ram is raised for each stroke by a double-action steam cylinder and the energy delivered to the workpiece is supplied by the velocity and weight of the ram and attached upper die driven downward by steam pressure. Energy delivered during each stroke may be varied.
- (133) "Stop control": an operator control on a mechanical power press designed to immediately deactivate the clutch control and activate the brake to stop slide motion.
- (134) "Stripper": a mechanism or die part on a power press for removing the parts or material from the punch.
- (135) "Stud, pin, or fastener (as used in portable fastening tools)": a fastening device specifically designed and manufactured for use in portable explosive-actuated fastening tools.

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- (136) "Substantial (referring to material things)": constructed of such strength, or of such materials, and of such workmanship that the object will withstand the wear, usage, or shock for which it is designed.
- (137) "Sweep device": a single or double arm (rod) attached to the upper die or slide of a power press and designed to move the operator's hands as the dies close when the operator's hands are inadvertently within the point of operation. (Their use on power presses is prohibited.)
- (138) "Swinging scaffold": (see "scaffold").
- (139) "Toeboard": a vertical barrier erected along exposed edges of a floor opening, platform, runway, ramp, or scaffold to prevent falls of material.
- (140) "Travel" (manlifts): the distance between the centers of the top and bottom pulleys.
- (141) "Traveling cable": a cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.
- (142) "Trench (when used as a noun)": a narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench at the bottom is no greater than fifteen feet.
- (143) "Trench boxes (safety cages, trench shields)": a shoring system composed of steel plates and bracing, welded or bolted together, which can be moved along as work progresses and protects employees from movement of earth and cave-ins.
- (144) "Trench jack": a screw or hydraulic-type jack used as cross bracing in a trench shoring system.
- (145) "Turnover bar": a bar used in die setting to turn manually the crankshaft of a mechanical power press.
- (146) "Two-point suspension scaffold": (see "scaffold").
- (147) "Unitized tooling": a type of die in which the upper and lower members are incorporated into a self-contained unit so arranged as to hold the die members in alignment.
- (148) "Uprights": the vertical members of a shoring system.
- (149) "Upsetting machines (forging machines, headers)": a type of forging equipment in which the main forming energy is applied horizontally to the workpiece which is gripped and held by prior action of the dies.
- (150) "Ventilation":
- (a) "Dilution ventilation": ventilation provided to reduce the concentration of air contaminants in the atmosphere of all or part of the place of employment.
 - (b) "General ventilation": ventilation of the general atmosphere in the place of employment.
 - (c) "Local exhaust ventilation": that type of ventilation in which suction is applied at the point of generation or escape of air contaminants.
- (151) "Wales (stringers)": the horizontal members of a shoring system with sides bearing against the uprights or earth.

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- (152) "Wall and chute openings": openings in any wall or partition from which there is a drop of more than four feet and which are thirty inches or more in height and eighteen inches or more in width through which an individual may inadvertently fall. Windows shall not be considered wall openings except when located at the foot of any flight of stairs or at any platform on stairs. Where windows or openings are filled in with glass block, metal frame with sash bars, or wire mesh types, they shall not be considered wall openings.
- (153) "Wall hole": an opening less than thirty inches but more than one inch high, of unrestricted width, in a wall or partition, such as a ventilation hole or drainage scupper.

4123:1-5-02 Guarding floor and wall openings and holes.

(A) Scope.

This rule covers the guarding of floor and wall openings and holes. It shall not apply to industrial grating holes nor to the working face of floor openings which are occupied by elevators, dumbwaiters, conveyors, machinery, piping or containers; the loading and unloading areas of automotive truck and railroad docks, or platforms, scaffolds, pits and trenches which are occupied for the purpose of providing access to a product, facility or process equipment while being worked upon.

(B) Reserved.

(C) Permanent openings - floor, wall and yard.

(1) Floor openings.

(a) Guarding.

- (i) Floor openings, not including hoistway openings, shall be guarded with standard railing or with fixed safety covers with flush hinges.
- (ii) When an overhead obstruction prevents the use of standard railing, the top of the railing shall be constructed not more than ten inches below the overhead obstruction.
- (iii) Removable or hinged railings or a substantial chain or wire rope section shall be installed when operations prevent installation of standard railing or fixed safety covers with flush hinges.

(b) Work below floor openings.

Where employees are required to work below a floor opening, toeboards shall be installed.

(c) Safety covers.

When a safety cover is used to protect an opening, the unused sides of the opening shall be guarded when the cover is raised.

(d) Guarding manholes, handholes, gratings and excavations.

Barriers, barricades or standard guard railings shall be provided for guarding open manholes, handholes, gratings or excavations and shall be visible at all times.

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(2) Floor holes - guarding.

(a) Every floor hole into which employees can accidentally walk shall be guarded by either:

(i) A standard railing and toeboard on all exposed sides, or

(ii) A fixed, hinged floor hole cover of substantial strength and construction. While the cover is not in place, the floor hole shall be attended by an employee designated by the employer or shall be guarded by a removable standard railing.

(b) Every floor hole into which employees cannot accidentally walk (on account of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than one inch wide. The cover shall be securely held in place to prevent tools or materials from falling through.

(3) Wall openings and holes, including chute openings.

(a) Wall opening - guarding.

(i) Wall openings shall be guarded by standard railings and toeboards, or with doors or gates or substantial screens which shall extend to a minimum height of forty-two inches measured from the floor or platform level.

(ii) When the top of the wall openings, protected by a railing, prevents installation of standard guard railing, the top rail shall be not be more than ten inches below the top of the wall opening.

(b) Wall hole - guarding.

Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than four inches above the floor, and the far side of the hole more than five feet above the next lower level, the hole shall be guarded by a toeboard, or an enclosing screen either of solid construction, or as specified in rule 4123:1-5-99 of the Administrative Code.

(c) Openings used for unloading materials - guarding.

(i) Openings used for unloading material into chutes, hoppers or bins when not in use, shall be guarded.

(ii) Area at discharge end of chutes:

The area at the discharge end of chutes shall be guarded if employees are required to work in, or pass through the area. If the chute discharges into a bin, conveyor, truck, railroad car, or other container, guarding shall not be required, but warning signs of conspicuous and easily read style shall be posted to warn employees when there is a hazard from falling, flying, moving or sliding objects.

(4) Working pits.

Working pits shall be guarded when not in use.

(5) Open vats, open soaking pits and open tanks.

(a) Sides of such vats, soaking pits, and tanks, containing injurious chemicals or other materials, shall

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extend to a height of not less than thirty-six inches above the working floor level or shall be guarded by standard guard railing. Employees shall not be required to work over such vats, soaking pits and tanks except on elevated runways, platforms and walkways (see paragraph (D)(1) of this rule).

(b) This shall not apply to open vats, soaking pits and open tanks designated as restricted areas where product is handled by conveyor or cab-controlled overhead crane.

(6) Galvanizing tanks.

Galvanizing tanks shall have a minimum height of thirty inches. At such height the wall thickness or bench shall be no less than thirty-two inches in width. For each increase in height of one inch the wall thickness or bench may be reduced by four inches (see appendix to this rule).

(D) Elevated platforms, runways and walkways.

This rule does not apply to scaffolding.

(1) Guarding.

(a) Elevated platforms, runways and walkways four feet or more above floor or ground level shall be guarded with standard railings and toeboards. All elevated runways, platforms and walkways, regardless of height, located over or adjacent to water, machinery, open vats, open soaking pits or open tanks shall be provided with standard railing and toeboards.

(b) When the requirement prescribed above would result in an impairment of the work being performed, alternative protection may be provided for employees. Such alternative protection shall provide safety equivalent to or greater than that required in paragraph (D)(1)(a) of this rule.

(2) Support.

Elevated runways, platforms and walkways, made of planks shall be supported at least every five feet and the planks shall be securely fastened together with cleats underneath.

(3) Openings (drainage, ventilation, etc.).

Openings for drainage, ventilation, etc. in floors, elevated runways, platforms and walkways four feet or more above floor or ground level where employees are required to work below, shall not be greater than one inch in width.

(4) Special purpose runways.

Runways used exclusively for special purposes, such as oiling, shafting, or filling tank cars, may have the railing on one side omitted where operating conditions necessitate such omission, provided the falling hazard is minimized by using a runway of not less than eighteen inches wide.

(E) Standard guard railings, intermediate rail and toeboards.

A standard guard railing shall be constructed as a substantial barrier, securely fastened in place, and free from protruding objects, such as nails, screws and bolts, to protect openings or prevent accidental contact with some object, which barrier shall consist of a top rail not less than forty-two inches above the working level, and unless the space between the top rail and the working level is covered with substantial material, an intermediate rail. Minimum material requirements shall be:

DRAFT - NOT FOR FILING

(1) Metal.

Top rail and intermediate railings shall be at least one and one half inch nominal diameter pipe, or two by two by three eighths inch angle. ~~Upright spacing not to exceed eight feet structural steel, or other metal shapes of equivalent bending strength with posts spaced not more than eight feet on centers.~~

(2) Wood.

~~Top rail and uprights~~ For wood railings, the posts shall not be less than of at least two inches inch by four inches inch (nominal) stock, intermediate rails shall be not less than two inches by four inches (nominal) stock. Uprights shall be spaced not to exceed six feet center to center. These measurements are net finished dimensions; the top and intermediate rails shall be of at least two inch by four inch stock. If top rail is made of two right-angle pieces of one inch by four inch stock, posts may be spaced on eight foot centers, with two inch by four inch intermediate rail.

(3) Toeboards.

A standard toeboard shall be four inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than one fourth inch clearance above floor level. It may be made of any substantial material either solid or with openings not over one inch in greatest dimension.

Where material is piled to such height that a standard toeboard does not provide protection, paneling from floor to intermediate rail, or to top rail shall be provided.

(F) Stairway railings, guards and treads.

(1) Standard stair railings and standard handrails.

Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails as specified in the following, the width of the stair to be measured clear of all obstructions except handrails:

- (a) On stairways less than forty-four inches wide having both sides enclosed, at least one handrail, preferably on the right side descending;
- (b) On stairways less than forty-four inches wide having one side open, at least one stair railing on the open side;
- (c) On stairways less than forty-four inches wide having both sides open, one stair railing on each side;
- (d) On stairways more than forty-four inches but less than eighty-eight inches wide, one handrail on each enclosed side and one stair railing on each open side;
- (e) On stairways eighty-eight or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.

(2) Winding stairs.

Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads

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having width less than six inches.

(3) Uniform treads.

All stairways shall have risers and treads of uniform dimensions in each run, except winding stairs as covered in paragraph (F)(2) of this rule.

(G) Dockboards (bridge plates).

(1) Portable and powered dockboards shall be substantial enough to carry the load imposed on them.

(2) Portable dockboards shall be secured in position, either being securely fastened or equipped with devices which will prevent slipping.

(3) Handholds, or other effective means shall be provided on portable dockboards.

(4) Positive protection shall be provided to prevent railroad cars or motor vehicles from moving or being moved while dockboards or bridge plates are in position.

(H) Stairways.

(1) "Stairway" means one or more flights of stairs and the necessary landings and platforms connecting them to form a continuous and uninterrupted passage from one floor or level to another.

(2) Flight of stairs.

(a) Four or more risers between landings shall be considered a flight of stairs.

(b) This does not apply to steps over a conveyor or to a working platform in connection with production lines or process units where access is for the performance of work, and the steps are not considered a passageway for general travel.

(I) Handrails.

Handrails shall be free of protruding nails or screws and not less than thirty inches, nor more than thirty-four inches in height measured vertically above the line in the top surface of the tread over the face of the riser.

4123:1-5-03 Ladders and scaffolds.

(A) Reserved.

(B) Reserved.

(C) Ladders.

(1) Construction.

All ladders shall be substantially constructed of wood, metal or other equivalent material ~~and shall have a safety factor of not less than four.~~ Ladders must be able to support at least four times the maximum intended

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load, except extra-heavy-duty type one A metal or plastic ladders, which must be able to sustain 3.3 times the maximum intended load.

(a) Side rails.

(i) Wood.

~~Wood side rails shall be of sound material. Knots shall not exceed one-half inch diameter and shall not be nearer than one-half inch to the edge of the rail or within three inches of the rung, step or tread.~~ All wood parts shall be free from shakes, cross grain, checks or decay. Sharp edges and splinters; sound and free from accepted visual inspection from shake, wane, compression failures, decay, or other irregularities. Low density wood shall not be used.

(ii) Metal.

Metal side rails shall be parallel or shall vary uniformly in separation along the length (tapered) of the ladder or shall flare at the base. The design of the side rails shall be such that the ladder will conform to the specific safety requirements of this code.

(b) Rungs, steps or treads.

(i) Wood.

Wood rungs, steps or treads shall be sound material free from knots, shakes, cross grain, large checks or decay. All rungs, steps or treads shall have a uniform spacing which shall not exceed twelve inches on center.

(ii) Metal.

Metal rungs, steps or treads shall have a uniform spacing which shall not exceed twelve inches on center. Metal rungs, steps or treads to side rail connections shall be so constructed as to conform to the factor of safety specified in paragraph (C)(1) of this rule.

(2) Portable ladders.

(a) Metal rungs, steps or treads.

All metal rungs, steps or treads shall be corrugated, knurled, dimpled, or coated with skid-resistant material.

(b) Safety shoes, spikes or spurs.

(i) All portable ladders shall be equipped with safety shoes, metal spikes or spurs. Safety shoes shall be surfaced with cork, carborundum, rubber or other material with equivalent coefficient of friction.

(ii) This does not apply to step ladders, lashed ladder or hook ladders.

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(c) Hook ladders.

Ladders designed for use by hooking shall be equipped with two or more substantial metal hooks at the top of the ladder.

(d) Portable metal or conductive ladders.

Portable metal or conductive ladders shall not be used near energized conductors or equipment except as may be necessary in specialized work, such as in high voltage substations where non-conductive ladders might present a greater hazard than conductive ladders. Conductive or metal ladders shall be prominently marked as "Conductive."

(3) Extension ladders.

(a) Automatic locks.

Extension ladders shall be equipped with two automatic locks of malleable iron or equivalent material attached to the side rails of the upper extension and of such construction as to make the extension ladder equal in strength to a ladder constructed of continuous side rails.

(b) Where a single rung support holds an entire rung of the upper extension and the support is attached to both side rails of the lower section, two automatic locks shall not be required.

(4) Step ladders.

(a) Height.

Step ladders shall not exceed twenty feet in length.

(b) Spreader.

A metal spreader shall be provided on step ladders to securely hold the front and back sections in open position.

(5) Sectional ladders.

When sectional ladders are used they shall conform to the following:

(a) Length.

Sectional ladders shall not exceed sixty feet in extended length.

(b) Connection joint.

(i) Adjacent sections shall be jointed by means of a groove in the bottom end of each rail of the upper of the two sections setting firmly over extensions outside the side rails, of the topmost rung of the

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next lower section and, at the same time, a groove in the top end of each rail of the lower of the two sections setting firmly over the bottom rung, inside the side rails, of the section next above.

- (ii) The distance between the two rungs (topmost rung of one section, bottom rung of the section next above) mentioned in paragraph (C)(5)(b)(i) of this rule shall not be less than one foot.
- (iii) The fit between rail grooves and rungs mentioned in paragraph (C)(5)(b)(i) of this rule shall be such as to provide a good fit without binding or unnecessary play.
- (iv) The grooved ends of the sections shall be reinforced with a metal plate of not less than eighteen-gauge (manufacturing standard) material properly secured thereto, and a rivet adjacent to the groove, extending through the depth of the rail, or the equivalent thereof.

(c) Structural dimensions and requirements.

- (i) The minimum dressed cross section and distance between side rails of wood shall be as follows:

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Number of Sections	Thickness (inches)	Side Rails Cross Section Depth (inches)	Distance Base (inches)
Up to & inc. 4 sections	1-1/8	2-3/4	13
Over 4 sections, up to & inc. 6 sections	1-1/8	3-1/8	20

- (ii) If the length exceeds six feet, the side rail cross sections shall be correspondingly increased.

(6) Fixed ladders.

All fixed ladders more than twenty feet in length shall be equipped with a ladder cage or ladder well. This requirement does not apply to chimney ladders.

(a) Landing platforms.

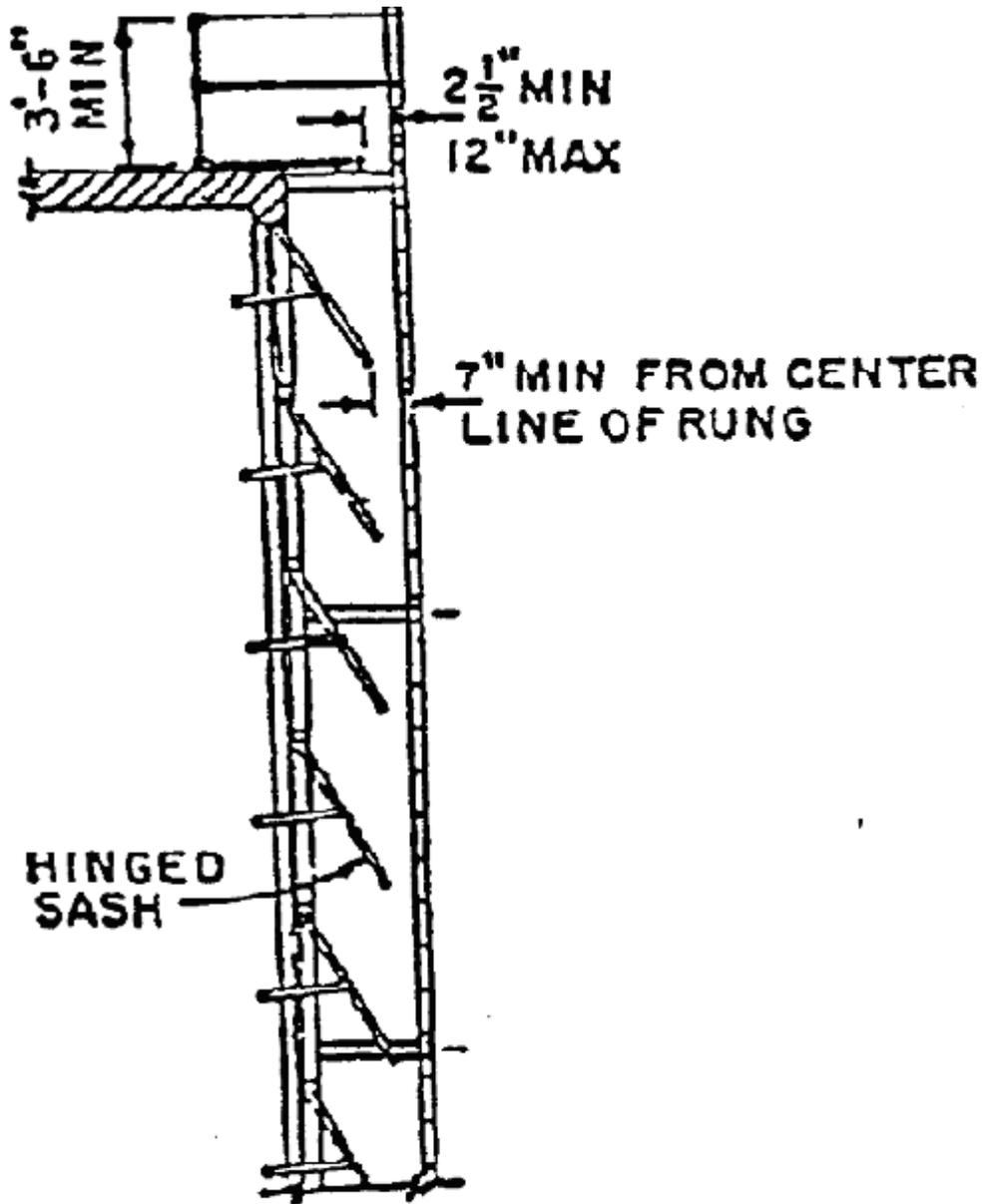
When ladders are used to ascend to heights exceeding twenty feet, landing platforms shall be provided for each thirty feet of height or fraction thereof, except that where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each twenty feet of height or fraction thereof. Each ladder section shall be offset from adjacent sections. Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset.

- (i) Where an employee must step a distance greater than twelve inches from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be two and one-half inches. (See figure 4123:1-5-03 (C)(6)(a)(i) to this rule.)

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- (ii) All landing platforms shall be equipped with standard guard railings and toeboards, so arranged as to give safe access to the ladder. Platforms shall be no less than twenty-four inches in width and thirty inches in length.
- (iii) One rung of any section of ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.

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(b) Ladder extensions.

The side rails of through or side-step ladder extensions shall extend three and one-half feet above any landing or other walking surface. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than eighteen nor more than twenty-four inches clearance between

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rails. For side-step or offset fixed ladder sections at landings, the side rails and rungs shall be carried to the next regular rung beyond or above the three-and-one-half-foot minimum. (See figure - 4123:1-5-03(C)(6)(b) to this rule.)

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(c) Grab bars.

Grab bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab bars' diameters shall be the equivalent of the round-rung diameters.

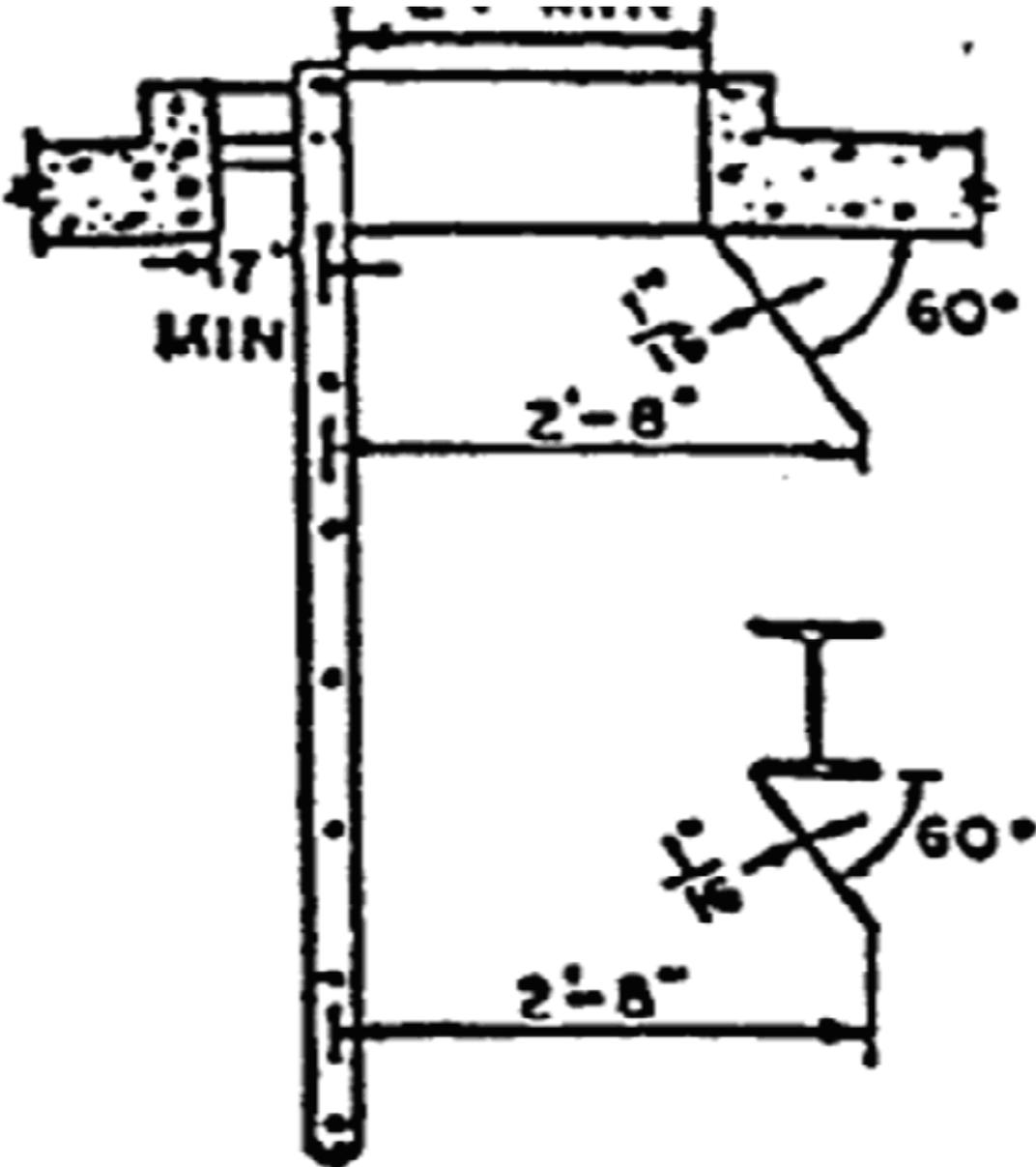
(d) Ladder safety devices.

Ladder safety devices may be used on ladders in lieu of cage protection. No landing platform is required in these cases. All ladder safety devices such as those that incorporate life belts, friction brakes, and sliding attachments shall meet the design requirements of the ladder which they serve.

(e) Counterweighted hatch covers.

Where counterweighted hatch covers are provided they shall open a minimum of sixty degrees from the horizontal. The distance from centerline of rungs or cleats to the edge of the hatch opening on the climbing side shall be not less than twenty-four inches from offset wells or thirty inches for straight wells. There shall be no protruding potential hazards within twenty-four inches of the centerline of rungs or cleats; any such hazards within thirty inches of the centerline of the rungs or cleats shall be fitted with deflector plates placed at an angle of sixty degrees from the horizontal as indicated in figure 4123:1-5-03(C)(6)(e) to this rule.

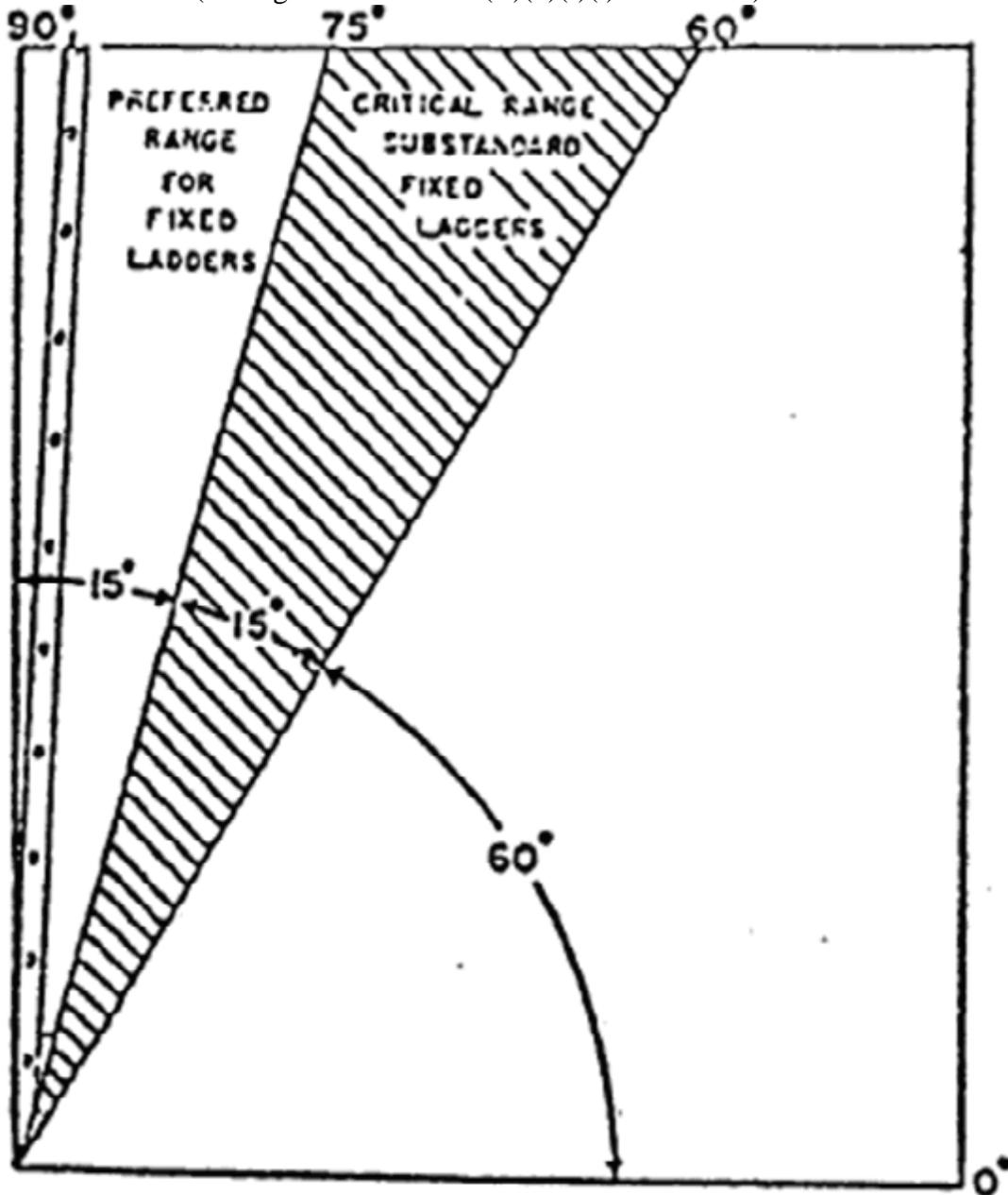
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(f) Pitch of fixed ladders.

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- (i) The pitch of fixed ladders shall come in the range of seventy-five degrees and ninety degrees with the horizontal. (See figure 4123:1-5-03(C)(6)(f)(i) to this rule).



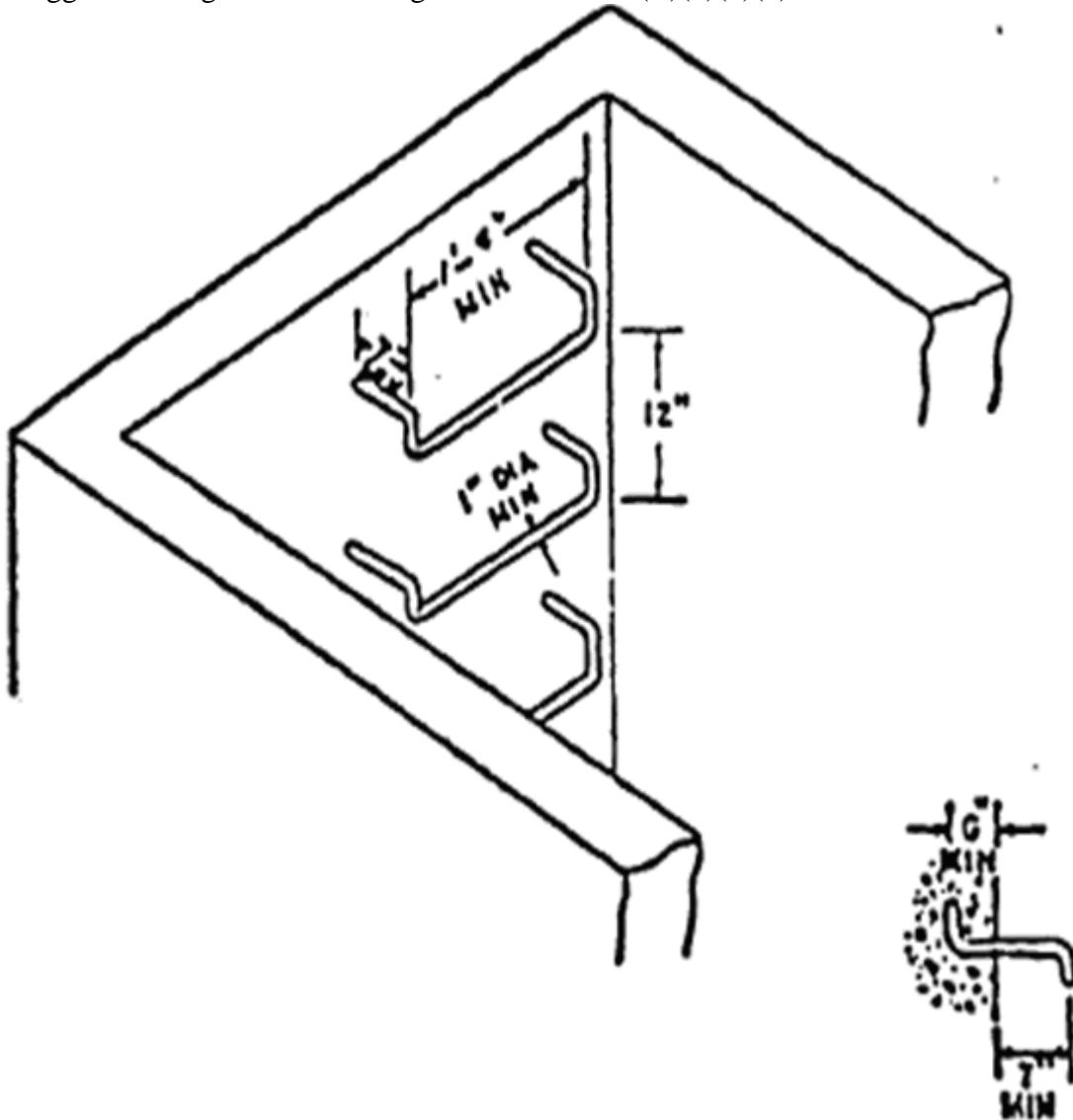
- (ii) Fixed ladders within the pitch range of sixty to seventy-five degrees with the horizontal are permitted only where it is found necessary to meet conditions of installation. Lesser pitch ranges are not permissible.

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- (iii) Ladders having a pitch in excess of ninety degrees with the horizontal are prohibited.
- (g) Manhole steps and ladders.
- (i) Entrance into a manhole shall be by steps that are cast or mortared into the walls of riser or conical top sections or by portable ladder. Portable ladders shall conform to the requirements of paragraphs (C)(1) and (C)(2) of this rule.
- (ii) Manhole steps that are cast or mortared into the walls of riser or conical top sections shall meet the following requirements:
- (a) For steps, appurtenances and fastenings, the minimum design live load shall be a single concentrated load of ~~three~~ two hundred pounds.
- (b) ~~Steps in riser and conical top sections shall be aligned in each section so as to form a continuous ladder with steps equally spaced vertically in the assembled manhole at the maximum design distance of sixteen inches apart. Steps shall be so designed that the foot cannot slide off the end~~ The distance between rungs, cleats, and steps shall not exceed twelve inches and shall be uniform throughout the length of the ladder. Rungs on an individual rung ladder shall be so designed that the foot cannot slide off the end.
- (c) When dissimilar types of materials are used in the steps, appurtenances and fastenings, the materials shall be treated to prevent deleterious effects.
- (d) The portion of the step projecting into the riser or cone opening shall be free of any hazardous sharp edges, burrs, or projections.
- (e) Ferrous metal steps not painted or treated to resist corrosion shall have a minimum cross-sectional dimension of one inch.
- (f) The minimum clear length of ~~steps~~ rungs or cleats shall be ~~ten~~ sixteen inches.
- (g) The step shall project a minimum clear distance of ~~four~~ seven inches from the wall of the rise or cone section measured from the point of embedment.
- (h) Rungs and cleats.
- (i) All rungs shall have a minimum diameter of three-fourths inch for metal ladders or material of equivalent strength, and minimum diameter of one and one-eighth inches for wood ladders.
- (ii) The distance between rungs, cleats, and steps shall not exceed ~~sixteen~~ twelve inches and shall be uniform throughout the length of the ladder.
- (iii) The minimum clear length of rungs or cleats shall be ~~twelve~~ sixteen inches.
- (iv) Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard.

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- (v) The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end. A suggested design is shown in figure 4123:1-5-03 (C)(6)(h)(v) to this rule.



- (i) Fastenings.

Fastenings shall be an integral part of fixed ladder design.

- (j) Ladder cage.

A ladder cage which encircles the climbing space and is securely fastened to the side rails of the fixed ladder or to the structure shall be provided.

- (i) Size of cage.

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The cage shall not extend less than twenty-seven or more than twenty-eight inches from the centerline of the rungs of the ladder and shall not be less than twenty-seven inches in width. Vertical bars shall be at a minimum spacing of forty degrees around the circumference of the cage. This will give a maximum spacing of approximately nine and one-half inches, center to center. The inside of the cage shall be clear of projections.

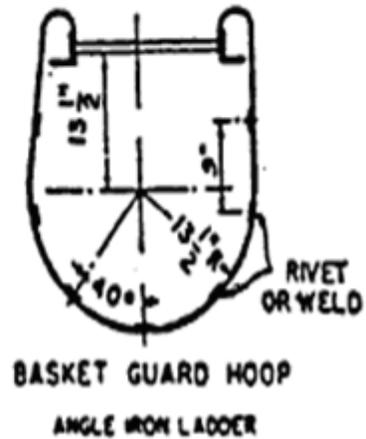
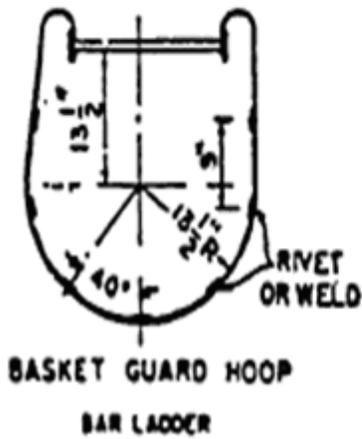
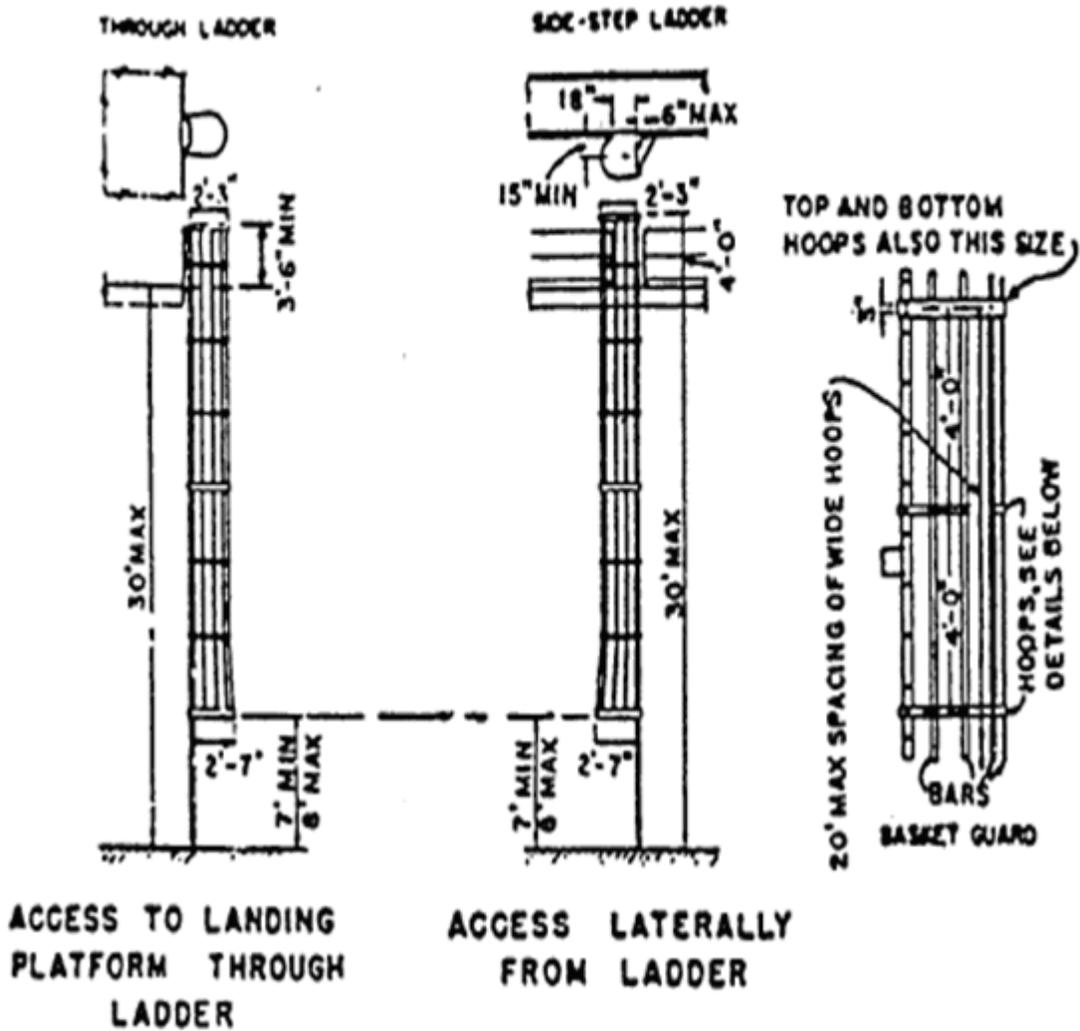
(ii) Top of cage.

The top of the cage shall extend a minimum of forty-two inches above the top of the landing.

(iii) Bottom of cage.

The bottom of the cage shall extend down the ladder to a point not less than seven nor more than eight feet above the base of the ladder, with bottom flared not less than four inches, or the portion of the cage opposite the ladder shall be carried to the base. (See figure 4123:1-5-03(C)(6)(j)(iii) to this rule.)

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(k) Ladder well.

DRAFT - NOT FOR FILING

(i) If a ladder well is provided, it shall permanently and completely enclose the climbing space and the ladder shall be securely fastened to the walls of the well.

(ii) Minimum clearance.

Ladder wells shall have a minimum clear width of fifteen inches measured each way from the center-line of the ladder. Smooth-walled wells shall be a minimum of twenty-seven inches from the centerline of the rungs, steps or treads to the well wall on the climbing side of the ladder. Where obstructions on the ~~climbside~~ climbing side of the ladder exist, there shall be a minimum clearance of thirty inches from the centerline of the rungs, steps or treads.

(7) Trolley and side-rolling ladders.

(a) Length.

Trolley ladders and side-rolling ladders longer than twenty feet shall not be provided.

(b) Width.

The width between the side rails, inside to inside, shall be not less than twelve inches.

(c) Step attachment.

Flat steps shall be inset in the side rails one-eighth inch and secured with not less than two 6-d nails at each end, or the equivalent thereof. They shall be reinforced with angle braces or a three-sixteenths-inch steel rod.

(d) Locking device.

Locking devices shall be provided on all trolley ladders.

(e) Tracks.

(i) Tracks shall be wood or metal (excluding cast iron) or a combination of these materials.

(ii) Tracks for the top end of ladders shall be fastened securely and shall be so constructed that the wheels will not jump the track.

(iii) Tracks for side-rolling ladders shall be supported by metal or wood brackets securely screwed or bolted to shelving or other permanent structure at intervals of not more than three feet.

(f) Wheel carriages.

(i) The wheel carriage shall be so designed that a loose or broken wheel will not allow the ladder to drop or become detached from the track.

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(ii) The wheel carriage for the bottom of the ladder shall be securely fastened to the bottom of the ladder.

(iii) The wheels at the upper end of the ladder shall have a minimum wheel base of eight inches.

(8) Trestle and extension trestle ladders.

(a) The width between the side rails the base of the trestle ladder and base sections of the extension trestle ladder shall be not less than twenty-one inches for all ladders and sections up to and including six feet. Longer lengths shall be increased at least one inch for each additional foot of length. The width between the side rails of the extension sections of the trestle ladder shall be not less than twelve inches.

(b) The tops of the side rails of the trestle ladder and of the base section of the extension trestle ladder shall be beveled, or of equivalent construction and shall be provided further with a metal hinge to prevent spreading.

(c) A metal spreader or locking device to hold the front and back sections in an open position, and to hold the extension section securely in the elevated position shall be a component of all extension trestle ladders and all trestle ladders over twelve feet in length.

(d) Rungs shall be parallel and level. On the trestle ladder, or on the base sections of the extension trestle ladder, rungs shall be spaced not less than eight inches or more than eighteen inches apart; on the extension section of the extension trestle ladder, rungs shall be spaced not less than six inches or more than twelve inches apart.

(e) General specifications - trestle and extension trestle ladders.

(i) Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than twenty feet in length.

(ii) The minimum distance between side rails of the trestle or extension sections or base sections at the narrowest point shall be not less than twelve inches. The width spread shall be not less than one inch per foot of length of side rail.

(9) Platform stepladder.

(a) The minimum width between side rails at the platform shall not be less than fifteen inches.

(b) The back legs and side rails shall extend at least twenty-four inches above the platform and shall be connected with a top member to form a three-sided rail, or equivalent construction shall be provided.

(c) The wood parts of a combined wood and metal platform functioning as a spreader shall not be depended upon to contribute to the spreading or locking action.

(D) Scaffolds.

(1) ~~Stationery~~ Stationary scaffolds.

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(a) Construction.

(i) Stationary scaffolds shall be substantially constructed of wood, metal or other equivalent material and shall be securely fastened.

(ii) Dimensions, structural.

Planks used in scaffolds shall be a minimum width of nine inches and a minimum thickness of two inches, scaffold grade, and shall be straight, close grained and free of visible defects, such as large knots, decay and shakes. Wooden materials of different sectional dimensions of equal strength or other material of equal strength may be used.

(b) Factor of safety.

Stationary scaffolds and their load-bearing members shall have a designed factor of safety of not less than four.

(c) Guarding.

(i) Standard guard railing and toeboards shall be provided on the unprotected sides of all stationary scaffolds which are ten feet or more above the ground or supporting area, or that are over or immediately adjacent to water, machinery or sources of danger.

(ii) Standard guard railing and toeboards shall not be required on ladder scaffolds.

(iii) When it is not practicable to install and use standard guard railing for employee protection on a scaffold, as required by this paragraph, safety harness which are properly secured to a lanyard and lifeline or a safety net properly installed, may be used instead of standard guard railings.

(d) Side screens.

Scaffolds shall be provided with a screen between the toeboard and the guardrail, extending along the entire opening, consisting of no. eighteen gauge U.S. standard wire one-half inch mesh or the equivalent, where persons are required to work or pass under the scaffolds. At a minimum, side screens shall be as high as the maximum height of material to be stored or piled on the scaffold. Side screens on scaffolds shall consist of no. eighteen gauge U.S. standard wire one-half inch mesh or the equivalent.

(e) Ladder or ramp access.

An access ladder or equivalent safe access shall be provided.

(f) Footings.

The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.

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(g) Overlap.

All planking on platforms shall be overlapped (minimum twelve inches) or shall be securely fashioned in place.

(h) End supports.

Scaffold planks shall extend over their end supports not less than six inches nor more than eighteen inches extending across the entire bearer from pole to pole. The scaffold planks shall be laid tightly with no opening greater than one inch, through which tools or materials can fall.

(i) Overhead protection.

Overhead protection shall be provided for employees on a scaffold exposed to overhead hazards.

(j) Rope.

(i) Rope (wire, fire, or equivalent) used for scaffold suspension shall have a factor of safety of not less than six.

(ii) Only treated or protected fiber rope or its equivalent shall be used on or near any work involving the use of corrosive substances or chemicals.

(k) Shore or lean-to scaffolds.

The use of shore scaffolds or lean-to scaffolds is prohibited.

(l) Lumber sizes.

Lumber sizes, when used in this paragraph, refer to nominal sizes except where otherwise stated.

(m) Securing.

Scaffolds shall be secured to permanent structures, through use of anchor bolts, reveal bolts, or other equivalent means. Window cleaners' anchor bolts shall not be used.

(2) Manually propelled mobile work platforms (ladder stands) and rolling scaffolds (towers).

Manually propelled mobile work platforms (ladder stands) and rolling platforms (towers) shall support at least four times the designed working load. The assembled components of all mobile work platforms (ladder stands) and rolling platforms (towers) shall provide a factor of safety of not less than four. Exposed surfaces shall be free from sharp edges, burrs, or other projecting parts.

(a) Work platform levels.

(i) The maximum work platform height shall not exceed four times the minimum or least base dimension of any mobile work platform (ladder stand) or rolling scaffold (tower). Where the basic

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mobile unit does not meet this requirement, outrigger frames shall be provided to meet this least base dimension, or it shall be securely fastened to prevent tipping.

- (ii) The minimum work platform width for any work level shall not be less than twenty inches for mobile scaffolds (towers). Ladder stands shall have a minimum step width of sixteen inches.
 - (iii) The supporting structure for the work platform shall be rigidly braced, using substantial cross bracing or diagonal bracing with rigid platforms at each work level.
 - (iv) The steps of ladder stands shall have slip resistant treads.
 - (v) The work platform of rolling scaffolds (towers) shall be the full width of the scaffold, except for necessary openings. Work platforms shall be securely fastened in place. All planking shall be two-inch scaffold grade lumber or equivalent.
 - (vi) Work platforms ten feet or more above the ground or floor shall have a standard guardrail with an intermediate rail and toeboard.
 - (vii) A climbing ladder or stairway shall be provided for access and egress, and shall be secured safely to or built into the scaffold and so located that its use will not tip the scaffold. A landing platform shall be provided at intervals not to exceed thirty feet.
- (b) Wheels or casters.
- (i) Wheels or casters shall support four times the designed working load.
 - (ii) Scaffold casters shall be provided with a positive wheel lock and/or swivel lock to prevent movement. Ladder stands shall have at least two of the four casters of the swivel type.
 - (iii) Where leveling of the elevated work platform is required, screw jacks or equivalent means for adjusting the height shall be provided in the base section of each mobile unit.
- (c) Mobile tubular welded frame scaffolds.
- (i) Bracing.

Scaffolds shall be braced by cross braces and/or diagonal braces for securely fastening vertical members together laterally. The cross braces shall be of a length that will automatically square and align vertical members so the erected scaffold is always plumb, square, and rigid.
 - (ii) Spacing.

Spacing of panels or frames shall provide a factor of safety of not less than four. The frames shall be placed one on top of the other with coupling or stacking pins which shall provide positive vertical alignment of the legs.
 - (iii) Locking.

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Panels Where uplift may occur, panels shall be locked together vertically by pins or be securely fastened in place by other means which shall provide equivalent rigidity.

(d) Mobile tubular welded sectional folding scaffolds.

(i) Stairway.

A stairway and work platform shall be an integral part of the structure of each sectional folding stairway scaffold.

(ii) Bracing.

A set of pivoting and hinged folding diagonal and horizontal braces and a detachable work platform shall be an integral part of the structure of each sectional folding ladder scaffold.

(iii) Sectional folding stairway scaffolds.

The width of a sectional folding stairway scaffold shall not exceed four and one-half feet. The maximum length of a sectional folding stairway scaffold shall not exceed six feet.

(iv) Sectional folding ladder scaffolds.

The width of a sectional folding ladder scaffold shall not exceed four and one-half feet. The maximum length of a sectional folding ladder scaffold shall not exceed six feet six inches for a six-foot-long unit, eight feet six inches for an eight-foot-long unit or ten feet six inches for a ten-foot-long unit.

(v) End frames.

The end frames of sectional ladder and stairway scaffolds shall be designed so that the horizontal bearers provide supports for multiple planking levels.

(e) Mobile tube and coupler scaffolds.

Couplers shall be of a structural type, such as a drop-forged steel, malleable iron or structural grade aluminum. The use of grey cast iron is prohibited.

(f) Mobile work platforms.

(i) Base width.

The minimum width of the base of mobile work platforms shall not be less than twenty inches.

(ii) Bracing.

Rigid diagonal bracing to vertical members shall be provided.

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(g) Mobile ladder stands.

(i) Base width.

The maximum length of the base section shall be the total length of combined steps and top assembly, measured horizontally, plus five-eighths inch per step of rise.

(ii) Steps.

Steps shall be uniformly spaced, and sloped, with a rise of not less than nine inches, nor more than ten inches and a depth of not less than seven inches. The slope of the steps section shall be a minimum of fifty-five degrees and a maximum of sixty degrees measured from the horizontal.

(iii) Handrails.

(a) Units having more than five steps or sixty inches vertical height to the top step shall be equipped with handrails.

(b) Handrails shall be a minimum of twenty-nine inches high. Measurements shall be taken vertically from the center of the step.

(h) Erection.

Only the manufacturer of the scaffold or its qualified designee shall be permitted to erect or supervise the erection of scaffolds exceeding fifty feet in height above the base, unless such a structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.

(E) Boatswains' chairs.

- (1) When constructed of wood, the chair seat shall be no less than twelve inches by twenty-four inches by one-inch thickness, reinforced by cleats on the underside to prevent splitting. A chair of the same size may be constructed of material of equal strength.
- (2) Seat slings shall be of no less than five-eighths-inch diameter, first grade manila rope, or its equivalent, which shall be reeved through the four seat holes so as to cross each other on the underside of the seat.
- (3) Seat slings shall be of no less than three-eighths-inch wire rope when an employee is conducting a heat-producing process, such as gas or arc welding.
- (4) The employee shall be protected by a safety belt and lifeline in accordance with paragraph (I)(6) of rule - 4123:1-5-17 of the Administrative Code. The attachment point of the lifeline to the structure shall be appropriately changed as the work progresses.
- (5) The tackle shall consist of correct size ball bearing or bushed blocks and properly spliced five-eighths-inch diameter, first grade manila rope, or equivalent.

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- (6) The roof irons or hooks shall be of proper size and design, securely installed and anchored. Tiebacks of three-quarters-inch manila rope, or its equivalent, shall serve as an additional means of anchorage, which shall be installed as nearly as possible at right angles to the face of the building and shall be ~~secured to a structurally sound portion of the building permits installation substantially at right angles to the face of the building, two tiebacks shall be used and secured at substantially equal and opposing acute angles to the right angle. Where outrigger beams, which shall consist of structural metal, or davits are used, they shall be~~ securely fastened ~~or anchored to the frame or floor system of the building or structure~~ to a chimney.

(F) Swinging scaffolds.

- (1) Swinging scaffold platforms shall be no less than twenty inches and no more than thirty-six inches wide overall. The platform shall be securely fastened to the hangers by U-bolts or by other equivalent means.
- (2) The hangers of swinging scaffolds shall be capable of sustaining four times the rated load.
- (3) When hoisting machines are used on swinging scaffolds, machines shall be of an approved design.
- (4) The ~~roofirons~~ roof irons or hooks shall be of proper size and design securely installed and anchored. Tiebacks of three-quarters-inch manila rope, or the equivalent, shall serve as an additional means of anchorage, which shall be installed as nearly as possible at right angles to the face of the building and shall be secured to a structurally sound portion of the building ~~permits installation substantially at right angles to the face of the building, two tiebacks shall be used and secured at substantially equal and opposing acute angles to the right angle. Where outrigger beams, which shall consist of structural metal, or davits are used, they shall be securely fastened or anchored to the frame or floor system of the building or structure.~~
- (5) Swinging scaffolds shall be suspended by wire, synthetic fiber, or natural fiber ropes capable of supporting no less than six times the rated load. All other components shall be capable of supporting no less than four times the rated load.
- (6) Only treated or protected fiber rope or its equivalent shall be used for or near any work involving the use of corrosive chemicals.
- (7) The sheaves of all blocks shall fit the size and type of rope used.
- (8) No more than two employees shall be required to be on a two-point suspension scaffold designed for a working load of five hundred pounds. No more than three employees shall be required to be on a two-point suspension scaffold designed for a working load of seven hundred fifty pounds.
- (9) The employer shall provide an approved safety belt or harness and lifeline for each employee working on a swinging scaffold in compliance with paragraph (I)(6) of rule 4123:1-5-17_ of the Administrative Code.
- (10) ~~Employees shall not be required to use a bridge, or to move directly, between one swinging scaffold and another. When two or more scaffolds are used they shall not be bridged one to another unless they are designed to be bridged, the bridge connections are articulated, and the hoists are properly sized. If bridges are not used, passage may be made from one platform to another only when the platforms are at the same height and are abutting.~~

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- (11) Each swinging scaffold shall be securely fastened to the building or structure at each work location to prevent it from swaying. Window cleaners' anchors shall not be used for this purpose. Tie-in anchors designed for the rated load of the scaffold may be used.
- (12) The platform of every swinging scaffold shall be capable of sustaining four times the rated load.
- (13) All swinging scaffolds shall have standard guardrails and toeboards on all unprotected sides of platforms [more than ten feet above the ground](#).
- (14) The free ends of fall lines from scaffolds shall be guarded to prevent tangling or snagging.

4123:1-5-05 Auxiliary equipment.

- (A) Reserved.
- (B) Reserved.
- (C) Power-driven conveyors - chain, bucket, belt, hook and screw.

(1) Horizontal, overhead, vertical and inclined conveyors.

(a) Overhead protection.

Where overhead conveyors carry material with a clearance of seven feet or more above the floor level, and cross designed walkways or roads, or pass over areas where employees are normally at work, a substantial barrier shall be installed to catch falling material.

(b) Screw conveyors.

In addition to the requirements of paragraph (C)(1)(a) of this rule, the auger of screw conveyors shall be operated with covers secured in place. Covers shall be solid or of wire mesh, in accordance with rule 4123:1-5-99 of the Administrative Code, and covers designed for regular removal shall be interlocked so that removal will disconnect power source.

(2) Conveyors exposed to contact.

All conveyors, where exposed to contact, shall be equipped with means to disengage them from their power supply at such points of contact.

(3) Safe means of passage.

Where employees are required to cross conveyors, a fixed platform equipped with standard guard railing and toeboards shall be provided.

(4) Pinch (nip) points.

Pinch points created by travel of conveyor belts over or around end, drive and snubber, or take-up pulleys of chain conveyors running over sprocket wheels shall be guarded or a means shall be provided

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at the pinch point to disengage the belt or chain from the source of power.

(D) Machinery control.

(1) 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.

(2) When machines are shut down.

The employer shall furnish and the employees shall use a device to lock the controls in the "off" position or the employer shall furnish and the employees shall use warning tags when machines are shut down for repair, adjusting, or cleaning.

(3) Mechanical belt shifters.

Tight and loose pulleys shall be equipped with mechanical belt shifters.

(a) Cone pulley drive belts.

Cone pulley drive belts shall be equipped with a mechanical belt shifter permanently attached.

(b) Where any part of the lower cone pulley is seven feet or less above the floor, the belt and pulley shall be guarded.

(4) Treadles or extensions.

Treadles or extensions for starting machinery shall be so located or guarded as to minimize accidental tripping.

(E) Anchoring and mounting of machinery.

(1) Stationary machinery.

All stationary machinery shall be positioned or installed on floors or foundations so to prevent walking, moving, or tipping.

(2) Portable machinery.

Portable machinery mounted upon trucks or bases shall be securely fastened thereto, and such truck or base shall be so locked or blocked as to prevent movement or shift while such machine is in operation.

(F) Counterweights.

Counterweights exposed to contact shall be guarded, or secured with safety chain or wire rope so the counterweight shall not descend to a level less than eight feet above the floor or working level, where employees are required to perform their assigned duties or where employees are required to pass through in the performance of their assigned duties.

(G) Grounding of electric-powered equipment.

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(1) Application.

This paragraph applies only to grounding of non-current carrying parts.

(2) Permanent equipment.

All permanently installed equipment and machinery connected to electric circuits in excess of eighty volts shall be permanently grounded.

(3) Portable electric tools.

Portable electric tools and equipment shall be provided with a means of grounding or shall be protected by a system of double insulation. Where such approved system is employed, the equipment shall be distinctively marked.

(H) Feed rolls.

Power-driven feed rolls, when exposed to contact, shall be guarded so as to prevent the hands of the operator from coming into contact with in-running rolls at any point.

(I) Fan blades.

Guarding - when the periphery of the blades of a fan is less than seven feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half inch.

(1) ~~Guarding.~~

~~When the periphery of the blades of a fan used for direct ventilation or cooling of employees, such as desk fans, pedestal fans, and wall fans, is less than seven feet above the floor or working level, the blades shall be guarded. The guard shall be firmly attached to its mount so that it is either permanently affixed, or tools are required for removal, or, in the case of spring-type fasteners or wingnuts, sufficient force is required for removal so that the guard device is not inadvertently removed.~~

(2) ~~Guard openings.~~

~~Any opening in a guard shall have at least one of its dimensions no greater than one inch and the distance from the guard to the blade shall be equal to or greater than the values listed in the following table to this rule.~~

~~Table 4123:1-5-05(I)(2)~~

SIZE OF OPENING IN GUARD	
Smallest dimension in guard (inches)	Minimum distance from guard to blade
Greater than 3/4 up to 1, inclusive	6 times the smallest dimension.
Greater than 1/2 up to 3/4, inclusive	4 inches.
Greater than 3/8 up to 1/2, inclusive	2 1/2 inches.
Greater than 1/4 up to 3/8, inclusive	1 1/2 inches.
Greater than 0 up to 1/4, inclusive	1/2 inch.

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(3) ~~Other fans.~~

~~Other fans, such as those used in process cooling, whose blade is less than seven feet above the floor or working level, shall meet the requirements of rule 4123:1-5-99 of the Administrative Code. The distance from the guard to the blade must be sufficient to prevent any part of any employee's body from inadvertently contacting the blade.~~

(J) Steam pipes (pressure pipes).

All steam pipes shall be covered where exposed to contact. Pipe supports or other effective means shall be provided to prevent failure from vibration, expansion, or contraction.

4123:1-5-07 Hand tools, hand-held portable powered tools, other hand-held equipment and portable safety containers.

(A) Reserved.

(B) Reserved.

(C) General requirement.

All hand tools and hand-held portable powered tools and other hand-held equipment whether furnished by the employee or the employer shall be maintained in a safe condition, free of worn or defective parts.

(D) Power saws.

(1) General.

All portable power-driven saws with blades more than two inches in diameter shall be equipped with guards above and below the base plate shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to covering position. The requirements of this paragraph do not apply to circular saws used in the meat industry for meat-cutting purposes.

(2) Portable chain saws.

(a) Portable chain saws shall have all guards and handles, provided by the manufacturer, in place, all controls functioning properly and mufflers operative.

(b) Electrically powered chain saws shall be provided with proper grounding devices.

(E) Power grinders.

Safety guards used on right angle head or vertical portable grinders shall have a maximum exposure angle of one hundred eighty degrees, and be located so as to be between the operator and wheel during use. The top half of the wheel shall be enclosed at all times.

(F) Pneumatically powered tools.

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All pneumatically powered portable tools shall be equipped with an automatic shutoff valve ("dead-man" control) so arranged as to close the air inlet valve when the pressure of the operator's hand is removed. Each tool shall be equipped with a retainer where accidental ejection is possible.

(G) Grounding.

All electrically powered portable tools with exposed noncurrent-carrying metal parts shall be grounded. Portable tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Where such an approved system is employed the equipment shall be distinctively marked.

(H) Power cut-off and pressure control devices.

(1) Woodworking tools.

Hand-held, power-driven woodworking tools shall be provided with a dead-man control, such as a spring actuated switch, valve, or equivalent device, so that the power will be automatically shut off whenever the operator releases the control.

(2) Hand-held powered tools-switches and controls.

- (a) All hand-held powered circular saws having a blade diameter greater than two inches, electric, hydraulic or pneumatic chain saws, and percussion tools without positive accessory holding means shall be equipped with a constant pressure switch or control that will shut off the power when the pressure is released. All hand-held gasoline powered chain saws shall be equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.
- (b) All hand-held powered drills, tappers, fastener drivers, horizontal, vertical and angle grinders with wheels greater than two inches in diameter, disc sanders with discs greater than two inches in diameter, belt sanders, reciprocating saws, saber, scroll, and jig saws with blade shanks greater than a nominal one-fourth inch, and other similarly operating powered tools shall be equipped with a constant pressure switch or control, and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.
- (c) All other hand-held powered tools, such as, but not limited to, platen sanders, grinders with wheels two inches in diameter or less, disc sanders with discs two inches in diameter or less, routers, planers, laminate trimmers, nibblers, shears saber, scroll, and jig saws with blade shanks a nominal one-fourth of an inch wide or less, may be equipped with either a positive "on-off" control, or other controls as described by paragraphs (H)(2)(a) and (H)(2)(b) of this rule.

(3) Use of compressed air.

The employer shall instruct the employees that compressed air shall not be used to clean themselves off.

(I) Jacks.

All jacks shall have the rated load legibly and permanently marked in a prominent location, except jacks supplied as standard equipment in passenger cars.

(J) Block and tackle equipment.

- (1) All blocks shall fit the size of rope they carry, and shall be so constructed as not to chafe the rope running through them.

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(2) Where ropes are subjected to chafing by dragging across an intervening object, such object shall be padded.

(K) Hand tools, miscellaneous.

Employers shall not issue or permit the use of unsafe hand tools, such as:

(1) Wrenches when jaws are sprung to the point that slippage occurs;

(2) Impact tools, such as drift pins, wedges, and chisels, with mushroomed heads;

(3) Tools with splintered or cracked wooden handles or wooden handles that cannot be kept tight in the tool.

(L) Portable pneumatically powered fastener tools.

(1) Except for portable pneumatically powered fastener tools authorized in paragraph (L)(2) of this rule, two separate and independent releases are required before any such tool activates. They are:

(a) A device on the muzzle that prevents activation except during the time the tool is held firmly against the work surface.

(b) A trigger or similar device that prevents activation except during the time it is held in depressed or active position by the operator.

(2) Fastener tools that do not meet the requirements of paragraph (L)(1) of this rule may be used if they comply with all of the following requirements.

(a) The tool may only be actuated by compressed air with a driving piston having an area no greater than one square inch, with an operating air pressure of no more than one hundred pounds per square inch gauge and with a driving velocity no greater than seventy-five feet per second as measured at the muzzle.

(b) The tool may only accommodate fasteners of the wire staple or pin types with a cross sectional area no greater than .00177 square inches.

(c) The tool may drive only one fastener each time the trigger or operating lever is depressed.

(3) The operator of the tool shall be furnished the personal protective equipment required in paragraph (D) of rule 4123:1-5-17 of the Administrative Code. Such protection shall also be furnished for any other employees required to work in the immediate area and who are exposed to the hazards of the operation.

(4) When not in use the tool shall be disconnected from the compressed air hose.

(5) Air hose.

Hose and hose connections used for conducting compressed air to the tool shall be designed for the pressure and service to which it is subjected.

(6) Pressure regulator.

The tool shall be equipped with a pressure regulator or other device to prevent air pressure on it from exceeding its maximum design capacity.

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(M) Portable safety containers.

~~Portable safety containers shall be provided for handling flammable liquids with a flash point (closed cup) below one hundred degrees Fahrenheit in quantities of one gallon or more. The containers shall be legibly marked "flammable".~~ Approved safety cans or department of transportation approved containers shall be used for handling and use of flammable liquids in quantities of five gallons or less.

4123:1-5-08 Power-driven saws and knives.

(A) Reserved.

(B) Reserved.

(C) Bandsaws, band resaws, and band knives.

All portions of the saw blade or band blade shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. Bandsaw wheels shall be fully enclosed. The outside of periphery of the enclosure shall be solid. The front and back of the band wheels shall be either enclosed by solid material, or by wire mesh, or perforated metal. Such mesh or perforated metal shall be not less than 0.037 inch (U.S. gage no. twenty), and the openings shall be not greater than three-eighths inch.

(D) Circular saws.

All circular saws shall have the exposed portion of the saw blade under the table guarded.

(1) Circular rip saw (manual feed).

(a) Guarding.

A hood-type guard shall be provided that will cover the exposed portion of the saw blade. When in use the hood type guard shall automatically adjust itself to the thickness of and remain in contact with the material being cut when the stock encounters the saw, or may be a fixed or manually adjusted guard, provided the space between the bottom of the guard and the material being cut does not exceed three-eighths inch at any time.

(b) Design.

The hood-type guard shall be so designed as to prevent a kickback, or a separate attachment that will prevent a kickback shall be provided. Anti-kickback devices shall be effective for all thicknesses of material that are cut.

(c) Spreader.

A spreader shall also be provided and securely fastened at the rear of the saw in alignment with the saw blade, except where a roller wheel is provided at the back of the saw. The spreader shall be slightly thinner than the saw kerf and slightly thicker than the saw disc to prevent material from squeezing the saw.

~~(d) Alternate method.~~

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~~Where the method of guarding as specified above is impossible, a substantial jig, fixture, or template may be used which is designed to keep the hands of the operator out of the danger zone.~~

(2) Circular rip saw (power feed).

(a) Guarding.

A hood-type guard shall be provided but need not rest upon the table nor upon the material being cut, but shall extend to a line not more than three-eighths of an inch above the plane formed by the bottom of the top feed rolls. This distance (three-eighths inch) may be increased to three-fourths inch, provided the lead edge of the hood is extended to be not less than five and one-half inches in front of the nip point between the front roll and the work.

(b) Spreader.

A spreader shall be provided and fastened securely at the rear of the saw in alignment with the saw blade, except where a roller wheel is provided at the back of the saw. The spreader shall be slightly thinner than the saw kerf and slightly thicker than the saw disc to prevent material from squeezing the saw.

(3) Circular cross-cut saw.

(a) Guarding.

A hood-type guard shall be provided that will cover the exposed portion of the saw blade. When in use the hood-type shall automatically adjust to the thickness of and remain in contact with the material being cut when the stock encounters the saw, or may be a fixed or manually adjusted hood or guard, provided the space between the bottom of the guard and the material being cut does not exceed three-eighths of an inch at any time.

(b) Automatic return.

A device shall be installed which shall return the saw automatically to the back of the table when released at any point of its travel. A device shall be installed which shall be designed to prevent a rebound of the saw blade.

(4) Circular resaws.

(a) Guarding.

A hood-type guard shall be provided that will cover the saw at all times, except where the material is being cut.

(b) Spreader.

A spreader shall be provided and securely fastened at the rear of the saw in alignment with the saw blade, except where a roller wheel is provided at the back of the saw. The spreader shall be slightly thinner than the saw kerf and slightly thicker than the saw disc and shall be placed not more than one-half inch from the ends of the saw teeth.

(5) Swing cutoff saws.

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The requirements of this paragraph are also applicable to sliding cutoff saws mounted above the table.

- (a) Each swing cutoff saw shall be provided with a hood that will completely enclose the upper half of the saw at the arbor end, and the point of operation at all positions of the saw. The hood shall be constructed in such a manner and of such material that it will protect the operator from flying splinters and broken saw teeth. Its hood shall be so designed that it will automatically cover the lower portion of the blade, so that when the saw is returned to the back of the table the hood will rise on top of the fence, and when the saw is moved forward the hood will drop on top of and remain in contact with the table or material being cut.
- (b) Each swing cutoff saw shall be provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel. Such a device shall not depend for its proper functioning upon any rope, cord or spring. If there is a counterweight, the bolts supporting the bar and counterweight shall be provided with cotter pins; and the counter-weight shall be prevented from dropping by either a bolt passing through both the bar and counterweight, or a bolt put together through the extreme end of the bar, or, where the counterweight does not encircle the bar, a safety chain attached to it.
- (c) Limit chains or other equally effective devices shall be provided to prevent the saw from swinging beyond the front or back edges of the table, or beyond a forward position where the gullets of the lowest saw teeth will rise above the table top.

(6) Inverted swing cutoff saws.

Inverted swing cutoff saws shall be provided with a hood that will cover the part of the saw that protrudes above the top of the table or above the material being cut. It shall automatically adjust itself to the thickness of and remain in contact with material being cut.

(7) Radial saws.

(a) Guarding.

The upper hood shall completely enclose the upper portion of the blade down to a point that will include the end of the saw arbor. The upper hood shall be constructed in such a manner and of such material that it will protect the operator from flying splinters, broken saw teeth, etc., and will deflect sawdust away from the operator. The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of the stock and remain in contact with stock being cut to give maximum protection possible for the operation being performed.

(b) Anti-kickback device.

Each radial saw used for ripping shall be provided with an anti-kickback device, which shall be designed to provide adequate holding power for all the thicknesses of material being cut.

(c) Saw rotation.

Ripping and ploughing shall be against the direction in which the saw turns. The direction of the saw rotation shall be conspicuously marked on the hood. In addition, a permanent label not less than one and one-half inches by three-fourths inch shall be affixed to the rear of the guard at approximately the level of the arbor, reading as follows: "Danger: do not rip or plough from this

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end."

(d) Automatic return.

A device shall be installed which shall return the saw automatically to the back of the table when released at any point of its travel. A device shall be installed which shall be designed to prevent a rebound of the saw blade.

(e) Positive stop.

A positive stop shall be installed which shall prevent the saw from traveling beyond the front edge of the table.

(E) Cracked saw blades.

All cracked saw blades shall be removed from service.

4123:1-5-09 Woodworking machinery.

(A) Reserved.

(B) Reserved.

(C) Jointers.

(1) Manual-feed jointers and planers - cutting head.

(a) Guarding - point of operation.

Manual-feed jointers and planers with horizontal head shall be equipped with a cylindrical cutting head, the knife projection of which shall not exceed one-eighth inch beyond the cylindrical body of the head.

(b) Table openings.

The opening in the table shall be as small as productive operation of the jointer permits. The clearance between the edge of the rear of the table and the cutter head shall ~~be~~ not ~~less~~ be more than one-eighth inch.

(c) Guards - automatic.

Manual-feed jointers and planers with horizontal cutting heads shall have an automatic guard which will:

(i) Cover the section of the head on the working side of the fence.

(ii) Automatically adjust itself to recover the cutting head after the material has passed through.

(d) Guard - cutting head back of fence or gage.

Each manual-feed jointer with horizontal cutting head shall have a guard which will cover the section of the head back of the gage or fence.

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(2) Vertical head jointers.

Each wood jointer with vertical head shall have either an exhaust hood or other guard so arranged as to guard completely the revolving head, except for a slot of such width as may be required for the application of the material to be jointed.

(D) Planer, molder, sticker, and matcher.

(1) Guarding - cutting heads.

Each planer, molder, sticker, and matcher shall have all cutting heads and saws, if used, covered by a metal guard. If such a guard is constructed of:

(a) Sheet metal - the material used shall be not less than one-sixteenth inch in thickness.

(b) Cast iron - the material used shall be not less than three-sixteenths inch in thickness.

(2) Guarding - where exhaust systems are used.

Where an exhaust system is used, the guards shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than that specified in paragraph (D)(1)(a) or (D)(1)(b) of this rule.

(3) Guarding - feed rolls.

~~Feed~~Power-driven feed rolls, when exposed to contact, shall be guarded ~~in accordance with the requirements of paragraph (H) of rule 4123:1-5-05 of the Administrative Code~~ so as to prevent the hands of the operator from coming into contact with in-running rolls at any point.

(a) Sectional in-feed rolls.

Surfaces of planers used in sizing multiple pieces of material simultaneously shall be provided with sectional in-feed rolls having sufficient yield in the construction of the sections to provide feeding contact pressure on the stock, over the permissible range of variation in stock thickness for which the machine was designed.

(b) Alternate method.

In lieu of such yielding sectional rolls, suitable section kickback finger devices shall be provided at the in-feed end.

(E) Boring and mortising machines.

(1) Guarding.

(a) Mortising machines (except hollow chisel mortisers).

Mortising machines, except hollow chisel mortisers, shall be provided with thumb stops at each side of the chisel or equivalent protection.

(b) Bits.

Bits on all automatic boring machines shall be guarded at the points of operation.

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(c) Chain mortiser.

The top of the cutting chain and driving mechanism shall be guarded.

(d) Counterweight.

~~If a counterweight is used it shall comply with the requirements of paragraph (F) of rule 4123:1-1-5-05 of the Administrative Code~~ Counterweights exposed to contact shall be guarded, or secured with safety chain or wire rope so the counterweight shall not descend to a level less than eight feet above the floor or working level, where employees are required to perform their assigned duties or where employees are required to pass through in the performance of their assigned duties.

(e) Universal joint.

Universal joints on spindles of boring machines shall ~~comply with the requirements of paragraph (E)(6) of rule 4123:1-5-04 of the Administrative Code~~ be completely enclosed in such a way as to prevent accidental contact by the operator.

(2) Chuck design.

Safety bit chucks with no projecting set screws shall be used.

(F) Stationary sanding machines.

(1) Drum sanders.

Drum sanders shall have a guard so arranged as to enclose the revolving drum, except such portion of the drum above the table (if table is used) as may be required for the application of the material to be finished. Where an exhaust system is used, the hood of the exhaust system shall be construed as comprising all, or part, of the guard.

(2) Disc sanders.

Disc sanders shall have a guard so arranged to enclose the periphery and back of the revolving disc, except such portion of the face of the disc above the table (if table is used) as may be required for the application of the material to be finished. Where an exhaust system is used, the hood of the exhaust system shall be construed as comprising all, or part, of the guard.

(3) Belt sanders.

Belt sanders shall have both pulleys guarded in such manner as to guard the points where the belt runs onto the pulleys. The edges of the unused run of the belt shall be guarded.

(4) Feed rolls of self-feed sanding machines.

~~Feed rolls of self feed sanding machines shall comply with the requirements of paragraph (H) of rule 4123:1-5-05 of the Administrative Code~~ Power-driven feed rolls, when exposed to contact, shall be guarded so as to prevent the hands of the operator from coming into contact with in-running rolls at any point.

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(G) Wood shapers.

(1) Guarding.

(a) Cutting heads.

(i) The cutting heads of each wood shaper, hand-fed panel raiser or other similar machine, not automatically fed, shall be guarded. The diameter of circular shaper guards shall be not less than the greatest diameter of the cutter.

(ii) When single cutter knives in shaper heads are used, the shaper heads shall be balanced.

(b) Alternate method.

A substantial jig, fixture, or template may be used which is designed to keep the hands of the operator out of the danger zone.

(2) Starting and stopping devices.

All shapers shall be provided with a spindle starting and stopping device for each spindle.

(H) Tenoners.

Tenoners shall have all cutting heads or saws guarded. An exhaust hood may comprise part or all of the guard. If such a guard is constructed of sheet metal, the material used shall be not less than one-sixteenth inch in thickness, and if cast iron is used, it shall be not less than three-sixteenths inch in thickness.

(I) Lathes.

Each profile and swing-head lathe shall have the cutting head guarded. An exhaust hood may comprise all, or part, of the guard.

(J) Veneer machinery and equipment.

(1) Vats and soaking pits.

(a) Guarding.

Sides of vats and soaking pits shall extend to a height of not less than thirty-six inches above the working floor level. When loading or unloading operations are performed from the sides and/or ends of vats and soaking pits, standard guard railing and toeboards shall be installed.

(b) Walkways between sections.

Large vats and soaking pits divided into sections shall be provided with substantial walkways between sections. Each walkway shall be provided with a standard guard railing.

(2) Drag saws.

Drag saws shall be so located as to give at least four feet clearance for passage when the saw is at extreme end of stroke or if such clearance is not obtainable, the saw and its driving mechanism shall be guarded.

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(3) Clippers and wringers.

(a) Clippers.

Veneer clippers shall have automatic feed or shall be provided with a guard when stock is manually fed or removed.

(b) Wringers.

In-running sides of veneer wringers shall be guarded leaving only sufficient space to insert stock.

(K) Cooperage machinery.

(1) Bolt, stave and heading equalizers.

Each bolt, stave and heading equalizer shall have the saws guarded except that portion immediately adjacent to the feeding device.

(2) Barrel stave saws.

Each machine of this type shall have the saw and the revolving part to which the saw blade is bolted, guarded, except that part of the saw immediately adjacent to the feeding device.

(3) Heading, rip, flat-stave and head-rounders.

All machines coming under this heading shall have the saws guarded.

(4) Stave and heading planers.

All cutting heads and knives of single and double planers shall be guarded. An exhaust hood may comprise all or part of the guard.

(5) Stave jointing machines (wheel).

Machines for jointing staves shall be guarded.

(6) Stave croziers.

The cutting heads shall be guarded except that part which actually imbeds itself in the stock.

(7) Pail and barrel lathes.

The requirements of paragraph (I) of rule 4123:1-5-09 of the Administrative Code, Lathes, where applicable, shall govern the guarding of pail and barrel lathes.

(L) Miscellaneous woodworking machines.

(1) Combination or universal woodworking machines.

(a) Guarding.

Each point of operation shall be guarded as required for such a tool in a separate machine.

(b) Stopping and starting devices.

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Such machines shall be provided with a separate stopping and starting device for each separate operation.

(2) Routers.

The pulleys, spindles, and cutting tools shall be guarded. Turnplates, jigs, and fixtures which keep the operator's hands out of the danger zone may be provided as an alternative.

(3) Glue spreaders (roll type).

The feed rolls shall be guarded. The bottom of the guard shall be not more than three-eighths inch above a plane formed by the contact face of the feed roll where it contacts the stock.

4123:1-5-10 Mechanical power presses.

(A) Scope.

The requirements of this rule pertain to mechanical power presses. Excluded from the requirements of this rule are press brakes (when used for bending, see paragraph (F) of this rule), hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators. For guarding of these excluded machines, see rule 4123:1-5-11 of the Administrative Code.

(B) Reserved.

(C) Mechanical power press guarding.

(1) Brakes.

Friction brakes provided for stopping or holding the slide movement shall be inherently self-engaging by requiring power or force from an external source to cause disengagement. Brake capacity shall be sufficient to stop the motion of the slide quickly and capable of holding the slide and its attachments at any point in its travel.

(2) Machines using full revolution clutches.

(a) Single-stroke mechanism.

Machines using full revolution clutches shall incorporate a single-stroke mechanism.

(b) Compression-type springs.

If the single-stroke mechanism is dependent upon spring action, the spring(s) shall be of the compression type, operating on a rod or guided within a bore or tube and designed to prevent interleaving of the spring coils in event of breakage.

(c) Two-hand trip.

A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement

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requiring concurrent operation of the individual operator's hand controls.

(d) Anti-repeat feature.

Two-hand trip systems on full revolution clutch machines shall incorporate an anti-repeat feature.

(e) Multiple-station presses.

Where two-hand trip systems are used on multiple-station presses, there shall be a separate set of controls for each assigned employee.

(3) Foot pedals (treadle).

(a) Pedal mechanism.

The pedal mechanism shall be protected to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal.

(b) Pedal return springs.

If pedal return springs are provided they shall be of the compression type, operating on a rod or guided within a bore or tube, and designed to prevent interleaving of spring coils in event of breakage.

(c) Pedal counterweights.

If pedal counterweights are provided, the path of the travel of the weight shall be enclosed.

(4) Hand-operated levers.

(a) Spring latch.

Hand-lever-operated power presses shall be equipped with a spring latch on the operating lever to prevent premature or accidental tripping.

(b) More than one operating station.

The operating levers on hand-tripped presses having more than one operating station shall be interlocked to prevent the tripping of the press except by the concurrent use of all levers.

(5) Machines using part revolution clutches.

(a) Clutch/brake control.

The clutch shall release and the brake shall be applied when the external clutch engaging means is removed, deactivated or deenergized.

(b) Stop control.

A red color stop control shall be provided with the clutch/brake control system. Momentary operation of the stop control shall immediately deactivate the clutch and apply the brake. The stop control shall override any other control, and reactivation of the clutch shall require use of the operating (tripping) means which has been selected.

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(c) Control selection.

A means of selecting "off," "inch," "single stroke," and "continuous" (when the "continuous" function is furnished) shall be supplied with the clutch/brake control to select type of operation of the press.

(d) Inch operating means.

An inch operating means shall be provided and shall prevent exposure of the employee's hands within the point of operation by:

- (i) Requiring the concurrent use of both hands to actuate the clutch, or
- (ii) Being a single control protected against accidental actuation and so located that the employee cannot reach into the point of operation while operating the single control.

(e) Two-hand controls for single stroke.

Two-hand controls for single stroke shall conform to the following requirements:

- (i) All controls shall be protected against unintended operation.
- (ii) The two-hand control system shall permit an adjustment which will require concurrent pressure from both hands during the die closing portion of the stroke.
- (iii) The two-hand control system shall incorporate an anti-repeat feature.
- (iv) The control system shall require the operator to release all hand controls before an interrupted stroke can be resumed.
- (v) Where two-hand trip controls are used on multiple-station presses, there shall be a separate set of controls for each designated employee. Controls shall be activated and deactivated in sets of two. The clutch/brake control system shall prevent actuation of the clutch if all operating stations are bypassed.
- (vi) The starting of a continuous run shall require a separate action by the operator in addition to the setting for continuous stroking of the press before actuation of the operating controls will result in continuous stroking.
- (vii) If foot control is provided, the selection method between foot or hand control shall be separate from the stroking selector and shall be designed so that the selection may be supervised by the employer.
- (viii) Foot-operated controls shall be guarded to prevent accidental operation.
- (ix) Clutch/brake control systems shall automatically deactivate in the event of failure of power or pressure supply for clutch engaging or failure of air supply. Reactivation shall require restoration of normal power or air and the use of the tripping mechanisms.
- (x) Turnover bar operation shall be performed only when the power source is deenergized.

(6) Electrical.

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(a) Disconnect switch.

A main power disconnect switch capable of being locked only in the "off" position shall be provided with every power press control system.

(b) Motor start button.

The motor start button shall be protected against accidental operation.

(c) Drive motor starter.

All mechanical power press controls shall incorporate a type of drive motor starter that will disconnect the drive motor from the [power source in the event of control voltage or power source failure](#), and require operation of the motor start button to restart the motor when voltage conditions are restored to normal.

(d) Accidental ground.

All clutch/brake control electrical circuits shall be protected against the possibility of an accidental ground in the control circuit causing false operation of the press.

(7) Slide counterbalance systems.

(a) Spring counterbalance systems.

Spring counterbalance systems when used shall:

- (i) Incorporate means to retain system parts in event of breakage, and
- (ii) Have the capability to hold the slide and its attachments at midstroke, without brake applied.

(b) Air counterbalance cylinders.

Air counterbalance cylinders shall:

- (i) Incorporate means to retain the piston and rod in case of breakage or loosening;
- (ii) Have adequate capability to hold the slide and its attachments at any point in stroke, without brake applied; and
- (iii) Incorporate means to prevent failure of capability (sudden loss of pressure) in event of air supply failure.

(8) Air controlling equipment.

Air controlling equipment shall be protected against foreign material and water entering the pneumatic system of the press. A means of air lubrication shall be provided when needed.

(9) Hydraulic equipment.

The maximum anticipated working pressures in any hydraulic system on a mechanical power press shall not exceed the safe working pressure rating of any component used in that system.

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(10) Pressure vessels.

All pressure vessels used in conjunction with power presses shall conform to the "American Society of Mechanical Engineers Code for Pressure Vessels, 1968 Edition."

(11) Control reliability.

When required by paragraph ~~(C)(2)(e)~~ (D)(5) of this rule, the control system shall operate so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but shall prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system. This requirement does not apply to those elements of the control system which have no effect on the protection against point of operation injuries.

(12) Brake system monitoring.

When required by paragraph (D)(5) of this rule, the brake monitor shall:

- (a) Automatically prevent the activation of a successive stroke if the stopping time or braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements set forth in paragraphs (D)(3)(c)(v) and (D)(3)(g)(iii) of this rule.

The brake monitor used with the type B gate or movable barrier device shall be installed in a manner to detect slide top-stop overrun beyond the limit established by the employer.

- (b) Indicate when the performance of the braking system has deteriorated to the extent described in paragraph (C)(12)(a) of this rule; and
- (c) Monitor the brake system performance on each stroke.

(D) Safeguarding the point of operation.

(1) General requirements.

- (a) It shall be the responsibility of the employer to provide and require the usage of "point of operation guards" or properly applied and adjusted "point of operation devices" on every operation performed on a mechanical press. (See table 4123:1-5-10(D) to this rule.)
- (b) The requirement of paragraph (D)(1)(a) of this rule shall not apply when the point of operation opening is one-fourth inch or less. (See table 4123:1-5-10 (D) to this rule.)

(2) Point of operation guards.

- (a) Every point of operation guard shall meet the following requirements:
 - (i) It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under, or around the guard;
 - (ii) It shall conform to the maximum permissible openings of table 4123:1-5-10(D) to this rule;
 - (iii) It shall, in itself, create no pinch point between the guard and moving machine parts;

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- (iv) It shall utilize fasteners not readily removable by the operator, so as to minimize the possibility of misuse or removal of essential parts;
 - (v) It shall be easy to inspect; and
 - (vi) It shall offer maximum visibility of the point of operation consistent with the other requirements.
- (b) When used, a die enclosure guard shall be attached to the die shoe or stripper or both in a fixed position.
- (c) When used, a fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.
- (d) Interlocked press barrier guard.
- (i) When used, an interlocked press barrier guard shall be attached to the press frame or bolster plate and shall be interlocked with the press clutch control so that the clutch cannot be activated during normal production unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of table 4123:1-5-10(D) to this rule.
 - (ii) The hinged or movable sections of an interlocked press barrier guard shall not be used to actuate the press during manual feeding. The guard shall prevent opening of the interlocked section and reaching into the point of operation prior to the die closure or prior to the cessation of slide motion. See paragraph (D)(3)(b) of this rule regarding manual feeding through interlocked press barrier devices.

~~Table 4123:1-5-10(D)~~

Distance of opening from point of operation hazard- (inches)-	Maximum width of opening (inches)
1/2 to 1 1/2	1/4
1 1/2 to 2 1/2	3/8
2 1/2 to 3 1/2	1/2
3 1/2 to 5 1/2	5/8
5 1/2 to 6 1/2	3/4
6 1/2 to 7 1/2	7/8
7 1/2 to 12 1/2	1 1/4
12 1/2 to 15 1/2	1 1/2
15 1/2 to 17 1/2	1 7/8
17 1/2 to 31 1/2	2 1/8

~~This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).~~

~~The clearance line marks the distance required to prevent contact between guard and moving parts.~~

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~~The minimum guarding line is the distance between the infeed side of the guard and the danger line which is one half inch from the danger line.~~

~~The various openings are such that for average size hands an operator's fingers will not reach the point of operation.~~

~~After installation of point of operation guards and before a job is released for operation a check should be made to verify that the guard will prevent the operator's hands from reaching the point of operation.~~

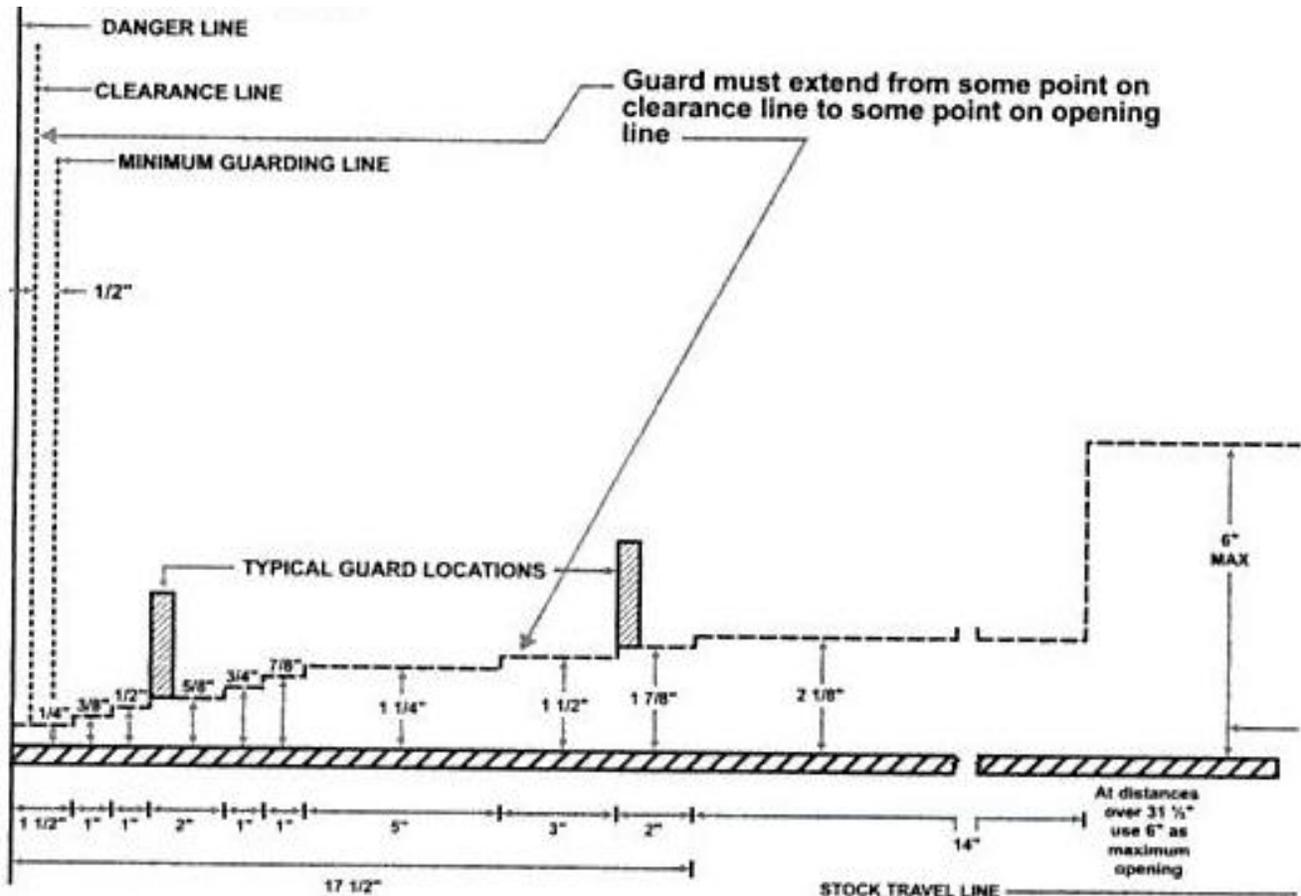
- (e) When used, the adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with table 4123:1-5-10(D) to this rule and the requirements of this paragraph.
- (f) A point of operation enclosure which does not meet the requirements of paragraphs (D)(2)(a) to (D)(2)(e) of this rule and table 4123:1-5-10(D) to this rule shall be used only in conjunction with point of operation devices.

Table 4123:1-5-10(D)

<u>Distance of opening from point of opening from point of operation hazard (inches)</u>	<u>Maximum width of opening (inches)</u>
<u>1/2 to 2-1/2</u>	<u>1/4</u>
<u>1-1/2 to 2-1/2</u>	<u>3/8</u>
<u>2-1/2 to 3-1/2</u>	<u>1/2</u>
<u>3-1/2 to 5-1/2</u>	<u>5/8</u>
<u>5-1/2 to 6-1/2</u>	<u>3/4</u>
<u>6-1/2 to 7-1/2</u>	<u>7/8</u>
<u>7-1/2 to 12-1/2</u>	<u>1-1/4</u>
<u>12-1/2 to 15-1/2</u>	<u>1-1/2</u>
<u>15-1/2 to 17-1/2</u>	<u>1-7/8</u>
<u>17-1/2 to 31-1/2</u>	<u>2-1/8</u>

This table shows the distance guards shall be positioned from the danger line in accordance with the required opening

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This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).

The clearance line marks the distance required to prevent contact between guard and moving parts.

The minimum guarding line is the distance between the infeed side of the guard and the danger line which is one-half inch from the danger line.

The various opening are such that for average size hands an operator's fingers will not reach the point of operation.

After installation of point of operation guards and before a job is released for operation a check should be made to verify that the guard will prevent the operator's hands from reaching the point of operation.

(3) Point of operation devices.

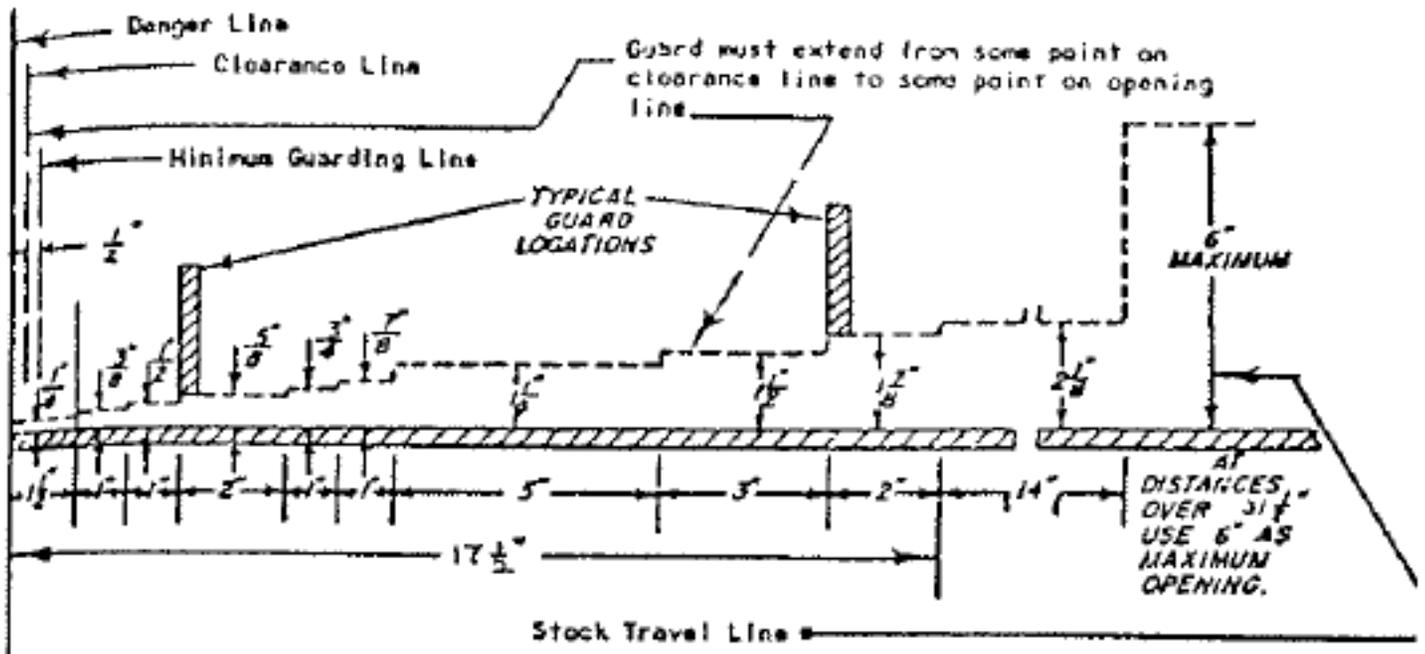
(a) Point of operation devices shall protect the operator by:

(i) Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation; or

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Table 4121:1-5-10(D)

Distance of opening from point of operation hazard (inches)	Maximum width of opening (inches)
1/2 to 1-1/2	1/4
1-1/2 to 2-1/2	3/8
2-1/2 to 3-1/2	1/2
3-1/2 to 5-1/2	5/8
5-1/2 to 6-1/2	3/4
6-1/2 to 7-1/2	7/8
7-1/2 to 12-1/2	1-1/4
12-1/2 to 15-1/2	1-1/2
15-1/2 to 17-1/2	1-3/8
17-1/2 to 31-1/2	2-1/8



This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).

The clearance line marks the distance required to prevent contact between guard and moving parts.

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The minimum guarding line is the distance between the infeed side of the guard and the danger line which is one half inch from the danger line.

The various openings are such that for average size hands an operator's fingers will not reach the point of operation.

After installation of point of operation guards and before a job is released for operation a check should be made to verify that the guard will prevent the operator's hands from reaching the point of operation.

- (ii) Preventing the operator from inadvertently reaching into the point of operation or withdrawing his hands if they are inadvertently located in the point of operation, as the dies close; or
 - (iii) Preventing the operator from inadvertently reaching into the point of operation at all times; or
 - (iv) Requiring application of both of the operator's hands to machine operating controls and locating such controls at such a safety distance from the point of operation that the slide completes the downward travel or stops before the operator can reach into the point of operation with his hands; or
 - (v) Enclosing the point of operation before a press stroke can be initiated and maintaining this closed condition until the motion of the slide has ceased; or
 - (vi) Enclosing the point of operation before a press stroke can be initiated, so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.
- (b) A gate or movable barrier device shall protect the operator as follows:
- (i) A type A gate or movable barrier device shall protect the operator in the manner specified in paragraph (D)(3)(a)(v) of this rule; and
 - (ii) A type B gate or movable barrier device shall protect the operator in the manner specified in paragraph (D)(3)(a)(vi) of this rule.
- (c) A presence sensing point of operation device shall protect the operator as provided in paragraph (D)(3)(a)(i) of this rule, and shall be interlocked into the control circuit to prevent or stop slide motion if the operator's hand or other part of his body is within the sensing field of the device during the down-stroke of the press slide.
- (i) The device shall not be used on machines using full revolution clutches.
 - (ii) The device shall not be used as a tripping means to initiate slide motion.
 - (iii) The device shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent the initiation of a successive stroke until the failure is corrected. The failure shall be indicated by the system.
 - (iv) Muting (bypassing of the protective function) of such device, during the up-stroke of the press slide, is permitted for the purpose of parts ejection, circuit checking and feeding.
 - (v) The safety distance ~~(D(s))~~ (D_s) from the sensing field to the point of operation shall be greater

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than the distance determined by the following formula:

~~D(s)~~D_s = sixty-three inches/second - ~~X~~X ~~T(s)~~T_s; where:

~~D(s)~~D_s = minimum safety distance (inches); sixty-three inches/second = hand speed constant; and

~~T(s)~~T_s = stopping time of the press measured at approximately ninety degree position of crankshaft rotation (seconds).

- (vi) Guards shall be used to protect all areas of entry to the point of operation not protected by the presence sensing device.
- (d) The pull-out device shall protect the operator as specified in paragraph (D)(3)(a)(ii) of this rule and shall include attachments for each of the operator's hands.
 - (i) Attachments shall be connected to and operated only by the press slide or upper die.
 - (ii) Attachments shall be adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close.
 - (iii) A separate pull-out device shall be provided for each operator if more than one operator is used on a press.
- (e) Sweep devices shall not be used.
- (f) A holdout or restraint device shall protect the operator as specified in paragraph (D)(3)(a)(iii) of this rule and shall include attachments for each of the operator's hands. Such attachments shall be securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation. A separate set of restraints shall be provided for each operator if more than one is required on a press.
- (g) The two-hand control device shall protect the operator as specified in paragraph (D)(3)(a)(iv) of this rule.
 - (i) When used in press operations requiring more than one operator, separate two-hand controls shall be provided for each operator and shall be designed to require concurrent application of all controls to activate the slide. The removal of a hand from any control button shall cause the slide to stop.
 - (ii) Each two-hand control shall meet the construction requirements of paragraph (C)(5)(e) of this rule.
 - (iii) The safety distance (~~D(s)~~D_s) between each two-hand control device and the point of operation shall be greater than the distance determined by the following formula:

~~D(s)~~D_s = sixty-three inches/second - ~~X~~X ~~T(s)~~T_s; where:

~~D(s)~~D_s = minimum safety distance (inches); sixty-three inches/second = hand speed constant; and

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~~T(s)~~T_s = stopping time of the press measured at approximately ninety degree position of crankshaft rotation (seconds).

- (h) The two-hand trip device shall protect the operator as specified in paragraph (D)(3)(a)(iv) of this rule.
- (i) When used in press operations requiring more than one operator, separate two-hand trips shall be provided for each operator, and shall be designed to require concurrent application of all operators to activate the slide.
 - (ii) Each two-hand trip shall meet the construction requirements of paragraph (C)(5)(e) of this rule.
 - (iii) The safety distance (~~D(m)~~D_m) between the two-hand trip and the point of operation shall be greater than the distance determined by the following formula:

~~D(m)~~D_m = sixty-three inches/second ~~X~~x ~~T(m)~~T_m; where:

~~D(m)~~D_m = minimum safety distance (inches); sixty-three inches/second = hand speed constant; and

~~T(m)~~T_m = the maximum time the press takes for the die closure after it has been tripped (seconds). ~~For full revolution clutch presses with only one engaging point, T(m) is equal to the time necessary for one and one-half revolutions of the crank shaft. For full revolution clutch presses with more than one engaging point, T(m) shall be calculated as follows: T(m) = [1/2 + (one divided by number of engaging points per revolution)] x time necessary to complete one revolution of the crankshaft (seconds).~~

For full revolution clutch presses with only one engaging point, T_m is equal to the time necessary for one and one-half revolutions of the crank shaft. For full revolution clutch presses with more than one engaging point, T_m shall be calculated as follows:

$T_m = [1/2 + (\text{one divided by number of engaging points per revolution})] \times \text{time necessary to complete one revolution of the crankshaft (seconds)}$.

(4) Hand-feeding tools.

Hand-feeding tools are intended for placing and removing materials in and from the press. Hand-feeding tools are not a point of operation guard or protection device and shall not be used in lieu of the guards or devices required in this paragraph.

(5) Additional requirements for safeguarding.

Where the operator feeds or removes parts by placing one or both hands in the point of operation, and a two-hand control, presence sensing device, type B gate, or movable barrier (on a part revolution clutch) is used for safeguarding:

- (a) The employer shall use a control system and a brake monitor which comply with paragraphs (C)(11) and (C)(12) of this rule;
- (b) The control of air clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the opening valve mechanism, and to inhibit further operation

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if such failure does occur, where a part revolution clutch is employed.

(E) Design, construction, setting, and feeding of dies.

(1) General requirements.

The employer shall furnish and require the use of hand tools for freeing and removing stuck work or scrap pieces from the dies, so that no employee need reach into the point of operation for such purposes.

(2) Scrap handling.

The employer shall provide means for handling scrap from roll feed or random length stock operations. Scrap cutters used in conjunction with scrap handling systems shall be safeguarded in accordance with paragraph ~~(C)~~ (D) of this rule.

(3) Guide post hazard.

The hazard created by a guide post (when it is located in the immediate vicinity of the operator) when separated from its bushing by more than one-fourth inch shall be considered as a point of operation hazard and be protected in accordance with paragraph (D) of this rule.

(4) Unitized tooling.

If unitized tooling is used, the opening between the top of the punch holder and the face of the slide, or striking pad, shall be safeguarded in accordance with the requirements of paragraph ~~(C)~~ (D) of this rule.

(5) Weight designation.

All dies shall be stamped to indicate complete die weight when handling equipment may become overloaded.

(6) Die fastening.

Provision shall be made in both the upper and lower shoes for securely mounting the die to the bolster plate and slide. Where clamp caps or setscrews are used in conjunction with punch stems, additional means of securing the upper shoe to the slide shall be used.

(7) Die handling.

Handling equipment attach points shall be provided on all dies requiring mechanical handling.

(8) Diesetting.

- (a) The employer shall provide spring loaded turnover bars for presses designed to accept such turnover bars.
- (b) The employer shall provide die stops or other means to prevent losing control of the die while setting or removing dies in presses which are inclined.
- (c) The employer shall provide and require the use of safety blocks for use whenever dies are being adjusted or repaired in the press.

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(d) The employer shall provide and require the use of brushes, swabs, lubricating rolls, and automatic, or manual pressure guns to lubricate material, punches or dies.

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

The requirements of this rule shall be applicable to power press brakes when used for other than bending operations.

(G) Hydraulic and pneumatic presses.

Hydraulic and pneumatic presses shall be guarded in accordance with paragraph (E) of rule 4123:1-5-11 of the Administrative Code.

(H) Exceptions.

The requirements set forth in this rule shall not apply to setting up or trying out dies.

4123:1-5-12 Abrasive grinding and cutting, polishing and wire buffing equipment.

(A) Reserved.

(B) Reserved.

(C) Responsibility.

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

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

(D) Abrasive wheel machinery.

(1) General requirements.

(a) Machine guarding.

Abrasive wheels shall be used only on machines provided with safety guards as defined in the following paragraphs of this rule, except:

(i) Wheels used for internal work while within the work being ground;

(ii) Mounted wheels, used in portable operations, two inches and smaller in diameter; and

(iii) Types 16, 17 and 18R and 19 cones, plugs, and threaded hole pot balls where the work offers protection (see appendix to this rule.)

(b) Guard design.

The safety guard shall cover the spindle end, nut, and flange projections. The safety guard shall be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard, except:

(i) Safety guards on all operations where the work provides protection to the operator, may be so

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constructed that the spindle end, nut, and outer flange are exposed; and where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted; and

- (ii) The spindle end, nut and outer flange may be exposed on machines, designed as portable saws, when used with abrasive wheels.

(c) Flanges.

Grinding machines shall be equipped with flanges in accordance with paragraph (D)(3) of this rule.

(d) Work rests.

- (i) On off-hand grinding machines (see appendix to this rule) work rests shall be used to support the work. They shall be of rigid construction and designed to be adjustable to compensate for wheel wear. Work rests shall be kept adjusted to a maximum opening of one-eighth inch to prevent the work from being jammed between the wheel and the rest. The employer shall instruct the employee to securely clamp the work rest after each adjustment. The employer shall also instruct the employee not to adjust the work rest with the wheel in motion.
- (ii) The work rest shall be used to support the work wherever practicable.
- (iii) Wherever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, work rests need not be used.

(e) Excluded machinery.

Natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface are not covered by paragraph (D) of this rule.

(2) Guarding of abrasive wheel machinery.

(a) Cup wheels.

Cup wheels types 6 and 11 (see appendix to this rule) shall be protected by:

- (i) Safety guards as specified in paragraph (D)(2)(a)(i) of this rule, applies to paragraphs (D)(2)(a) to (D)(2)(j) of this rule;
- (ii) Band type guards as specified in paragraph (D)(2)(k) of this rule; and
- (iii) Special "revolving cup guards" which mount behind the wheel and turn with it. They shall be made of steel or other material with strength enough to withstand the shock of the bursting wheel and shall enclose the wheel sides upward from the back for one-third of the wheel thickness. The mounting features shall conform with all requirements of paragraph (D) of this rule. It is necessary to maintain clearance between the wheel side and the guard. This clearance shall not exceed one-sixteenth inch.

(b) Guard exposure angles.

The maximum exposure angles specified in paragraphs (D)(2)(a) to (D)(2)(h) of this rule shall not be exceeded. Visors or other ~~necessary~~ accessory equipment shall not be included as a part of the

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guard when measuring the guard opening, unless such equipment has strength equal to that of the guard.

(c) Bench and floor stands.

- (i) The angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as bench and floor stands shall not exceed ninety degrees or one-fourth of the periphery. This exposure shall begin at a point not more than sixty-five degrees above the horizontal plane of the wheel spindle (see figures 12-1 and 12-2 to this rule, and paragraph (D)(2)(i) of this rule).



Figure 12-1

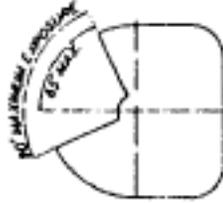


Figure 12-2

- (ii) Where the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure shall not exceed one hundred twenty-five degrees (see figures 12-3 and 12-4 to this rule).

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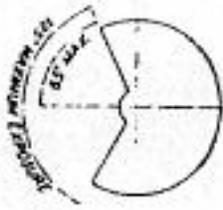


Figure 12-3

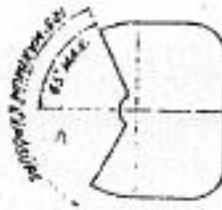
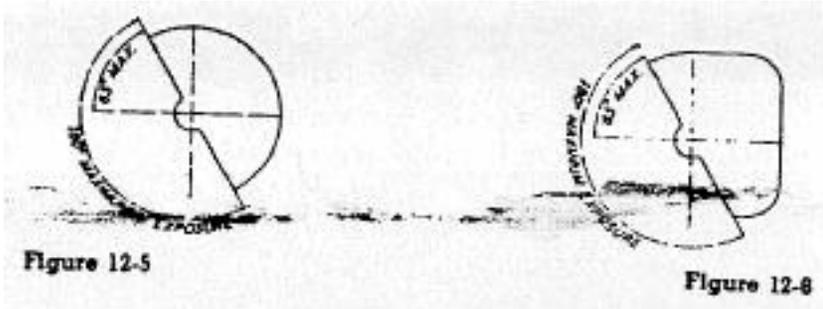


Figure 12-4

(d) Cylindrical grinders.

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cylindrical grinding machines shall not exceed one hundred eighty degrees. This exposure shall begin at a point not more than sixty-five degrees above the horizontal plane of the wheel spindle (see figures 12-5 and 12-6 to this rule, and paragraph (D)(2)(i) of this rule).

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(e) Surface grinders and cutting-off machines.

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cutting-off machines and on surface grinding machines which employ the wheel periphery shall not exceed one hundred fifty degrees. This exposure shall begin at a point not less than fifteen degrees below the horizontal plane of the wheel spindle (see figures 12-7 and 12-8 to this rule).

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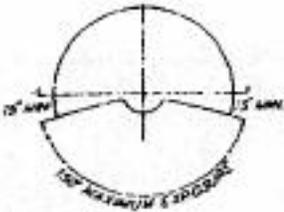


Figure 12-7

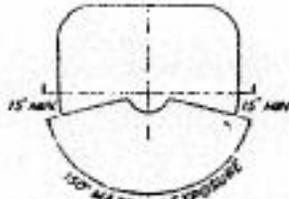


Figure 12-8

(f) Swing frame grinders.

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as swing frame grinding machines shall not exceed one hundred eighty degrees, and the top half of the wheel shall be enclosed at all times (see figures 12-9 and 12-10 to this rule).

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(g) Automatic snagging machines.

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on grinders known as automatic snagging machines shall not exceed one hundred eighty degrees and the top half of the wheel shall be enclosed at all times (see figures 12-9 and 12-10 to this rule).

(h) Top grinding.

Where the work is applied to the wheel above the horizontal centerline, the exposure of the grinding wheel periphery shall not exceed sixty degrees (see figures 12-11 and 12-12 to this rule).

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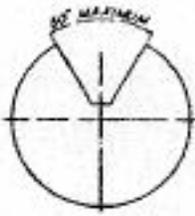


Figure 12-11

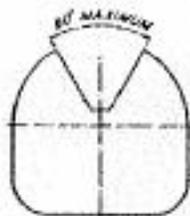


Figure 12-12

(i) Exposure adjustment.

Safety guards of the type described in paragraphs (D)(2)(c) and (D)(2)(d) of this rule, where the operator stands in front of the opening, shall be constructed so that the peripheral protecting member can be adjusted to the constantly decreasing diameter of the wheel. The maximum angular exposure above the horizontal plane of the wheel spindle as specified in paragraphs (D)(2)(c) and (D)(2)(d) of this rule shall never be exceeded, and the distance between the wheel periphery member at the top shall never exceed one-fourth inch (see figures 12-13, 12-14, 12-15, 12-16, 12-17 and 12-18 to this rule).

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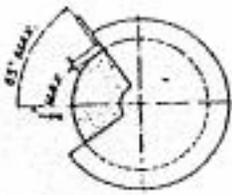


Figure 12-13

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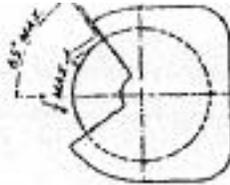


Figure 12-14

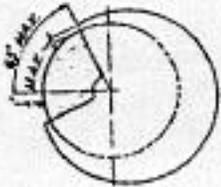


Figure 12-15

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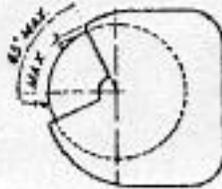


Figure 12-16



Figure 12-17

INCORRECT



Figure 12-18

(j) Material requirements and minimum dimensions.

- (i) See figures 12-31 and 12-32 and table 12-J to this rule for minimum basic thickness of peripheral and side members for various types of safety guards and classes of service.
- (ii) If operating speed does not exceed eight thousand surface feet per minute cast iron safety guards, malleable iron guards or other guards as described in paragraph (D)(2)(j)(iii) of this rule shall be used.
- (iii) Cast steel, or structural steel safety guards as specified in figures 12-31 and 12-32 and table 12-J to this rule shall be used where operating speeds of wheels are faster than eight thousand surface feet per minute up to a maximum of sixteen thousand surface feet per minute.
- (iv) For cutting-off wheels sixteen inches diameter and smaller and where speed does not exceed sixteen thousand surface feet per minute, cast iron or malleable iron safety guards as specified in figures 12-31 and 12-32 to this rule, and in table 12-J to this rule shall be used.
- (v) For cutting-off wheels larger than sixteen inches diameter and where speed does not exceed fourteen thousand two hundred surface feet per minute, safety guards as specified in figures 12-22 and 12-23 to this rule and in table 12-A to this rule shall be used.

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(vi) For thread grinding wheels not exceeding one inch in thickness cast iron or malleable iron safety guards as specified in figures 12-31 and 12-32 to this rule and in table 12-J to this rule shall be used.

(k) Band type guards - specifications.

Band type guards shall conform to the following specifications:

- (i) The bands shall be of steel plate or other material of equal or greater strength. They shall be continuous, the ends being either riveted, bolted, or welded together in such a manner as to leave the inside free from projections.
- (ii) The inside diameter of the band shall not be more than one inch larger than the outside diameter of the wheel, and shall be mounted as nearly concentric with the wheel as practicable.
- (iii) The band shall be of sufficient width and its position kept so adjusted that at no time will the wheel protrude beyond the edge of the band a distance greater than that indicated in figure 12-24 and table 12-B to this rule or the wall thickness (W), whichever is smaller.

(3) Flanges.

(a) General requirements.

(i) All abrasive wheels shall be mounted between flanges which shall not be less than one-third the diameter of the wheel.

(ii) Exceptions.

(a) Mounted wheels;

(b) Portable wheels with threaded inserts or projecting studs;

(c) Abrasive discs (inserted nut, inserted washer and projecting stud type);

(d) Plate mounted wheels;

(e) Cylinders, cup, or segmental wheels that are mounted in chucks;

(f) Types 27 and 28 wheels;

(g) ~~Internal~~Certain internal wheels, ~~less than two inches in diameter~~;

(h) Modified types 6 and 11 wheels (terrazzo);

(i) Cutting-off wheels, types 1 and 27A (see paragraphs (D)(3)(a)(ii)(i)(i) and (D)(3)(a)(ii)(i)(ii) of this rule);

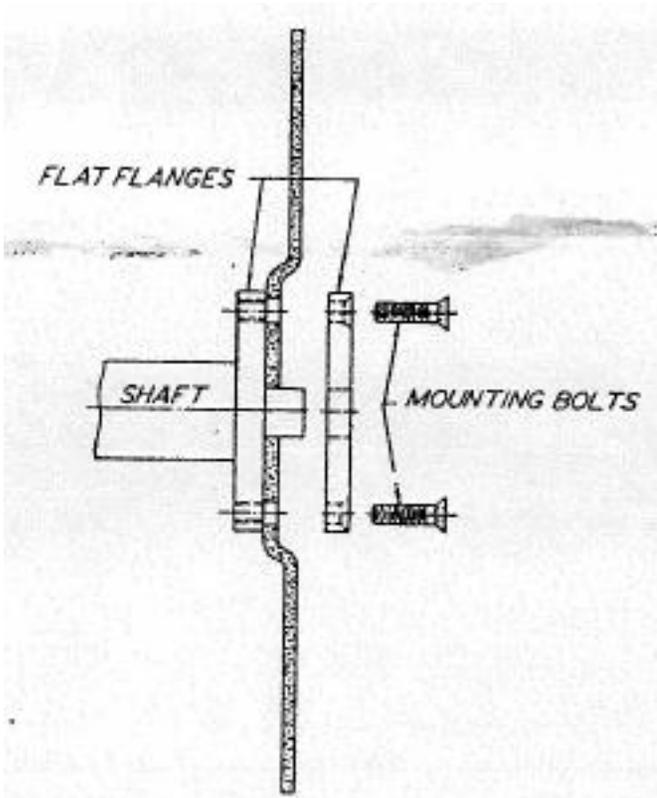
(i) Type 1 cutting-off wheels are to be mounted between properly relieved flanges which have matching bearing surfaces. Such flanges shall be at least one-fourth the wheel diameter;

(ii) Type 27A cutting-off wheels are designed to be mounted by means of flat, not relieved, flanges having matching bearing surfaces and which may be less than one-third but

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shall not be less than one-fourth the wheel diameter (see figure 12-19 to this rule for one such type of mounting);

- (iii) There are three general types of flanges: straight relieved flanges (see figure 12-27 to this rule); straight unrelieved flanges (see figure 12-25 to this rule); and adaptor flanges (see figures 12-28 and 12-29 to this rule);
- (iv) Regardless of flange type used, the wheel shall always be guarded. Blotters shall be used in accordance with paragraph (D)(3)(f) of this rule.



(b) Design and material.

- (i) Flanges shall be of such design as to satisfactorily transmit the driving torque from the spindle to the grinding wheel.
- (ii) Flanges shall be made of steel, cast iron, or other material of equal or greater strength and rigidity.
- (iii) Flanges shall be designed with respect to rigidity so that when tightened, the radial width of bearing surface of contact on wheel is maintained (see table 12-F and figure 12-27 to this rule).

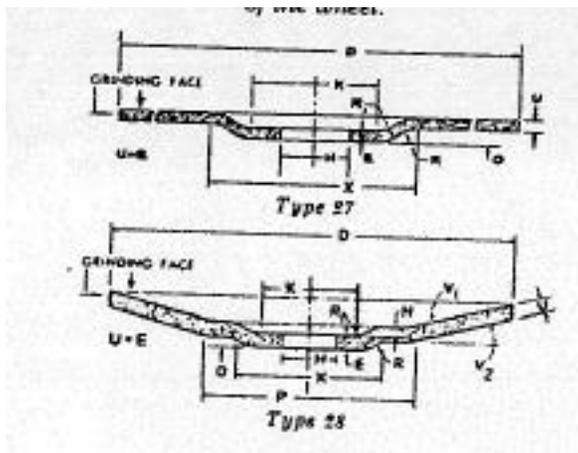
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(c) Finish and balance.

Flanges shall be dimensionally accurate and in good balance. There shall be no rough surfaces or sharp edges.

(d) Uniformity of diameter.

- (i) Both flanges, of any type, between which a wheel is mounted, shall be of the same diameter and have equal bearing surface. Exceptions are set forth in the remaining requirements of this rule.
- (ii) Type 27 and type 28 wheels, because of their shape and usage, require specially designed adaptors. The back flange shall extend beyond the central hub or raised portion and contact the wheel to counteract the side pressure on the wheel in use. The adaptor nut which is less than the minimum one-third diameter of wheel fits in the depressed side of wheel to prevent interference in side grinding and serves to drive the wheel by its clamping force against the depressed portion of the back flange. The variance in flange diameters, the adaptor nut being less than one-third wheel diameter, and the use of side pressure in wheel operation limits the use to reinforced organic bonded wheels. Mounts which are affixed to the wheel by the manufacturer shall not be reused. Type 27 and type 28 wheels shall be used only with a safety guard located between wheel and operator during use (see figure 12-19a to this rule).



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(iii) Modified types 6 and 11 wheels (terrazzo) with tapered K dimension.

(e) Recess and undercut.

(i) Straight relieved flanges made according to table 12-F to this rule and figure 12-27 to this rule shall be recessed at least one-sixteenth inch on the side next to the wheel for a distance as specified in table 12-F to this rule.

(ii) Straight flanges of the adaptor or sleeve type (see table 12-G to this rule and figures 12-28 and 12-29 to this rule) shall be undercut so that there will be no bearing on the sides of the wheel within one-eighth inch of the arbor hole.

(f) Blotters.

(i) Blotters (compressible washers) shall always be used between flanges and abrasive wheel surfaces to ensure uniform distribution of flange pressure (see paragraph ~~(D)(4)~~ (D)(4)(e) of this rule).

(ii) Exceptions.

(a) Mounted wheels;

(b) Abrasive discs (inserted washer, and projecting stud type);

(c) Plate mounted wheels;

(d) Cylinders, cups, or segmental wheels that are mounted in chucks;

(e) Types 27 and 28 wheels;

(f) Type 1 and type 27A cutting-off wheels;

(g) ~~Internal~~ Certain internal wheels ~~less than two inches in diameter~~;

(h) Diamond and cubic boron nitride wheels; and

(i) Modified types 6 and 11 wheel (terrazzo) - blotters applied flat side of wheel only.

(g) Multiple wheel mounting.

The driving flange shall be securely fastened to the spindle and the bearing surface shall run true. When more than one wheel is mounted between a single set of flanges, wheels may be cemented together or separated by specially designed spacers. Spacers shall be equal in diameter to the mounting flanges and have equal bearing surfaces.

(h) Dimensions.

(i) Tables 12-D and 12-F to this rule and figures 12-25 and 12-27 to this rule show minimum dimensions for straight relieved and unrelieved flanges for use with wheels with small hole that fit directly on the machine spindle. Dimensions of such flanges shall never be less than indicated and should be greater where practicable.

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- (ii) Tables ~~12-F~~ [12-E](#) and 12-G to this rule and figures 12-26, [12-28](#) and 12-29 to this rule show minimum dimensions for straight adaptor flanges for use with wheels having holes larger than the spindle. Dimensions of such adaptor flanges shall never be less than indicated and should be greater where practicable.
- (iii) Table 12-H to this rule and figure 12-30 to this rule show minimum dimensions for straight flanges that are an integral part of wheel sleeves which are frequently used on precision grinding machines. Dimensions of such flanges shall never be less than indicated and should be greater where practicable.

(i) Repairs and maintenance.

All flanges shall be maintained in good condition. When bearing surfaces become worn, warped, sprung, or damaged they shall be trued, refaced, or replaced. When refacing or truing, care shall be exercised to make sure that proper relief and rigidity is maintained as specified in paragraphs (D)(3)(b) and (D)(3)(e) of this rule, and they shall be replaced when they do not conform to these requirements and table 12-D to this rule, figure 12-25 to this rule, table 12-E to this rule, figure 12-26 to this rule, table 12-F to this rule, figure 12-27 to this rule, and table 12-H to this rule, figure 12-30 to this rule. Failure to observe these requirements might cause excessive flange pressure around the hole of the wheel. This is especially true of wheel-sleeve or adaptor flanges.

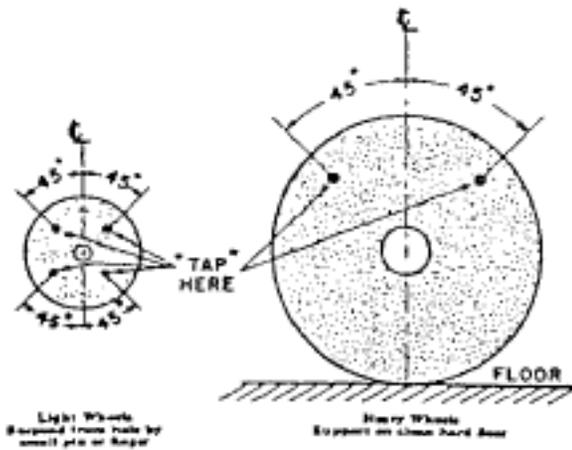
(4) Mounting.

(a) Inspection.

Immediately before mounting, all wheels shall be closely inspected and sounded by the employer or a designated employee (ring test) to make sure they have not been damaged in transit, storage, or otherwise. The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel. Wheels shall be tapped gently with a light nonmetallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. If they sound cracked (dead), they shall not be used. This is known as the "ring test."

- (i) Wheels must be dry and free from sawdust when applying the ring test, otherwise the sound will be deadened. It should also be noted that organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.
- (ii) "Tap" wheels about forty-five degrees each side of the vertical centerline and about one or two inches from the periphery as indicated by the spots in figure 12-20 and figure 12-21 to this rule. Then rotate the wheel forty-five degrees and repeat the test. A sound and undamaged wheel will give a clear metallic tone. If cracked, there will be a dead sound and not a clear ring.

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(b) Arbor size.

Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions. A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion. To accomplish this, the machine spindle shall be made from a nominal (standard) size to plus .002 inch. A wheel which must be forced on a spindle shall not be used.

(c) Surface condition.

All contact surfaces of wheels, blotters and flanges shall be flat and free of foreign matter.

(d) Bushing.

When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

(e) Blotters.

A blotter shall be used between the flange and the abrasive wheel. The blotter shall cover the entire contact area of the flange. Blotters need not be used with the following types of wheels:

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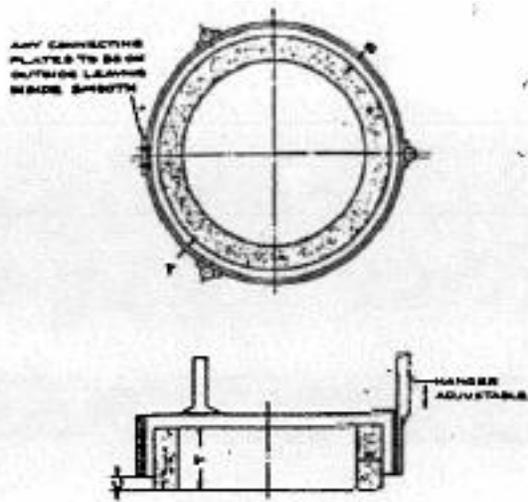


Figure 12-24

Table 12-B

EXPOSURE VERSUS WHEEL THICKNESS

Overall Thickness of Wheel (T) Inches	Maximum Exposure of Wheel (C) Inches
1/2	3/4
1	1 1/2
2	3/4
3	1
4	1 1/2
5 and over	2

Table 12-C
GUIDE FOR CONSTRUCTION OF BAND TYPE GUARDS
Maximum Wheel Speed 7000 SFPM

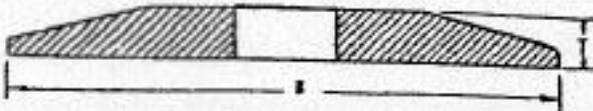
Minimum Material Specifications	Diameter of Wheel	Minimum Thickness of Band A'	Minimum Diameter of Rivets	Maximum Distance between Centers of Rivets
Hot Rolled Steel SAE 1008	Inches Under 8	Inches $\frac{1}{16}$	Inches $\frac{3}{16}$	Inches $\frac{3}{4}$
	8 to 24	$\frac{1}{8}$	$\frac{1}{4}$	1
	Over 24 to 30	$\frac{1}{4}$	$\frac{3}{8}$	$1\frac{1}{4}$

Table 12-D
MINIMUM DIMENSIONS FOR STRAIGHT UNRELIEVED FLANGES FOR WHEELS WITH THREADED INSERTS OR PROJECTING STUDS

A Diameter of Wheel	B* Minimum Outside Diameter of Flange	T Minimum Thickness of Flange
Inches	Inches	Inches
1	$\frac{5}{8}$	$\frac{1}{3}$
2	1	$\frac{1}{2}$
3	1	$\frac{3}{16}$
4	$1\frac{3}{8}$	$\frac{2}{16}$
5	$1\frac{3}{4}$	$\frac{1}{4}$
6	2	$\frac{3}{8}$

* NOTE: Must be large enough to extend beyond the bushing. Where prong anchor or cupback bushing are used, this footnote does not apply.

Figure 12-25



Driving flange secured to spindle for use only on portable wheels with threaded inserts or projecting studs.

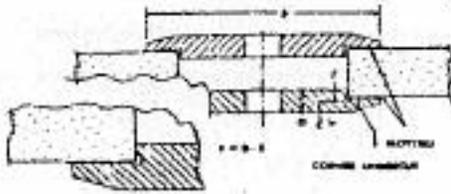


Figure 12-26

Table 12-E

**MINIMUM DIMENSIONS FOR STRAIGHT ADAPTOR FLANGE—
FOR ORGANIC BONDED WHEELS OVER 1 1/4 INCH THICK***

Wheel Diameter	Wheel Hole Diameter	B Minimum Flange Diameter	D Minimum Thickness of Flange at Bore	E Minimum Thickness of Flange at Edge of Undercut	F* (D-E) Minimum Thickness
Inches	Inches	Inches	Inches	Inches	Inches
12	4	6	3/4	3/4	1/2
to	5	7	3/4	3/4	1/2
14	6	8	3/4	3/4	1/2
Larger than	6	8	3/4	3/4	1/2
14	5	7	3/4	3/4	1/2
to	6	8	3/4	3/4	1/2
18	7	9	3/4	3/4	1/2
	8	10	3/4	3/4	1/2
Larger than	6	8	1	3/4	1/2
18	7	9	1	3/4	1/2
to	8	10	1	3/4	1/2
24	10	12	1	3/4	1/2
	12	14	1	3/4	1/2
Larger than 24 to 30	12	15	1	3/4	1/2
Larger than 30 to 36	12	15	1 1/4	3/4	1/2

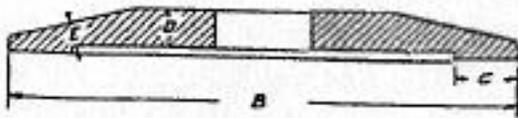
*For wheels under 1 1/4 inch thick F dimension shall not exceed 40% of wheel thickness

Table 12-F

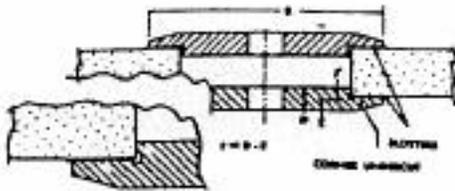
MINIMUM DIMENSIONS FOR STRAIGHT RELIEVED FLANGES

A* Diameter of Wheel	B Minimum Outside Diameter of Flanges	C Radial Width of Bearing Surface		D Minimum Thickness of Flange at Bore	E Minimum Thickness of Flange at Edge of Recess
		Minimum	Maximum		
Inches	Inches	Inches	Inches	Inches	Inches
1	$\frac{3}{8}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{16}$
2	$\frac{3}{4}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{16}$
3	1	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{16}$
4	1 $\frac{1}{4}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{8}$	$\frac{1}{8}$
5	1 $\frac{3}{4}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$
6	2	$\frac{1}{4}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{16}$
7	2 $\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{16}$
8	3	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{16}$
10	3 $\frac{1}{2}$	$\frac{3}{16}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{4}$
12	4	$\frac{3}{16}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{16}$
14	4 $\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{1}{16}$
16	5 $\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{3}{8}$	$\frac{1}{16}$
18	6	$\frac{1}{2}$	1	$\frac{3}{8}$	$\frac{1}{8}$
20	7	$\frac{5}{8}$	1 $\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$
22	7 $\frac{1}{2}$	$\frac{5}{8}$	1 $\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{16}$
24	8	$\frac{3}{4}$	1 $\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{16}$
26	8 $\frac{1}{2}$	$\frac{3}{4}$	1 $\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{8}$
28	10	$\frac{3}{4}$	1 $\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{8}$
30	10	$\frac{3}{4}$	1 $\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{8}$
36	12	1	2	$\frac{3}{8}$	$\frac{3}{8}$
42	14	1	2	$\frac{3}{8}$	$\frac{3}{8}$
48	16	1 $\frac{1}{4}$	2	1 $\frac{1}{8}$	1
60	20	1 $\frac{1}{4}$	2	1 $\frac{1}{4}$	1 $\frac{1}{8}$
72	24	1 $\frac{1}{2}$	2 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{1}{4}$

Flanges for wheels under 2 inches diameter may be unrelieved and shall be maintained flat and true.

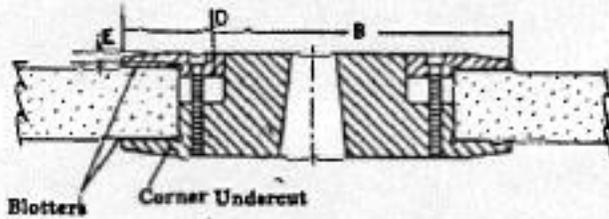


Driving flange secured to spindle.



Central Nut Mounting
Driving flange secured to spindle.

Figure 12-28



Multiple Screw Mounting
Driving flange secured to spindle.

Figure 12-29

Table 12-G

**MINIMUM DIMENSIONS FOR STRAIGHT FLANGES—
FOR MECHANICAL GRINDERS
12,500 S.F.P.M. to 18,500 S.F.P.M.(1)**

Wheel Diameter	Wheel Hole Diameter	"B" Minimum Flange Diameter	"D" Minimum Thickness of Flange at Bore	"E" Minimum Thickness of Flange at Edge of Undercut	F*(D-E) Minimum Thickness
20	6	8	1	1/2	1/2
20	8	10	1 1/2	3/4	3/4
24	12	15	2	1	1
30	12	15	2	1	1
36	12	15	2	1	1

¹Flanges shall be of steel, quality SAE 1040 or equivalent, annealed plate, heat treated to Rc 25-30.

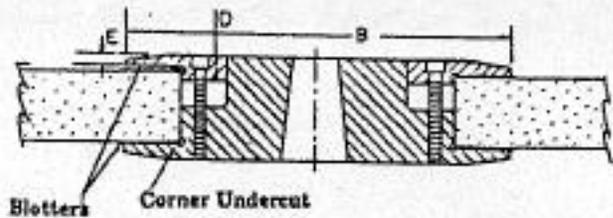
*For wheels under 1 1/4 inch thick F dimension shall not exceed 40% of wheel thickness.

Table 12-H

**MINIMUM DIMENSIONS FOR STRAIGHT FLANGES USED AS
WHEEL SLEEVES FOR PRECISION GRINDING ONLY**

Wheel Diameter	Wheel Hole Diameter	B Minimum Outside Diameter of Flange	D Minimum Thickness of Flange at Bore	E Minimum Thickness of Flange at Edge of Undercut
Inches 12 to 14	Inches 5	Inches 7	Inches $\frac{1}{2}$	Inches $\frac{7}{16}$
Larger than 14 to 20	5	7	$\frac{5}{8}$	$\frac{7}{16}$
	6	8	$\frac{5}{8}$	$\frac{7}{16}$
	8	10	$\frac{5}{8}$	$\frac{7}{16}$
	10	11 $\frac{1}{2}$	$\frac{5}{8}$	$\frac{7}{16}$
Larger than 20 to 30	12	13 $\frac{1}{2}$	$\frac{5}{8}$	$\frac{7}{16}$
	8	10	$\frac{3}{4}$	$\frac{1}{2}$
	10	11 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	12	13 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
Larger than 30 to 42	16	17 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	12	13 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	16	17 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	18	19 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
Larger than 42 to 60	20	21 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$
	16	20	1	$\frac{3}{8}$
	20	24	1	$\frac{3}{8}$
	24	29	1 $\frac{1}{2}$	$\frac{3}{8}$

Note: These flanges may be clamped together by means of a central nut, or by a series of bolts or some other equivalent means of fastening.



Driving Axles secured to spindle.

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Figure 12-31

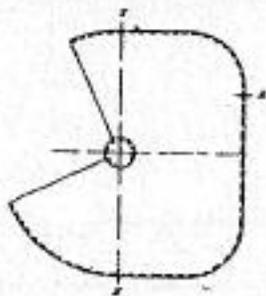
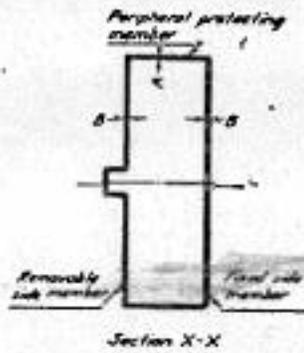
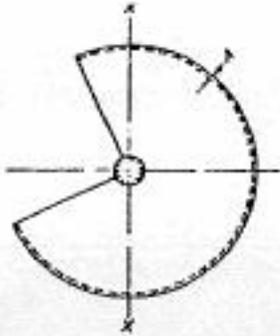


Figure 12-32

MINIMUM BASIC THICKNESSES OF PERIPHERAL AND SIDE MEMBERS FOR SAFETY GUARDS

Table 12-J

Grinding Wheel Dimensions

Material Used in Construction of Guard	Maximum Thickness of Grinding Wheel	2 to 6 inches		Over 6 to 12 inches		Over 12 to 18 inches		Over 18 to 24 inches		Over 24 to 30 inches		Over 30 to 36 inches		Over 36 to 48 inches	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
Material Safe for speeds up to 16,000 SFPM (Cast Iron or Alloy Steels) Strength 20,000 PSI CLASS 20	2	1/4	1/4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4
	4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4	1 3/4	1 3/4
	6	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2
	10	3/4	3/4	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4
	16	1	1	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4	3	3	3 1/2	3 1/2
Material Safe for speeds up to 9,000 SFPM (Mild Steels) Strength 50,000 PSI Grade 23510	2	1/4	1/4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4
	4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4	1 3/4	1 3/4
	6	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2
	10	3/4	3/4	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4
	16	1	1	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4	3	3	3 1/2	3 1/2
Material Safe for speeds up to 16,000 SFPM (Steel Castings - Mild Steels) Strength 60,000 PSI Grade 550-20	2	1/4	1/4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4
	4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4	1 3/4	1 3/4
	6	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2
	10	3/4	3/4	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4
	16	1	1	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4	3	3	3 1/2	3 1/2
Material Safe for speeds up to 16,000 SFPM (Structural Steel - Mild Steels) Strength 60,000 PSI	2	1/4	1/4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4
	4	3/8	3/8	1/2	1/2	5/8	5/8	3/4	3/4	1	1	1 1/4	1 1/4	1 3/4	1 3/4
	6	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2
	10	3/4	3/4	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4
	16	1	1	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4	2 3/4	3	3	3 1/2	3 1/2

*The recommendations listed in the above table are guides for the conditions stated. Other material, designs or dimensions affording equal or superior protection are also acceptable.

(E) Wire buffing wheels.

Wire buffing wheels shall be guarded unless the nature of the work is such that the material being processed acts as a shield to the periphery of the wheel, such as internal buffing.

(F) Polishing equipment.

(1) When dry grinding, dry polishing, or buffing is being performed, suitable hoods, or enclosures, connected to exhaust systems shall be used.

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(2) Such exhaust systems shall be operated continuously whenever such operations are being done and shall be capable of preventing contaminants from entering the breathing zone.

4123:1-5-13 Motor vehicles, mobile mechanized equipment, and marine operations.

(A) Reserved.

(B) Reserved.

(C) General requirements for motor vehicles and mobile mechanized equipment.

(1) A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims or rims equipped with locking rings or similar devices.

(2) Machinery, equipment, or parts thereof, being supported by slings, hoists, or jacks shall be substantially blocked or cribbed. Bulldozer blades, scraper blades, end-loader buckets, dump bodies, and similar equipment shall be either fully lowered or blocked when being repaired or not in use.

(3) Equipment parked on inclines shall have the brakes set, and the blade, bucket, etc., fully lowered if the equipment is unattended (out of sight or more than twenty-five feet from the operator).

(4) All cab glass shall be safety glass or equivalent with the vision unimpaired by its condition.

(5) All equipment which can contact power lines shall also comply with the requirements of paragraph (D) of rule 4123:1-5-23 of the Administrative Code.

(6) At locations where gasoline is being transferred to the fuel tank of any machinery, a notice shall be posted by the employer stating specifically that the engine shall be shut down and that no smoking or open flames be permitted during the transfer.

(7) All motor vehicles operating within the confines of the owner's property shall be equipped with an audible or visual warning device, in an operable condition, activated at the operator's station.

(D) Overhead protection.

(1) All haulage vehicles loaded by means of cranes, power shovels, loaders, or similar equipment shall have a substantial cab shield or canopy to protect the operator from shifting or falling materials.

(2) High lift rider trucks shall have a substantial overhead guard as protection against falling objects, constructed in a manner that does not interfere with visibility. Openings shall not exceed six inches in one of the two dimensions, width or length, and shall extend over the operator under all normal truck operations, including forward tilts.

(a) Where materials being handled are of such dimensions that objects could fall through the above protection, then substantial guarding, such as expanded metal, woven wire, or similar materials, shall be used in addition to the above (see rule 4123:1-5-99 of the Administrative Code).

(b) Exception: Where headroom conditions are such that overhead protection cannot be used because of clearance, means of limiting the lift height shall be provided and the load shall not extend above the operator's head.

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(3) In stacking or tiering operations, where the load extends above the backrest and may endanger the operator, load backrest extensions shall be provided and used.

(E) Motor vehicles used to transport employees.

(1) Vehicles assigned to, or generally used for the transportation of employees shall be equipped with securely fastened seats and backrests.

(2) Tools and material transported in the same compartment with employees shall be secured to prevent movement.

(F) Powered industrial trucks.

(1) General requirements.

(a) All nameplates and markings shall be affixed in place and maintained in legible condition.

(b) Modifications or additions which affect capacity shall conform with manufacturer's specifications. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

(c) Where trucks are designed to permit the interchange of front-end attachments, each attachment shall be marked to identify it and show its approximate weight and capacity, together with instructions to consult truck nameplate for combination capacity at maximum elevation with load laterally centered.

(d) Trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts, except as provided in paragraph (F)(1)(e) of this rule. Additional counterweighting of fork trucks shall not be done unless authorized by the truck manufacturer.

(e) Trucks originally approved for the use of gasoline for fuel may be converted to liquefied petroleum gas (LPG) fuel; provided the conversion meets the manufacturer's specifications.

(f) Moving parts that represent a hazard to the operator in the normal operating position shall be guarded.

(g) Employees shall not be required to operate any truck that is not equipped with an adequate, properly maintained braking system.

(h) Only employees who have been trained and are authorized by their employer shall be ~~required~~ permitted to operate a powered industrial truck.

(2) Restricted locations for fire safety purposes.

(a) The location or atmosphere shall be classified, as to whether it is hazardous or nonhazardous, prior to trucks being used therein.

(b) ~~Trucks shall not~~ Only approved power-operated trucks designated as "EX" may be used in atmospheres containing explosive or flammable concentrations of liquids, gases, or vapors, such as, but not limited to, acetylene, butadiene, or hydrogen.

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- (c) Under the following described conditions trucks may be used only if designed and built specifically for use therein (see appendix to this rule for "Summary Table on use of Industrial Trucks in Various Locations"):
- (i) Atmospheres containing explosives or flammable concentrations of metal dust, such as aluminum, magnesium, and their alloys, or other metals of similarly hazardous characteristics;
 - (ii) Atmospheres containing explosives or flammable concentrations of dust in grain processing operations, such as starch plants, malting plants, and other occupancies of similar nature;
 - (iii) Atmospheres containing explosive or flammable concentrations of dust from coal, coke, carbon black, or similar materials;
 - (iv) Locations hazardous due to the presence of easily ignitable fibers or flyings which may or may not be in suspension in the air;
 - (v) Locations where deposits or accumulations of the aforementioned dusts may be ignited by arcs or sparks originating in the truck;
 - (vi) Locations where easily ignitable fibers are stored or handled, including outside storages.

(3) Lighting and ventilating for operating areas.

- (a) Where general lighting is less than two lumens per square foot, auxiliary directional lighting shall be provided on the truck.
- (b) Adequate ventilation shall be provided in enclosed areas as required in rule 4123:1-5-18 of the Administrative Code (see also the current edition of "Threshold Limit Values (TLVs) for Chemical Substances in the Work Environment" adopted by the "American Conference of Governmental Hygienists (ACGIH)."

(4) Lifting of personnel.

Lift trucks equipped with vertical only, or vertical and horizontal travel controls using a lifting carriage or forks for lifting of personnel shall:

- (a) Have a platform with standard guardrails, intermediate rail, and toeboards, and ~~a mast guard~~ seventy-two inches in height protection for personnel in their normal working position on the platform from moving parts of the truck that represent a hazard, all securely fastened to the lifting carriage or forks;
- (b) Have controls whereby personnel on the platform can shut off power to the truck and the platform, provided that such controls shall not be required if there is a truck operator in attendance at the truck controls at all times when the platform is raised; and
- (c) Have overhead protection on the work platform where the employee is exposed to falling objects.

(G) Highway-type trucks, trailers, and railroad cars.

- (1) Wheel chocks shall be provided and employees instructed to place them under the rear wheels to prevent highway-type trucks and trailers from rolling while they are being loaded or unloaded by powered

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industrial trucks. Equivalent protection may be provided instead of wheel chocks.

- (2) Wheel stops or other recognized protective devices shall be provided and used to prevent railroad cars from moving while they are being loaded or unloaded by powered industrial trucks.
- (3) ~~Warning signals, i.e., blue lights at night and blue flags in the daytime, shall be placed at any end of a car accessible by switch engines to warn against movement of railroad cars while dockboards or bridge plates are in position~~ Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position.

(H) Marine operations and equipment.

When employees are required to step or operate a vehicle to or from a wharf, float, barge, or towboat, a ramp with side boards or a walkway shall be provided substantial in construction and fastening.

4123:1-5-17 Personal protective equipment.

(A) Reserved.

(B) Reserved.

(C) Specific requirements of general application.

- (1) Personal protective equipment furnished by the employer shall be issued to the employee in sanitary and proper condition so that it will effectively protect against the hazard involved.
- (2) Where employees provide their own protective equipment, such equipment shall give equal or greater protection than that furnished by the employer.

(D) Eye and face protection.

(1) Responsibility.

The employer shall provide eye protection for all employees engaged in the operations listed in paragraph (D)(2) of this rule and exposed to an eye hazard. Eye protection shall also be provided for any other employees in the immediate area and who are exposed to the hazards of the operations listed. It shall be the responsibility of the employee to use the eye protection provided by the employer (see appendix to this rule for eye and face protector selection guide).

(2) Operations requiring eye protection.

(a) Eye protection shall be provided to employees performing the following operations:

- (i) When using hand tools or mechanical equipment to cut, chip, drill, clean, buff, grind, polish, shape, or surface masonry, brick, concrete, plaster, stone, plastics, or other hardened substances. This also covers demolition work where the material listed are part of the operation;
- (ii) Where acids, sand, or shot blast are used in building cleaning operations;
- (iii) Welding, brazing, soldering, or cutting operations involving the use of gas flames or electric arc. (See appendix to this rule);

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- (iv) Where portland cement is taken from an elevated bin, hopper or similar structure by a chute;
- (v) All spray paint operations where the operator's eyes are exposed to paint mist in the atmosphere;
- (vi) All sand or shot blast operations where the operator's eyes are exposed to the blasting;
- (vii) The opening or closing of the tap holes of cupolas or melting furnaces;
- (viii) In the handling of molten metal, molten glass, and molten plastic;
- (ix) Metal and plastic chipping, cutting, cleaning, grinding, conditioning, or machining where there is danger of flying particles;
- (x) Dressing grinding wheels;
- (xi) Cleaning operations where wire wheels are used;
- (xii) In handling injurious acids, alkalis, or other chemicals;
- (xiii) Cutting, drilling, turning, planing, jointing, and sanding of wood with power tools;
- (xiv) Operation of portable powder-actuated, pneumatically powered, and other powered fastening tools;
- (xv) Operations requiring the use of compressed air;
- (xvi) When working in close proximity to a laser beam in excess of five milliwatts;
- (xvii) Pruning trees or cutting underbrush.

- (b) This rule does not apply where a shield or exhaust equipment provides adequate eye protection for employees otherwise exposed to the hazards covered in paragraphs (D)(2)(a)(i) to (D)(2)(a)(xvii) of this rule.

(3) Face shields.

- (a) Face shields may be provided in lieu of other forms of eye protection if they provide the required protection against the particular hazards for which they are designed.
- (b) Face shields, in addition to eye protection, shall be provided where danger to the face exists, such as in the following operations:
 - (i) Welding operations;
 - (ii) All sand or shot blast operations;
 - (iii) Cleaning operations where wire wheels are used;
 - (iv) Metal and plastic chipping, cutting, cleaning, grinding, conditioning, or machining where there is danger of flying particles;
 - (v) The handling of molten metal, molten glass, and molten plastic;
 - (vi) The handling of injurious acids, alkalis, or other chemicals.

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(4) Material requirements for eye protection shall meet ANSI Z87.1 - 1968.

(E) Foot (toe) protection.

Foot protection shall be worn by the employee where an employee is exposed to machinery or equipment that presents a foot hazard or where an employee is handling material which presents a foot hazard.

(F) Respiratory protection.

(1) Where there are air contaminants as defined in rule 4123:1-5-01 of the Administrative Code, the employer shall provide respiratory equipment approved for the hazard. It shall be the responsibility of the employee to use the respirator or respiratory equipment provided by the employer, guard it against damage and report any malfunction to the employer. Note: See appendix to this rule for basic guides for the selection of respirators.

(2) This requirement does not apply where an effective exhaust system (see [rules rule 4123:1-5-18](#) ~~and 4123:1-5-992~~ of the Administrative Code) or where other means of equal or greater protection have been provided.

(G) Head and hair protection.

(1) Responsibility.

(a) Employer.

(i) Whenever employees are required to be present where the potential hazards to their head exists from falling or flying objects, or from physical contact with rigid objects, or from exposures where there is a risk of injury from electric shock, employers shall provide employees with suitable protective headgear.

Where required, head protection shall meet the requirements of ANSI Z89.1 - 1969.

(ii) When head protection is required employers shall provide accessories designed for use with the headgear.

(iii) Damaged parts of protective headgear shall be replaced. Protective helmets and bump caps or parts thereof and hair enclosures shall be sanitized before reissue.

(b) Employees.

Employees shall not alter any head or hair protective equipment and shall use such equipment in accordance with instructions and training received.

(c) Hair enclosures.

(i) A hat, cap or net shall be provided where there is danger of hair entanglement in moving parts of machinery or equipment, or where there is exposure to means of ignition. It shall be designed to enclose all loose hair and be adjustable to accommodate all head sizes. Material used for a hair enclosure shall be durable, fast-dyed, nonirritating to the skin, and capable of withstanding frequent cleaning. It shall not be reissued from one employee to another unless it has been thoroughly sanitized.

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- (ii) Hair enclosures used in areas where there is exposure to sparks, hot or molten metals, or ignition from heat, flames, or chemical reaction shall be made of materials that are nonburning or flame retardant and do not melt.

(H) Hearing protection.

Employees exposed to continuous noise levels of ninety or more decibels (dBA) slow response shall be provided with approved ear protection. (If variations in noise level involve maxima at intervals of one second or less, the noise is considered continuous.) If ear plugs that require fitting are provided, they shall be fitted to the individual employees by a competent person.

(I) Protection of the body and exposed parts and other protective equipment.

- (1) All persons required to work in such a manner that their clothing may become wet with acids caustics or other injurious liquids shall be provided with such gloves, aprons, coats, jackets, sleeves, or other garments made of rubber, or other materials impervious to such liquids as are required to keep their clothing dry. Aprons shall extend well below the top of boots to prevent such liquid from splashing into the boots. Provision of dry clean cotton clothing along with rubber shoes or short boots and an apron impervious to such liquids shall be considered a satisfactory substitute where small parts are cleaned, plated, or acid-dipped in open tanks and rapid work is required.

- (2) Facilities for quick drenching or flushing of the eyes and body shall be provided within the work area, where employees are exposed to injurious corrosive materials. Where plumbing is not available and where storage batteries of the enclosed type with explosion-proof vents are serviced exclusively, portable, self-contained eyewash equipment may be provided in lieu of the quick drenching or flushing facilities. Where portable self-contained eyewash equipment is used in lieu of drenching or flushing facilities, it shall be capable of delivering to the eye no less than 1.5 liters (0.4 gallons) per minute for a minimum of fifteen minutes.

(3) Welding, cutting, brazing, and molten metal exposures.

All employees exposed to the hazards created by welding, cutting, brazing, or molten metal operations shall be protected by protective clothing. This includes:

- (a) Flameproof gauntlet gloves.
- (b) Flameproof aprons made of leather, or other material which provides equivalent protection.
- (c) Exterior clothing made of wool, cotton, or other material chemically treated to reduce combustibility.
- (d) Capes or shoulder covers made of leather or other material which provides equivalent protection.
- (e) Protection for the ears from the overhead welding and cutting or welding and cutting in extremely confined spaces.

(4) Working by hand on energized circuits.

When an employee is required to work on, or in proximity to, energized lines, the employer shall provide and the employee shall use protective equipment approved for the hazard involved.

(5) Climbers.

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(a) Where employees are required to climb poles or trees, the employer shall provide climbers, the appropriate gaffs (spurs). ~~of which shall not be less than~~ Pole gaffs shall measure at least one and one-eighth seven-sixteenth inches (36.5 mm) in length, measured on the underside. Tree gaffs shall measure no more than three and one half inches (88.9 mm) nor less than two and one-fourth inches (57.2 mm) on the underside.

(b) Storage.

Storage facilities shall be provided so that the sharp points of the climber gaffs will not cause damage to other equipment or cause injury to employees.

(6) Safety belts, harness, lifelines and lanyards.

(a) Lifelines, safety belts or harnesses and lanyards shall be provided by the employer, and it shall be the responsibility of the employee to wear such equipment when exposed to hazards of falling where the operation being performed is more than six feet above the ground or above a floor or platform, except as otherwise specified in this chapter, and when required to work on stored material in silos, hoppers, tanks, and similar storage areas. ~~Lifelines and safety belts or harnesses shall be securely fastened to the structure and shall sustain a static load of no less than three~~ Lanyards and vertical lifelines shall have a minimum breaking strength of five thousand pounds. Anchorage used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least five thousand pounds per employee attached.

(b) Where the lifeline may be subjected to cutting or abrasion, a minimum seven-eighths-inch wire core manila rope, or equivalent, shall be provided. For all other lifeline applications, a minimum of three-fourths-inch manila rope, or equivalent, shall be provided.

(c) Safety belt, harness, or strap lanyards shall be a minimum of one-half inch nylon, or equivalent, with a maximum length to provide for a fall of no more than six feet. The lanyard shall have a breaking strength of no more than ~~three~~ five thousand pounds.

(d) All safety belt, harness, or strap and lanyard hardware shall be drop-forged or pressed steel, cadmium plated. Surface shall be smooth and free from sharp edges.

(e) All safety belt, harness, or strap and lanyard hardware shall be capable of withstanding a tensile loading of ~~three~~ five thousand pounds without cracking, breaking, or becoming permanently deformed.

(7) Safety nets.

(a) Safety nets shall be provided when workplaces are more than ~~thirty~~ twenty-five feet above the ground, water, or other surface where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical.

(b) Where safety net protection is required by this rule, operations shall not be undertaken until the net is in place and has been tested.

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- (c) Nets shall extend outward from the outermost projection of the work surface in accordance with the following table to this rule and shall be installed as closed under the work surface as practical but in no case more than thirty feet below such work surface with the exception of bridge construction where only one level of nets is required. Nets shall be hung with sufficient clearance to prevent the falling employee's contact with the surface or structures below. Such clearance shall be determined by impact load testing.

Table

Vertical distance from working level to horizontal plane of the net.	Minimum required horizontal distance of net from the edge of the working surface.
Up to five feet	eight feet
More than five feet up to ten feet	ten feet
More than ten feet	thirteen feet

- (d) The mesh size of nets shall not exceed six inches. All new nets shall meet accepted performance standards of seventeen thousand five hundred foot-pounds minimum impact resistance as determined and certified by the manufacturer, and shall bear a label of proof test. Edge ropes shall provide a minimum breaking strength of five thousand pounds.
- (e) Forged steel safety hooks or shackles shall be used to fasten the net to its supports. Attachment of safety nets to the working platform is prohibited.
- (f) Connections between net panels shall maintain the full strength of the net.
- (8) Working over or near water.
- (a) Where employees are working over or near water, and where the depth or current of the water creates a danger of drowning, the employer shall provide U.S. coast guard-approved life jackets or buoyant work vests for each employee.
- (b) Ring buoys with no less than ninety feet of line attached shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed ~~one~~ two hundred ~~fifty~~ feet.
- (c) At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.
- (d) In cribs and cofferdams where employees are exposed to danger of falling inside of the enclosure containing water, a life raft shall be provided.

(9) Night work.

When working at night, spotlights or portable lights for emergency lighting shall be provided as needed to perform the work safely.

(10) Barriers and warning devices.

The employer shall provide barriers and effective warning devices such as flasher lights, "Men Working" signs, cones, flares, lanterns, flags and reflectors, for the protection of employees when work

DRAFT - NOT FOR FILING

is performed in congested areas and where employees are exposed to traffic hazards or other working conditions where a hazard may exist.

(J) Employee's responsibility.

It shall be the responsibility of the employee to properly use the equipment provided by the employer as required in this rule.

4123:1-5-18 Control of air contaminants.

(A) Reserved.

(B) Reserved.

(C) Where employees are exposed to hazardous concentrations of air contaminants, the air contaminants shall be minimized by at least one of the following methods:

(1) Substitute a non-hazardous, or less hazardous material;

(2) Confine or isolate the contaminants;

(3) Remove at or near source;

(4) Dilution ventilation;

(5) Exhaust ventilation; ~~(for examples of exhaust ventilation, see rule 4123:1-5-99.2 of the Administrative Code).~~

(6) Using wet methods to allay dusts. Note: Good housekeeping is of definite value in minimizing air contaminants created by dusts.

(D) Exhaust systems: machinery and equipment.

(1) Grinding, polishing and buffing.

(a) Abrasive wheels and belts.

(i) Abrasive wheels and belts shall be hooded and exhausted when there is a hazardous concentration of air contaminants.

(ii) This does not apply to abrasive wheels or belts:

(a) Upon which water, oil, or other liquid substance is used at the point of the grinding contact;
or

(b) To small abrasive wheels used occasionally for tool grinding.

(b) Separate exhaust systems.

Abrasive wheel and buffing wheel exhaust systems shall be separate when the dust from the buffing wheel is of flammable material.

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(2) Generation of toxic materials.

When toxic materials are generated in hazardous concentrations during their application, drying, or handling, they shall be minimized or eliminated by at least one of the methods described in paragraph (C) of this rule.

(3) Internal combustion engines.

Hazardous concentrations of air contaminants produced by internal combustion engines shall be exhausted.

(E) Exhaust systems - structural requirements.

(1) Exhaust or ventilating fan.

Each exhaust or ventilating fan located less than seven feet above the floor or normal working level shall be guarded.

(2) Ductwork.

Exhaust ductwork shall be sized in accordance with good design practice which shall include consideration of fan capacity, length of duct, number of turns and elbows, variation in size, volume, and character of materials being exhausted.

(3) Discharge.

The outlet from every separator or (collector) shall discharge the air contaminants collected by the exhaust system, in such manner that the discharged materials shall not re-enter the working area in hazardous concentrations.

(4) Location of air supply openings or inlets.

Air supply openings or inlets through which air enters the building or room in which the local exhaust system is in operation shall be isolated from any known source of contamination from outside of the building.

4123:1-5-19 Manlifts of the endless belt type.

(A) Reserved.

(B) Reserved.

(C) General requirements.

(1) Floor openings.

(a) Allowable size.

Floor openings for both the up and down runs shall be no less than twenty-eight inches nor more than thirty-six inches in width for a twelve-inch belt; no less than thirty-four inches nor more than thirty-eight inches for a fourteen-inch belt; and no less than thirty-six inches nor more than forty inches for a sixteen-inch belt and shall extend no less than twenty-four inches, nor more than

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twenty-eight inches from the face of the belt.

(b) Uniformity.

All floor openings for a given manlift shall be uniform in size and shall be approximately circular, and each shall be located vertically above the opening below it.

(2) Landings.

(a) Vertical clearance.

The clearance between the floor or mounting platform and the lower edge for the conical guard above it required by paragraph (C)(3) of this rule shall be no less than seven feet six inches. Where this clearance cannot be obtained no access to the manlift shall be provided and the manlift runway shall be enclosed where it passes through such floor.

(b) Clear landing space.

The landing space adjacent to the floor openings shall be free from obstructions and kept clear at all times. This landing space shall be no less than two feet in width from the edge of the floor opening used for mounting and dismounting.

(c) Lighting of landings.

Adequate lighting, no less than five foot candles, shall be provided at each floor landing at all times when the lift is in operation.

(d) Landing surface.

The landing surfaces at the entrances and exits to the manlift shall be constructed and maintained as to provide safe footing at all times.

(e) Emergency landings.

Where there is a travel of fifty feet or more between floor landings, one or more emergency landings shall be provided so that there will be a landing (either floor or emergency) for every twenty-five feet or less of manlift travel.

(i) Emergency landings shall be accessible from both the up and down runs of the manlift and shall give access to the ladder required in paragraph (C)(8) of this rule.

(ii) Emergency landings shall be completely enclosed with a standard railing and toeboard.

(iii) Platforms constructed to give access to bucket elevators or other equipment for the purpose of inspection, lubrication and repair may also serve as emergency landings under this rule. All such platforms will then be considered part of the emergency landing and shall be provided with standard guard railings and toeboards.

(3) Guards on underside of floor openings.

(a) Fixed type.

The ascending side of the manlift floor openings shall be provided with a bevel guard or cone

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meeting the following requirements:

(i) Slope.

The cone shall make an angle of no less than forty-five degrees with the horizontal. An angle of sixty degrees or greater shall be used where ceiling heights permit.

(ii) Extent.

The lower edge of this guard shall extend no less than forty-two inches outward from any handhold on the belt. It shall not extend beyond the upper surface of the floor above.

(iii) Material and construction.

The cone shall be made of no less than "No. 18 U.S. Gauge" sheet steel or material of equivalent strength or stiffness. The lower edge shall be rolled to a minimum diameter of one-half inch and the interior shall be smooth with no rivets, bolts or screws protruding.

(b) Floating type.

In lieu of the fixed guards specified in paragraph (C)(3)(a) of this rule, a floating type safety cone may be used, such floating cones to be mounted on hinges no less than six inches below the underside of the floor and so constructed as to actuate a limit switch should a force of two pounds be applied on the edge of the cone closest to the hinge. The depth of this floating cone shall not exceed twelve inches.

(4) Protection of entrances and exits.

(a) Guardrail requirement.

The entrance and exits at all floor landings affording access to the manlift shall be guarded by a maze (staggered railing) or a handrail equipped with self-closing gates.

(b) Construction.

The rails shall be standard guardrails with toeboards meeting the provisions of rule 4123:1-5-02 of the Administrative Code.

(c) Gates.

Gates, if used, shall open outward and shall be self-closing. Corners of gates shall be rounded.

(d) Maze.

Maze or staggered openings shall offer no direct passage between enclosure and outer floor space.

(e) Except where building layout prevents, entrances at all landings shall be in the same relative position.

(5) Guards for openings.

(a) Construction.

The floor opening at each landing shall be guarded on sides not used for entrance or exit by a wall, a

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railing and toeboard or by panels of wire mesh of suitable strength.

(b) Height and location.

Such rails or guards shall be no less than forty-two inches in height on the up-running side and sixty-six inches in height on the down-running side. Rails or guards shall be located no more than one foot from the edge of the floor opening.

(6) Bottom arrangement.

(a) Bottom landing.

At the bottom landing the clear area shall be no smaller than the area enclosed by the guardrails on the floors above, and any wall in front of the down-running side of the belt shall be no less than forty-eight inches from the face of the belt. This space shall not be encroached upon by stairs or ladders.

(b) Location of lower pulley.

The lower (boot) pulley shall be installed so that it is supported by the lowest landing served. The sides of the pulley support shall be guarded to prevent contact with the pulley or the steps.

(c) Mounting platform.

A mounting platform shall be provided in front or to one side of the up-run at the lowest landing, unless the floor level is such that the following requirement can be met: the floor or platform shall be at or above the point at which the upper surface of the ascending step completes its turn and assumes a horizontal position.

(d) Guardrails.

To guard against employees walking under a descending step, the area on the down side of the manlift shall be guarded in accordance with paragraph (C)(4) of this rule. To guard against an employee getting between the mounting platform and an ascending step, the area between the belt and the platform shall be protected by a guardrail.

(7) Top arrangements.

(a) Clearance from floor.

A top clearance shall be provided of no less than eleven feet above the top terminal landing. This clearance shall be maintained from a plane through each face of the belt to a vertical cylindrical plane having a diameter two feet greater than the diameter of the floor opening, extending upward from the top floor to the ceiling on the up-running side of the belt. No encroachment of structural or machine supporting members within this space will be permitted.

(b) Pulley clearance.

- (i) There shall be a clearance of no less than five feet between the center of the head pulley shaft and any ceiling obstruction.
- (ii) The center of the head pulley shaft shall be no less than six feet above the top terminal landing.

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(c) Emergency grab rail.

An emergency grab bar or rail and platform shall be provided at the head pulley when the distance to the head pulley is over six feet above the top landing, otherwise only a grab bar or rail is to be provided to permit the rider to swing free should the emergency stops become inoperative.

(8) Emergency exit ladder.

A fixed metal ladder accessible from both the up and down run of the manlift shall be provided for the entire travel of the manlift. Such ladder shall be in accordance with paragraph (C)(6) of rule 4123:1-5-03 of the Administrative Code, except that a safety cage shall not be provided, notwithstanding the provisions of paragraph (C)(6) of rule 4123:1-5-03 of the Administrative Code.

(9) Superstructure bracing.

Manlift rails shall be secured in such a manner as to avoid spreading, vibration and misalignment.

(10) Illumination.

(a) General.

Both runs of the manlift shall be illuminated at all times when the lift is in operation. An intensity of no less than one foot candle shall be maintained at all points. (See paragraph (C)(2)(c) of this rule for illumination requirements at landings).

(b) Control of illumination.

Lighting of manlift runways shall be by means of circuits permanently tied in to the building circuits (no switches), or shall be controlled by switches at each landing. Where separate switches are provided at each landing, any switch shall turn on all lights necessary to illuminate the entire runway.

(11) Weather protection.

The entire manlift and its driving mechanism shall be protected from the weather at all times.

(D) Mechanical requirements.

(1) Machines.

(a) Brakes.

Brakes provided for stopping and holding a manlift shall be inherently self-engaging, by requiring power or force from an external source to cause disengagement. The brake shall be electrically released, and shall be applied to the motor shaft for direct-connected units or to the input shaft for belt-driven units. The brake shall be capable of stopping and holding the manlift when the descending-side is loaded with two hundred fifty pounds on each step.

(b) Belt.

(i) Material.

The belt shall be of hard-woven canvas, rubber-coated canvas, leather, or other material meeting

*****DRAFT - NOT FOR FILING*****

the strength requirements of paragraph (D)(1)(b)(iii) of this rule and having a coefficient of friction such that when used in conjunction with an adequate tension device it will meet the brake test specified in paragraph (D)(1)(a) of this rule.

(ii) Width.

The width of the belt shall be no less than twelve inches for a travel not exceeding one hundred feet, no less than fourteen inches for a travel greater than one hundred feet but not exceeding one hundred fifty feet and sixteen inches for a travel exceeding one hundred fifty feet.

(iii) Strength.

The strength of the belt shall be no less than one thousand five hundred pounds per inch of belt width for belts having a distance between pulley centers not in excess of one hundred feet, and one thousand eight hundred pounds per inch of belt width for belts having a distance between pulley centers of over one hundred feet but not in excess of two hundred feet; for over two hundred feet, two thousand four hundred fifty pounds per inch of belt width.

(iv) Belt fastenings.

Belts shall be fastened by a lapped splice or shall be butt-spliced with a strap on the side of the belt away from the pulley.

- (a) For lapped splices, the overlap of the belt at the splice shall be no less than three feet where the travel of the manlift does not exceed one hundred feet and no less than four feet, if the travel exceeds one hundred feet. Where butt splices are used the straps shall extend no less than three feet on one side of the butt for a travel not in excess of one hundred feet and four feet for a travel in excess of one hundred feet.
- (b) For twelve-inch belts, the joint shall be fastened with no less than twenty special elevator bolts, each of a minimum diameter of one-fourth inch. These bolts shall be arranged as to cover the area of the joint effectively.
- (c) The minimum number of bolts for a belt width of fourteen inches shall be no less than twenty-three and for a belt width of sixteen inches, the number of bolts shall be no less than twenty-seven.

(v) Repairs prohibited.

A belt that has become torn while in use on a manlift shall not be spliced and put back in service.

(vi) Flush bolt heads.

All bolts used for splicing the belt or securing handholds or steps to the belt shall be installed and maintained so that the heads do not project beyond the inner surface of the belt.

(c) Pulleys.

Drive pulleys and idler (boot) pulleys shall have a diameter no less than given in the following table to this rule.

*****DRAFT - NOT FOR FILING*****

Table 19-1

BELT CONSTRUCTION	MINIMUM STRENGTH POUNDS PER INCH OF WIDTH	MINIMUM PULLEY DIAMETER INCHES
5 ply	1500	20
6 ply	1800	20
7 ply	2100	22

(The above values are based on thirty-two-ounce duck; three hundred pounds per linear inch per ply.)

(d) Pulley protection.

The machine shall be designed and constructed as to catch and hold the driving pulley in event of shaft failure.

(e) Belt location.

Manlift belts shall be centered in the floor openings.

(f) Pulley lagging.

All head pulleys shall be lagged (i.e., covered with non-slip material securely fastened in place).

(2) Speed.

No manlift designed for a speed in excess of eighty feet per minute shall be installed.

(3) Steps.

(a) Minimum depth.

Steps shall be no less than twelve inches nor more than fourteen inches deep, measured from the belt to the edge of the step.

(b) Width.

The width of the step shall be no less than the width of the belt to which it is attached.

(c) Distance between steps.

The distance between steps shall be equally spaced and not less than sixteen feet measured from the upper surface of one step to the upper surface of the next step above it.

(d) Angle of step.

The surface of the step shall make approximately a right angle with the up and down run of the belt, and shall travel in the approximate horizontal position with the up and down run of the belt.

(e) Surfaces.

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The upper or working surfaces of the step shall be of a material having inherent nonslip characteristics (coefficient of friction no less than 0.5) or shall be covered completely by a nonslip tread securely fastened to it.

(f) Strength of step supports.

When subjected to a load of four hundred pounds applied at the approximate center of the step, step frames or supports and their guides shall be of adequate strength to:

- (i) Prevent the disengagement of any step roller.
- (ii) Prevent any appreciable misalignment.
- (iii) Prevent any visible deformation of the step or its support.

(g) Prohibition of steps without handholds.

No step shall be provided unless there is a corresponding handhold above or below it meeting the requirements of paragraph (D)(4) of this rule. If a step is removed for repairs or permanently, the handholds immediately above and below it shall be removed before the lift is again placed in service.

(4) Handholds.

(a) Location.

Handholds attached to the belt shall be provided and so installed that they are no less than four feet nor more than four feet eight inches above the step tread. These shall be so located as to be available on both up and down run of the belt.

(b) Size.

The grab surface of the handhold shall be no less than four and one-half inches in width, no less than three inches in depth and provide two inches of clearance from the belt. Fastenings for handholds shall be located no less than one inch from the edge of the belt.

(c) Strength.

The handhold shall be capable of withstanding, without damage, a load of three hundred pounds applied parallel to the run of the belt.

(d) Prohibition of handhold without steps.

No handhold shall be provided without a corresponding step. If a handhold is removed permanently or temporarily, the corresponding step and handhold for the opposite direction of travel shall also be removed before the lift is again placed in service.

(e) Type.

All handholds shall be of the closed type.

(5) Up limit stops.

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(a) Requirements.

Two separate automatic stop devices shall be provided to cut off the power and apply the brake when a loaded step passes the upper terminal landing. One of these shall consist of a split-rail switch or equivalent mechanically operated by the step roller and located no more than six inches above the top terminal landing. The second automatic stop device may consist of any of the following:

- (i) A split-rail switch placed six inches above and on the side opposite the first limit switch.
- (ii) An electronic device.
- (iii) A switch actuated by a lever, rod or plate, the latter to be placed on the up side of the head pulley so as to just clear a passing step.

(b) Manual reset location.

After the manlift has been stopped by a stop device it shall be necessary to reset the automatic stop manually. The device shall be so located that a person resetting it shall have a clear view of both the up and down runs of the manlift. It shall not be possible to reset the device from any step or platform.

(c) Cut-off point.

The initial limit stop device shall function so that the manlift will be stopped before the loaded step has reached a point twenty-four inches above the top terminal landing.

(d) Electrical requirements.

- (i) Where such switches open the main motor circuit directly they shall be of the ~~multiple~~ multipole type.
- (ii) Where electronic devices are used they shall be so designed and installed that failure will result in shutting off the power to the driving motor.
- (iii) Where flammable vapors or dusts may be present all electrical installations shall be of a type approved for use in such locations.
- (iv) Unless of the oil-immersed type, controller contacts carrying the main motor current shall be copper to carbon or equal, except where the circuit is broken at two or more points simultaneously.

(6) Emergency stop.

(a) Requirements.

An emergency stop means shall be provided.

(b) Location.

This stop means shall be within easy reach of the ascending and descending runs of the belt.

(c) Operation.

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This stop means shall be so connected with the control lever or operating mechanism that it will cut off the power and apply the brake when pulled in the direction of travel.

(d) Rope.

If rope is used, it shall be no less than three-eighths inch in diameter. Wire rope, unless marlin-covered, shall not be used.

(7) Factor of safety.

All parts of the machine shall have a factor of safety of six based on a load of two hundred pounds on each horizontal step on the up and down runs.

(8) Instruction and warning signs and devices.

(a) Instruction signs at landings or belt.

Signs of conspicuous and easily read style giving instructions for the use of the manlift shall be posted at each landing or stenciled on the belt.

(i) Size and legibility.

Such signs shall be of letters no less than two inches in height and of a color having high contrast with the surface on which it is stenciled or painted (white or yellow on black or black on white or gray).

(ii) Inscription.

The instructions shall read approximately as follows: "Face the belt. Use the handholds. To stop - pull rope."

(b) Top floor warning sign and light.

(i) Requirements.

At the top floor an illuminated sign shall be displayed bearing the following wording: "Top floor - get off". The sign shall be in block letters no less than two inches in height. This sign shall be located within easy view of an ascending passenger and no more than two feet above the top terminal landing.

(ii) Additional warning light.

In addition to the sign required by paragraph (D)(8)(b)(i) of this rule, a red warning light of no less than forty-watt rating shall be provided immediately below the upper landing terminal and so located as to shine in the passenger's face.

(c) A visual or audible warning system shall be provided to alert passengers and others in the vicinity when a manlift is started or re-started.

(d) Visitor warning.

A conspicuous sign having the following legend, "Authorized Personnel Only", shall be displayed at each landing. The sign shall be of block letters no less than two inches in height and shall be of a

DRAFT - NOT FOR FILING

color offering high contrast with the background color".

(E) Recommended minimum instructions in the proper use of manlifts.

- (1) Only authorized personnel, trained in their use, shall be permitted to use manlifts.
- (2) When riding a manlift, the passenger shall stand squarely on the step, face the belt and grip the handhold securely. Jumping on the step, yanking on the handhold or engaging in horseplay of any ~~king~~ kind is prohibited.
- (3) No freight, packaged goods, pipe, lumber or construction materials of any kind shall be handled on any manlift.
- (4) No tools, except those which will fit entirely within a pocket in usual working clothes shall be carried on any manlift.
- (5) Before starting or re-starting the manlift, it shall be necessary to alert all passengers on the manlift and all others in its vicinity.

(F) Inspection and maintenance.

(1) Frequency.

All manlifts shall be inspected by a competent designated person at intervals of no more than thirty days. Limit switches shall be checked weekly. Manlifts found to be unsafe shall not be operated until properly repaired.

(2) Items covered.

The inspection shall cover but is not limited to the following items:

- (a) Steps;
- (b) Steps fastenings;
- (c) Rails;
- (d) Rail supports and fastenings;
- (e) Rollers and slides;
- (f) Belt and belt tension;
- (g) Handholds and fastenings;
- (h) Floor landings;
- (i) Guardrails;
- (j) Lubrication;
- (k) Limit switches;

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- (l) Warning signs and lights;
- (m) Illumination;
- (n) Drive pulley;
- (o) Bottom (boot) pulley and clearance;
- (p) Pulley supports;
- (q) Motor;
- (r) Driving mechanism;
- (s) Brake;
- (t) Electrical switches;
- (u) Vibration and misalignment;
- (v) Skip on up or down run when mounting step (indicating worn gears).

4123:1-5-20 Roof car suspended platforms.

(A) Roof car.

- (1) The horizontal speed of a roof car shall be no more than fifty feet per minute.
- (2) A roof car may not be moved horizontally unless means are in place to prevent the car from moving outside the areas provided for roof car travel.
- (3) The roof car shall be designed and installed in such a manner as to remain stable and upright under every loading condition.
- (4) A roof car shall be so positioned and anchored to the structure as to ~~insure~~ ensure that the working platform is placed and retained in proper position for vertical travel.
- (5) The operating device controlling movement of a roof car shall be of the continuous pressure weatherproof electric type and shall be located on the roof car, the working platform, or both. If located on both, such operating devices shall be interlocked so that control is possible only from one at a time.
- (6) The operating device controlling movement of a roof car shall not be operable until the working platform is at its uppermost position for travel and is not in contact with the building face or fixed vertical guides in the face of the building, and until all protective devices and interlocks are in a position for movement.
- (7) If the access to the roof car at any point of its travel is not over the roof area, standard guardrails with self-closing, self-locking gates shall be provided on the roof car.

(B) Working platforms.

- (1) The working platform shall be of girder or truss construction and shall be capable of supporting its rated load under any position of loading.

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- (2) Each working platform shall bear the manufacturer's load rating plate, conspicuously posted and legible, stating the maximum permissible load.
- (3) The vertical speed of a working platform suspended by four or more hoisting ropes shall be no more than seventy-five feet per minute.
- (4) The vertical speed of a working platform suspended by less than four hoisting ropes shall be no more than thirty-five feet per minute.
- (5) The working platform shall be no less than twenty-four inches wide.
- (6) The working platform shall be provided with toeboards and with permanent guardrails no less than thirty-six inches high, and no more than forty-two inches high at the front (building side). At the rear, and on the sides, a standard guardrail and toeboard shall be provided. An intermediate guardrail shall be provided around the entire platform between the top guardrail and the toeboard.
- (7) The platform flooring shall be of the nonskid type.
- (8) Where access gates are provided, they shall be self-closing and self-locking. Such gates are required where access to the working platform is not over the roof area.
- (9) A means shall be provided to prevent inadvertent horizontal movement of the working platform.
- (10) The operating device controlling vertical movement of the working platform shall be located on the working platform and shall be of the continuous pressure weatherproof electric type.
- (11) The operating device controlling vertical movement shall be operable only when all electrical protective devices and interlocks on the working platform are in normal operating position, and the roof car is at an established operating point.
- (12) On roof-powered platforms, an emergency electric operating device shall be provided near the hoisting machine for use in the event of failure of the traveling cable system. This emergency device shall be mounted in locked compartment and shall have a legend mounted thereon reading: "For Emergency Operation Only. Establish Communication With Personnel On Working Platform Before Use." A key for unlocking the compartment housing the emergency operating device shall be mounted in a break-glass receptacle located near the device.

(C) Hoisting equipment.

- (1) Hoisting equipment shall consist of a power-driven drum or drums contained in the roof car (i.e., roof-powered platform) or contained on the working platform (i.e., self-powered platform).
- (2) Hoisting equipment shall be power-operated in both up and down directions.
- (3) Where exposed to contact, rotating shafts, drums, couplings, and other mechanisms and gears shall be guarded.
- (4) Friction devices or clutches shall not be used connecting the main driving mechanism to the drum or drums. Belt-or chain-driven machines are prohibited.
- (5) Hoisting motors shall be electric and of waterproof construction.

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- (6) Hoisting motors shall be directly connected to the hoisting machinery. Motor couplings, if used, shall be of steel construction.
- (7) Hoisting machines shall have two independent braking means, each designed to stop and hold the working platform with one hundred twenty-five per cent of rated load.

(D) Hoisting ropes and winding drums.

- (1) Each hoisting rope shall be made of wire and shall be no less than five-sixteenths-inch diameter.
- (2) Working platforms shall be suspended by no less than two ropes with a safety factor of ten as calculated under the following formula:

$$F = S \times N \div W$$

Where

S = manufacturer's rated breaking strength of one rope

N = number of ropes under load

W = maximum static load on all ropes with the platform and its rated load at any point of its travel

- (3) Where winding drums are used, the rope shall be wound in level layers.
- (4) Winding drums shall have no less than three turns of rope remaining when the working platform is at its lowest possible point of travel.
- (5) Where the working platform is suspended by more than two ropes, the nondrum ends of the ropes shall be provided with individual shackle rods which will permit individual adjustment of rope lengths.
- (6) The lengthening or repairing of wire ropes by splicing is prohibited.
- (7) More than one reverse bend in the length of seven wire rope lays is prohibited.
- (8) Wire rope shall not be used if, in any length of eight diameters, the total number of visible broken wires exceeds ten percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect.

(E) Electrical protective devices.

- (1) Electrical protective devices and interlocks shall be of the weatherproof type.
- (2) When a traveling cable storage reel is used, an electric contact shall be provided and so connected that it will cause the relay for vertical travel to open if the tension on the traveling cable exceeds safe limits.
- (3) An automatic overload device shall be provided to cut off electrical power to the circuit in all hoisting motors for travel in the up direction, should the load applied to the hoisting ropes at either end of the working platform exceed one hundred twenty-five per cent of its normal tension with rated load as shown on the manufacturer's data plate on the working platform.
- (4) An automatic device shall be provided for each hoisting rope which will cut off electrical power to the hoisting motor or motors in the down direction and will apply the brakes if any hoisting rope becomes

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slack.

- (5) Upper and lower directional limit devices shall be provided to prevent the travel of the working platform beyond the normal upper and lower limits of travel.
- (6) Directional limit devices, if driven from the hoisting machine by chains, tapes, or cables, shall incorporate a device to disconnect the electric power from the hoisting machine and apply both the primary and secondary brakes in the event of failure of the driving means.
- (7) On platforms with four or more ropes, final terminal stopping devices for the working platform shall be provided as a secondary means of preventing the working platform from over-traveling at the terminals.
- (8) Emergency stop switches shall be provided in or adjacent to each operating device.
- (9) Electrical cord strain relief anchors and grip or equivalent means shall be provided to prevent the electrical cord from pulling on the receptacle.

(F) Emergency communications.

A means of two-way communication shall be provided for each roof car suspended platform for use in emergency.

(G) Safety belts and lifelines.

Employees on working platforms shall be protected by a personal fall arrest system meeting the requirements of appendix C to Section I of 29 CFR 1910.66.

4123:1-5-21 Storage batteries.

(A) Battery charging areas shall be designated for that purpose.

(B) Employees shall be instructed that:

- (1) When charging batteries, acid shall be poured into water; water shall not be poured into acid;
- (2) When charging batteries, make certain vent caps are functioning: vent caps shall be kept in place to avoid electrolyte spray, and covers shall be open to dissipate heat; and
- (3) Smoking and open flames are prohibited.

(C) In designated battery charging and changing areas the employer shall:

- (1) Provide personal protective equipment as required in rule ~~4123:1-5-21~~ [4123:1-5-17](#) of the Administrative Code;
- (2) Provide fire protection;
- (3) Provide protection to charging apparatus to prevent damage by trucks;
- (4) Provide adequate ventilation for exhausting fumes;
- (5) Provide racks, when needed for support, made of nonconductive materials with dielectric properties the

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equivalent of dry wood or made of other material coated or covered to achieve that objective;

- (6) Provide material handling equipment, such as a conveyor, hoist, or similar equipment, for handling large batteries, such as those used in electrically powered industrial trucks;
- (7) Provide a carboy tilter or siphon for handling electrolyte;
- (8) Provide signs prohibiting open flames or smoking.

4123:1-5-22 Confined spaces.

- (A) No employee shall be required to enter into any confined space unless a confined space entry procedure, incorporating one of the following, is used (see appendix to this rule for recommended entry procedures):
 - (1) Air sampling shall be performed by qualified, trained personnel prior to and periodically during occupancy to determine that the atmosphere within the confined space contains an adequate quantity of oxygen (nineteen per cent), and any known or expected harmful atmospheric contaminants have been diluted to safe concentrations.
 - (2) A supplied-air respirator or self-contained breathing apparatus is provided and used.
- (B) When the confined space has been exposed to, contained, or is likely to have combustible gases within its confines (such as sewage treatment plants), it shall not be entered unless the atmosphere contains a concentration of less than ten per cent of the lower explosive limit, ~~(see rule 4123:1-5-99.1 of the Administrative Code).~~
- (C) Appropriate control measures, which may consist of forced or natural ventilation, use of personal protective equipment, a combination of these, or other effective control techniques, shall be instituted if tests under paragraph (A)(1) or (B) of this rule indicate that the atmosphere in the space to be entered contains:
 - (1) Any concentration of flammable vapor or gas ten per cent or greater of the lower explosive limit; and/or,
 - (2) A hazardous concentration of any known or expected toxic contaminants; and/or,
 - (3) Less than nineteen per cent oxygen.
- (D) Means of safe entry and exit shall be provided for entering or leaving a manhole, vault or other similar underground area.
- (E) Where electrical equipment is used in confined spaces subject to combustible atmospheres, the permanent fixtures to which the lamp socket and plugs are attached shall be the type approved for that location. All extension cords shall be made of heavy duty cord. All lamps shall be guarded.

4123:1-5-26 Trenches and excavations.

- (A) General requirements.
 - (1) Utility companies and municipally owned utilities shall be contacted and advised of proposed work prior to the start of actual excavation. Prior to opening an excavation, effort shall be made to determine whether underground installations, i.e., sewer, telephone, water, fuel, electric lines, etc., will be

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encountered and, if so, where such underground installations are located.

(2) An employee shall not be required to use mechanical digging or trenching equipment within three feet of an energized underground electrical conductor whose location is known, unless the conductors are protected by concrete ducts or equivalent protection.

(3) Where trenches or excavations are made in locations adjacent to backfilled trenches or excavations or where trenches or excavations are subjected to vibrations from any source, such as railroad or highway traffic or the operation of machinery, additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins.

(4) Undercutting of the exposed faces of trenches or excavations is prohibited unless the exposed faces of such undercutting are supported by one or more of the methods prescribed for the support of exposed faces of trenches.

(5) Material placement.

(a) Excavated material or other material shall be retained a minimum of twenty-four inches from the top edge of the trench or excavation.

(b) As an alternative to the clearance prescribed in paragraph (A)(5)(a) of this rule, the employer shall use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the trench or excavation.

(6) Wells, pits, shafts etc.

(a) All wells, pits, shafts, etc., shall be barricaded or covered.

(b) Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

(B) Trenches.

(1) The exposed faces of all trenches more than five feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. (See table 26-1 to this rule.)

(2) Sides of trenches in unstable or soft material, five feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. (See table 26-1 and table 26-2 to this rule.)

(3) Sides of trenches in hard compact soil, including embankments, shall be shored or otherwise supported when the trench is more than five feet in depth and eight feet or more in length. In lieu of shoring, the sides of the trench above the five-foot level ~~shall~~ may be sloped to preclude collapse, but shall not be steeper than a one-foot rise to each one-half-foot horizontal.

(4) Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the trench.

(5) Minimum requirements - trench shoring.

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- (a) Minimum requirements for trench bracing and shoring shall be in accordance with table 26-2 to this rule. The vertical planks in the bracing system shall extend at least to the top of the trench face.
- (b) Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:

$$S = 1300 - 20L \div D$$

$$\text{Maximum ratio: } L \div D = 50$$

Where: L = length, unsupported, in inches.

D = least side of the timber in inches.

S = allowable stress in pounds per square inch of cross section.

- (6) When employees are required to be in trenches four feet deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than twenty-five feet of lateral travel.
- (7) When bracing or shoring of trenches is required, such bracing and shoring shall be carried along with the excavation.
- (8) Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.
- (9) Portable trench boxes, safety cages or sliding trench shields may be used for the protection of employees in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench and shall extend at least to the top of the trench face.
- (10) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly, and, in unstable soil, employees shall clear the trench before pulling out the jacks or braces with ropes.

(C) Excavations.

- (1) The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means. (See table 26-1 and table 26-2 to this rule.)

Table 26-1.

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Note: Clays, Silts, Loams, or Non-homogenous soils require Shoring and Bracing.

Note: The presence of ground water requires special treatment.

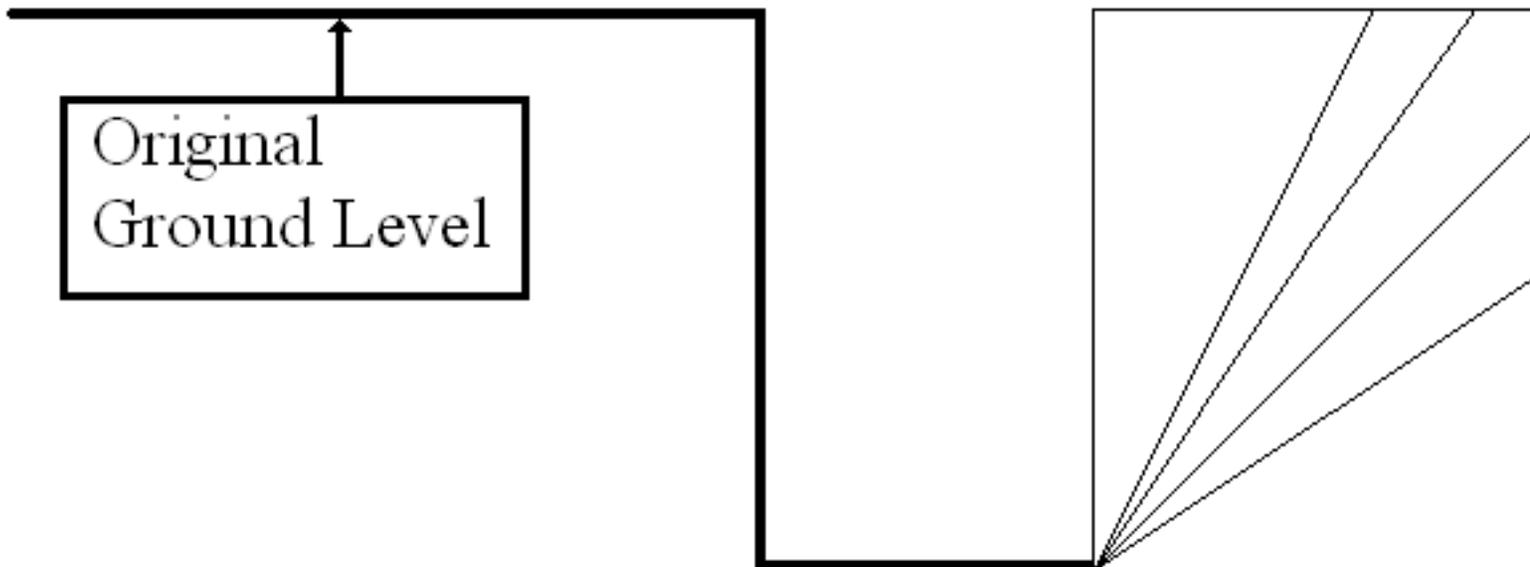


Table 10.1	
Soil Classification	
Soil Type	Classification
Clay	CH, CHC, CHU, MH, MHC, MHU, SH, SHC, SHU
Silt	ML, MLC, MLU, OL, OLC, OLU
Loam	CL, CLC, CLU, CL, CLC, CLU
Sand	SW, SWC, SWU, SM, SMC, SMU, SC, SCU
Gravel	GC, GCU
Rock	SR, SRU

- (2) Supporting systems, i.e., piling, cribbing, shoring etc., shall be designed by a qualified person and shall meet accepted engineering requirements.
- (3) Excavations sloped to the angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear.

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- (4) Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or equally effective means.
- (5) Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions. (See table 26-2 to this rule for proper dimensions.)
- (6) Excavations below the level of the base of the footing of any foundation or retaining wall are prohibited, except in hard rock, unless the wall is underpinned and appropriate precautions are taken to ensure the stability of adjacent walls.
- (7) If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, braced or sloped as necessary to resist the extra pressure due to such super-imposed loads.
- (8) When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed.
- (9) Where employees or equipment are required to cross over excavations, walkways or bridges with standard guardrails shall be provided.

4123:1-5-27 Lasers.

~~See paragraph (D)(5) of rule 4123:1-5-17 of the Administrative Code for eye protection required in laser operations.~~

(A) Labeling of laser equipment.

The employer shall furnish equipment provided with labels containing the following minimum information for continuous-wave (CW) lasers:

- (1) Wavelength or wavelength range;
- (2) Emergent beam size;
- (3) Beam divergence;
- (4) Maximum average power output;
- (5) Maximum emergency beam irradiance;
- (6) Manufacturer's name and address;
- (7) Product identification number.

(B) Posting.

The employer shall post notices in prominent locations in which lasers are being operated. (For examples see appendix to this rule.)

(C) Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually

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required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight, or at change of shifts, the laser shall be turned off.

(D) Atmospheric conditions.

The employer shall require the employee to keep away from the source, range, and target of the laser when there is exposure to rain or snow or when there is dust or fog in the air.

4123:1-5-29 Explosives and blasting.

(A) Specific requirements for all blasting operations.

- (1) No explosives shall be abandoned.
- (2) Smoking, firearms, (except firearms carried by guards), matches, open flame lamps, and other fire, flame, heat or spark-producing devices are prohibited in or within fifty feet of explosive magazines or while explosives are being handled, transported or used.
- (3) Persons authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution, including, but not limited to, warning signals, flags, barricades, or woven wire mats to protect employees.
- (4) Before a charge is detonated, employees shall be instructed to leave the blasting area.
- (5) Blasting operations in the proximity of overhead power lines, communications lines, utility services, or other services and structures, the blaster shall notify the appropriate representatives of such utilities at least twenty-four hours in advance of blasting, specifying the location and intended time of such blasting. Verbal notice shall be confirmed with written notice.
- (6) Signs shall be posted warning against the use of mobile radio transmitters on all roads within ~~three-~~ hundred fifty one thousand feet of blasting operations where electric blasting caps are used.
- (7) All blasting operations shall be suspended and employees removed from the blasting area during the approach and progress of an electrical storm.
- (8) Empty boxes, paper, and fiber packing materials which have previously contained explosive materials shall be disposed of in a safe manner, or reused in accordance with the department of transportation's hazardous materials regulations (49 CFR parts 177-180).
- (9) Containers of explosives shall not be opened in any magazine or within fifty feet of any magazine. In opening kegs or wooden cases, no sparking metal tools shall be used; wooden wedges and either wood, fiber or rubber mallets shall be used. Nonsparking metallic slitters may be used for opening fiberboard cases.
- (10) Explosive materials that are obviously deteriorated or damaged shall not be used and shall be disposed of in accordance with the manufacturer's recommendation.

(B) Transportation of explosives.

Any vehicle used to transport explosives on the job site shall have a nonsparking floor and side members and

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shall ~~carry at least two fire extinguishers, each having a rating of at least ten-BC~~ be equipped with fully charged fire extinguisher of not less than "10-ABC" rating. Blasting caps or electric blasting caps shall not be transported over the highways on the same vehicles with other explosives, unless packaged, segregated, and transported in accordance with the department of transportation's hazardous materials regulations (49 CFR parts 177-180).

(C) Storage of explosives and blasting agents.

- (1) Blasting caps, electric blasting caps, or other detonating devices shall not be stored in the same magazine with other explosives or blasting agents.
- (2) Primed cartridges shall not be stored.
- (3) All explosives stored on the job site shall be stored in approved storage facilities. All brush and combustible materials shall be kept clear of the magazine to a distance of no less than twenty-five feet.

(D) Loading of explosives or blasting agents.

- (1) All drill holes shall be sufficiently large to admit freely the insertion of the packages of explosive materials.
- (2) Tamping shall be done only with wooden rods or plastic tamping poles without exposed metal parts, except that nonsparking metal connectors may be used for jointed poles. Violent tamping is prohibited. Primed cartridges shall not be tamped.
- (3) No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives shall be immediately returned to the magazine.
- (4) Drilling shall not be started until all remaining butts of old holes are examined with a wooden rod for unexploded charges, and, if any are found, they shall be refired before work proceeds.
- (5) Drill holes which have contained explosives or blasting agents shall not be made deeper.
- (6) No loaded holes shall be left unattended.

(E) Initiation of explosive charges.

(1) General.

- (a) When fuse is used, the blasting cap shall be securely attached to it with a standard ring type cap crimper. All primers shall be assembled no less than fifty feet from any magazine.
- (b) Primers for use in blasting shall be made up only as required for each round of blasting.
- (c) No blasting cap shall be inserted in the explosive materials without first making a hole in the cartridge for the cap with a wooden punch of proper size or standard cap crimper.
- (d) If there are any misfires while using cap and fuse, all employees shall be required to remain away from the charge for at least an hour. If electric blasting caps are used and a misfire occurs, this waiting period may be reduced to thirty minutes.

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(2) Electric blasting caps.

- (a) Blasters, when testing circuits to loaded holes, shall use only blasting galvanometers or other instruments which have been designed and approved for the purpose.
- (b) Only the employee making the final check on the wire connections shall fire the shot. All connections shall be made from bore hole back to the source of firing current, and the leading wires shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.