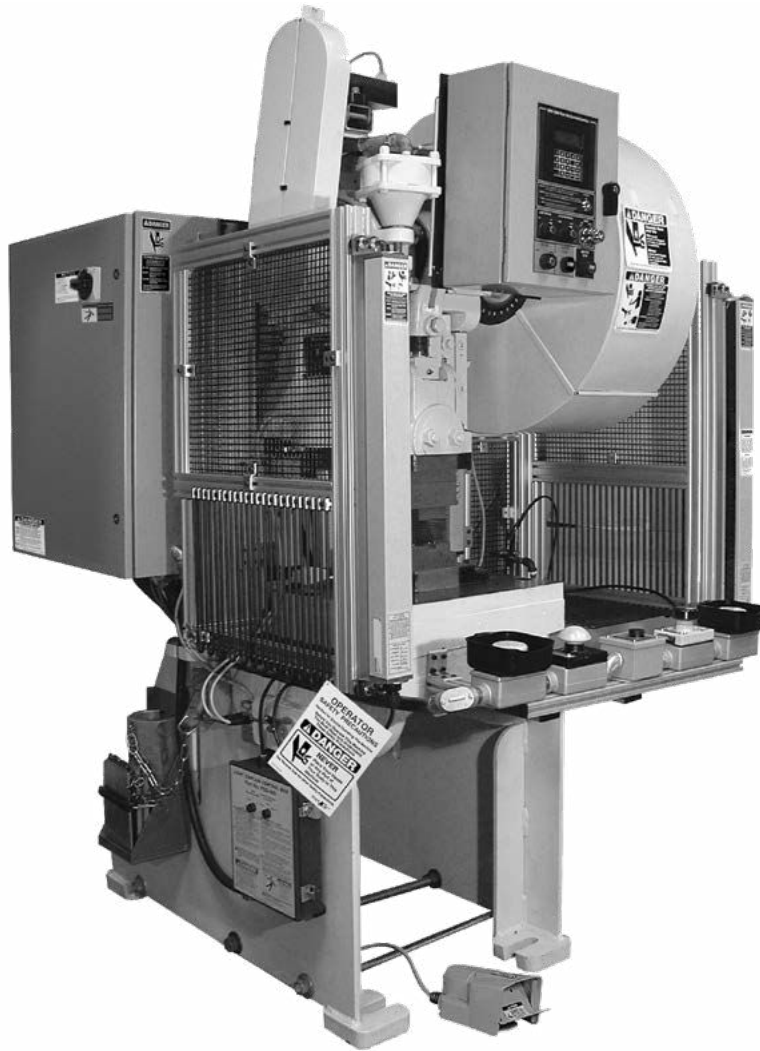




INSTALLATION MANUAL FOR Mechanical Power Press Safety



Content taken from OSHA 29 CFR 1910.211, 1910.212, 1910.217, 1910.219, and ANSI B11.1–2001

IMPORTANT: PLEASE REVIEW THIS ENTIRE PUBLICATION BEFORE INSTALLING, OPERATING OR MAINTAINING THIS DEVICE.

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

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OSHA (Occupational Safety and Health Administration) standards 29 CFR 1910.211, 1910.212, 1910.217, 1910.219, and portions of ANSI (American National Standards Institute) B11.1–2001 are included in this catalog for use as a reference when determining safety requirements for bringing machines into compliance with the federal standards.

This information is arranged to more easily understand the OSHA requirements and apply them to mechanical power presses and other machines. It is copied verbatim from Title 29 of the Code of Federal Regulations (CFR) and contains all pertinent sections of the OSHA standards concerning power presses with which an employer (user) must comply. For Section 1910.217, the OSHA requirements are listed in the left column, while comparable or additional requirements of ANSI B11.1–2001 are listed in the right column. Sections 1910.212 and 1910.219 can be applied to presses, press brakes, and other machines discussed in this catalog as well as lathes, milling machines, etc. Safety standards for these types of machines are available from the American National Standards Institute.

For a copy of the appropriate B11– series standard, contact:

**AMT—The Association for
Manufacturing Technology**

7901 Westpark Drive
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Be sure to review these standards before updating or installing any equipment on a machine. If you are unfamiliar with how to properly safeguard the point of operation of a machine or how to calculate the safety distance for light curtains, two-hand control, etc., we offer a monthly machine safeguarding seminar to educate the employer/user on the safety requirements. (See back cover.)

OSHA'S MACHINERY AND MACHINE GUARDING REQUIREMENTS FOR MECHANICAL POWER PRESSES AND OTHER MACHINES

EDITED FOR POWER PRESSES AND OTHER MACHINES

*As taken from Title 29 of the Code of Federal Regulations (CFR), 1910.211,
1910.212, 1910.217, 1910.219, and ANSI B11.1–2001.*

Many people find the OSHA standards confusing and difficult to read as published in the Code of Federal Regulations. As an aid to manufacturers using machines, we have rearranged and labeled certain paragraphs to help categorize the subject material. Each paragraph has been identified so that the reader can refer to the standards and read the paragraph in context as the government wrote it. No words of the text have been changed; however, this information should never be used in place of the actual standards. We can assume no liability for acts taken as a result of reference to it. We offer this information for use in analyzing problems and finding solutions for bringing full- and part-revolution mechanical power presses and other machines into compliance with the OSHA standards.

For Section 1910.217, the OSHA requirements are listed in the left column, while comparable or additional requirements of ANSI B11.1–2001 are listed in the right column.

SECTION 1 — DEFINITIONS

Mechanical Power Press Safety

AS USED IN 1910.217 AND 1910.219 UNLESS THE CONTEXT CLEARLY REQUIRES OTHERWISE, THE FOLLOWING POWER PRESS AND MECHANICAL POWER-TRANSMISSION GUARDING TERMS SHALL HAVE THE FOLLOWING MEANING:

Adjustable barrier guard means a barrier requiring adjustment for each job or die setup.

Antirepeat means the part of the clutch/brake control system designed to limit the press to a single stroke if the tripping means is held operated. Antirepeat requires release of all tripping mechanisms before another stroke can be initiated. Antirepeat is also called single stroke reset or reset circuit.

Authorized person means one to whom the authority and responsibility to perform a specific assignment has been given by the employer.

Automatic feeding means feeding wherein the material or part being processed is placed within or removed from the point of operation by a method or means not requiring action by an operator on each stroke of the press.

Belts include all power transmission belts, such as flat belts, round belts, V-belts, etc., unless otherwise specified.

Belt shifter means a device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

Belt pole (sometimes called a belt shipper or shipper pole,) means a device used in shifting belts on and off fixed pulleys on line or countershaft where there are no loose pulleys.

Bolster plate means the plate attached to the top of the bed of the press having drilled holes or T-slots for attaching the lower die or die shoe.

Brake means the mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

Brake monitor means a sensor designed, constructed, and arranged to monitor the effectiveness of the press braking system.

Clutch means the coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

Concurrent means acting in conjunction, and is used to describe a situation wherein two or more controls exist in an operated condition at the same time.

Continuous means uninterrupted multiple strokes of the slide without intervening stops (or other clutch control action) at the end of individual strokes.

Control system means sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements to press operating mechanism.

Counterbalance means the mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments.

Device means a press control or attachment that:

(i) Restrains the operator from inadvertently reaching into the point of operation, or

(ii) Prevents normal press operation if the operator's hands are inadvertently within the point of operation, or

(iii) Automatically withdraws the operator's hands if the operator's hands are inadvertently within the point of operation as the dies close, or

(iv) Prevents the initiation of a stroke, or stops of stroke in progress, when there is an intrusion through the sensing field by any part of the operator's body or by any other object.

Die means the tooling used in a press for cutting or forming material. An upper and a lower die make a complete set.

Die builder means any person who builds dies for power presses.

Die enclosure guard means an enclosure attached to the die shoe or stripper, or both, in a fixed position.

Die set means a tool holder held in alignment by guide posts and bushings and consisting of a lower shoe, an upper shoe or punch holder, and guide posts and bushings.

Die setter means an individual who places or removes dies in or from mechanical power presses, and who, as a part of his duties, makes the necessary adjustments to cause the tooling to function properly and safely.

Die setting means the process of placing or removing dies in or from a mechanical power press, and the process of adjusting the dies, other tooling and safeguarding means to cause them to function properly and safely.

Die shoe means 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 slide.

Direct drive means the type driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energization and deenergization of a motor. Even though not employing a clutch, direct drives match the operational characteristics of "part revolution clutches" because the driving power may be disengaged during the stroke of the press.

Exposed to contact means that the location of an object is such that a person is likely to come into contact with it and be injured.

Ejector means a mechanism for removing work or material from between the dies.

Face of slide means the bottom surface of the slide to which the punch or upper die is generally attached.

Feeding means the process of placing or removing material within or from the point of operation.

Fixed barrier guard means a die space barrier attached to the press frame.

Flywheels include flywheels, balance wheels, and flywheel pulleys mounted and revolving on crankshaft of engine or other shafting.

Foot control means the foot operated control mechanism designed to be used with a clutch or clutch/brake control system.

Foot pedal means the foot operated lever designed to operate the mechanical linkage that trips a full revolution clutch.

Full revolution clutch means 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.

Gate or movable barrier device means a movable barrier arranged to enclose the point of operation before the press stroke can be started.

Guard means a barrier that prevents entry of the operator's hands or fingers into the point of operation.

Guide post means 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.

(Continued on next page.)

SECTION 1 — DEFINITIONS

Mechanical Power Press Safety

Hand feeding tool means any hand held tool designed for placing or removing material or parts to be processed within or from the point of operation.

Holdout or restraint device means a mechanism, including attachments for operator's hands, that when anchored and adjusted prevent the operator's hands from entering the point of operation.

Inch means an intermittent motion imparted to the slide (on machines using part revolution clutches) by momentary operation of the Inch operating means. Operation of the Inch operating means engages the driving clutch so that a small portion of one stroke or indefinite stroking can occur, depending upon the length of time the Inch operating means is held operated. Inch is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the operator.

Interlocked press barrier guard means a barrier attached to the press frame and interlocked so that the press stroke cannot be started normally unless the guard itself, or its hinged or movable sections, enclose the point of operation.

Jog means an intermittent motion imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

Knockout means a mechanism for releasing material from either die.

Liftout means the mechanism also known as knockout.

Maintenance runway means any permanent runway or platform used for oiling, maintenance, running adjustment, or repair work, but not for passageway.

Manual feeding means feeding wherein the material or part being processed is handled by the operator on each stroke of the press.

Nip-point belt and pulley guard means a device which encloses the pulley and is provided with rounded or rolled edge slots through which the belt passes.

Operator's station means the complete complement of controls used by or available to an operator on a given operation for stroking the press.

Part revolution clutch means 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.

Pinch point means any point other than the point of operation at which it is possible for a part of the body to be caught between the moving parts of a press or auxiliary equipment, or between moving and stationary parts of a press or auxiliary equipment or between the material and moving part or parts of the press or auxiliary equipment.

Point of operation (from § 1910.217 Mechanical Power Presses) means the area of the press where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

Point of operation (from § 1910.219 Mechanical Power-Transmission Apparatus) means that point at which cutting, shaping, or forming is accomplished upon the stock and shall include such other points as may offer a hazard to the operator in inserting or manipulating the stock in the operation of the machine.

Presence sensing device means a device designed, constructed and arranged to create a sensing field or area that signals the clutch/brake control to deactivate the clutch and activate the brake of the press when any part of the operator's body or a hand tool is within such field or area.

Press means a mechanically powered machine that shears, punches, forms or assembles metal or other material by means of cutting, shaping, or 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.

Prime movers include steam, gas, oil, and air engines, motors, steam and hydraulic turbines, and other equipment used as a source of power.

Pull-out device means a mechanism attached to the operator's hands and connected to the upper die or slide of the press, that is designed, when properly adjusted, to withdraw the operator's hands as the dies close, if the operator's hands are inadvertently within the point of operation.

Repeat means an unintended or unexpected successive stroke of the press resulting from a malfunction.

Safety block means a prop that, when inserted between the upper and lower dies or between the bolster plate and the face of the slide, prevents the slide from falling of its own deadweight.

Safety system means the integrated total system, including the pertinent elements of the press, the controls, the safeguarding and any required supplemental safeguarding, and their interfaces with the operator, and the environment, designed, constructed and arranged to operate together as a unit, such that a single failure or single operating error will not cause injury to personnel due to point of operation hazards.

Semiautomatic feeding means feeding wherein the material or part being processed is placed within or removed from the point of operation by an auxiliary means controlled by operator on each stroke of the press.

Sheaves mean grooved pulleys, and shall be so classified unless used as flywheels.

Single stroke means one complete stroke of the slide, usually initiated from a full open (or up) position, followed by closing (or down), and then a return to the full open position.

Single stroke mechanism means 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.

Slide means the main reciprocating press member. A slide is also called a ram, plunger, or platen.

Stop control means an operator control designed to immediately deactivate the clutch control and activate the brake to stop slide motion.

Stripper means a mechanism or die part for removing the parts or material from the punch.

Stroking selector means the part of the clutch/brake control that determines the type of stroking when the operating means is actuated. The stroking selector generally includes positions for "Off" (Clutch Control), "Inch," "Single Stroke," and "Continuous" (when Continuous is furnished).

Sweep device means a single or double arm (rod) attached to the upper die or slide of the press and designed to move the operator's hands to a safe position as the dies close, if the operator's hands are inadvertently within the point of operation.

Trip or (tripping) means activation of the clutch to "run" the press.

Turnover bar means a bar used in die setting to manually turn the crankshaft of the press.

Two-hand trip means a clutch actuating means requiring the concurrent use of both hands of the operator to trip the press.

Two hand control device means a two hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

Unitized tooling means 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.

(Continued on next page.)

SECTION 2 — GENERAL MECHANICAL POWER PRESS SAFETY

Mechanical Power Press Safety

(a) *Machine guarding—(1) Types of guarding.* One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are—barrier guards, two-hand tripping devices, electronic safety devices, etc.

(2) *General requirements for machine guards.* Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

(3) *Point-of-operation guarding.* (i) Point of operation is the area on a machine where work is actually performed upon the material being processed.

(ii) The point of operation of machines whose operation exposes an employee to injury shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

(iii) Special hand tools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

(iv) The following are some of the machines which usually require point-of-operation guarding:

- (a) Guillotine cutters.
- (b) Shears.
- (c) Alligator shears.
- (d) Power presses.
- (e) Milling machines.
- (f) Power saws.
- (g) Jointers.
- (h) Portable power tools.
- (i) Forming rolls and calenders.

(4) *Barrels, containers and drums.* Revolving drums, barrels and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum or container cannot revolve unless the guard enclosure is in place.

(5) *Exposure of blades.* When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half (½) inch.

(b) *Anchoring fixed machinery.* Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

WHEN MUST THINGS BE DONE?

(a)(4) RECONSTRUCTION AND MODIFICATION

It shall be the responsibility of any person reconstructing, or modifying a mechanical power press to do so in accordance with paragraph (b) of this section.

(a)(5) EXCLUDED MACHINES

Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.

CONSTRUCTION OF THE PRESS AND ITS CONTROLS—FULL REVOLUTION CLUTCHES

(b)(3) MACHINES USING FULL REVOLUTION POSITIVE CLUTCHES

(i) Machines using full revolution clutches shall incorporate a single stroke mechanism.

(ii) 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 hole or tube, and designed to prevent interleaving of the spring coils in event of breakage.

ANSI B11.1–2001 REQUIREMENTS

ADDITIONAL EXCLUDED MACHINES

1.1 Cold headers, cold formers, eyelet machines, high-energy-rate presses (compressed gas), iron workers and detail punches, metal shears, powdered-metal presses, press welders, turret and plate-punching machines, wire-termination machines, and welding presses.

5.1 Task and hazard identification

5.2 Risk assessment/risk reduction

E5.1 and E5.2 For more information, see ANSI B11.TR3.

6.11.1 Presses used in single-cycle (stroke) operations shall be equipped with single-cycle (stroke) capability.

E6.11.1 Single-cycle (stroke) capability is provided by a mechanism or a trip-control system. It may be desirable to have both.

6.11.4.3.3 Presses used in single-cycle (stroke) mode shall incorporate an antirepeat feature.

6.11.2 Same.

6.11.4.2 Modes of operation selection

(1) A means of selecting operating modes shall be supplied with the clutch/brake control to select the mode of operation of the press.

(3) Fixing of selection shall be by means capable of being supervised.

6.11.4.3 Operating modes

6.11.4.3.1 Off

(See 6.12.3.3.1 [part revolution] for same requirements.)

6.11.4.3.2 Jog

The jog mode, if provided, shall be designed to prevent exposure of the worker's hands within the point of operation.

E6.11.4.3.2

Methods of meeting this requirement include:

- a) Requiring the concurrent use of both hand to jog,
or
- b) Having a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operating the single control.

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

CONSTRUCTION OF THE PRESS AND ITS CONTROLS—FULL REVOLUTION CLUTCHES *(continued)*

(b)(3) MACHINES USING FULL REVOLUTION POSITIVE CLUTCHES *(continued)*

METHODS OF INITIATING A PRESS CYCLE

(b)(4) FOOT PEDALS (TREADLE)

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

(ii) A pad with a nonslip contact area shall be firmly attached to the pedal.

(iii) The pedal return spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of spring coils in event of breakage.

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

(b)(5) HAND OPERATED LEVERS

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

(ii) 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.

ANSI B11.1–2001 REQUIREMENTS

6.11.4.3.4 Continuous

(See 6.12.3.3.4 [part revolution] for same requirements.)

6.11.4.3.5 Operator-maintained continuous

(See 6.12.3.3.5 [part revolution] for same requirements.)

6.11.4.3.6 Continuous on demand

(See 6.12.3.3.6 [part revolution] for same requirements.)

6.11.4.3.7 Automatic single stroke

(See 6.12.3.3.7 [part revolution] for same requirements.)

6.11.3.2(3) Same.

6.11.3.2(1) Same.

E6.11.3.2 A contact area greater than 8 square inches is recommended.

6.11.3.2(2) Same.

6.11.3.2(4) Same.

6.11.3.3 Same.

6.11.4.1(1) A red stop control shall be provided at each operator station.
(2) A top stop control, if provided, shall be yellow.

6.11.4.7 The valve, if provided, shall be designed and constructed so that any single failure within the operating valve mechanism shall not prevent the normal disengagement of the activating means but shall inhibit subsequent initiation until the failure has been corrected.

E6.11.4.7 As with any mechanism employing moving parts, eventual failure will certainly occur. Inspection to determine mechanical condition is difficult, and the results to be obtained from such inspections are not positive. A tandem or dual air-valve arrangement with monitoring is commonly used to meet this provision.

(No equivalent.)

(Continued on next page.)

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SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

PART REVOLUTION CLUTCHES (AIR AND MECHANICAL FRICTION CLUTCHES)

(b)(7) MACHINES USING PART REVOLUTION CLUTCHES

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

Stop control

(ii) 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.

Press stroking selector

(iii) 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. Fixing of selection shall be by means capable of supervision by the employer.

Inch operation

(iv) The "Inch" operating means shall be designed to prevent exposure of the worker's hands within the point of operation by:

(a) Requiring the concurrent use of both hands to actuate the clutch; or

(b) Being a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operating the single control.

ANSI B11.1-2001 REQUIREMENTS

E6.12 Air-pressure-operated friction clutches are the predominant type of part-revolution clutches.

E6.12.1 Typically, the clutch is released and the brake is applied in the event of an air-supply failure, with an air-friction clutch.

6.12.3.1(1) A red stop control shall be provided at each operator station.

E6.12.3.1 This stop may disengage the clutch and apply the brake or it may concurrently de-energize all motors.

See ANSI/NFPA 79 for additional requirements.

6.12.3.1(2) A top stop control, if provided, shall be yellow.

6.12.3.2 Same.

6.12.3.3.2 The inch operating mode shall not be used as a production mode.

6.12.3.3.2(a) Same.

6.12.3.3.2(b) Same.

6.12.3.3.3 Single cycle (stroke) shall include the following:

a) Holding time.

b) Antirepeat.

c) Interrupted cycle (stroke) protection.

d) If there are multiple operator stations, control systems shall require the release and reactivation of all controls before reinitiation of press cycle.

6.12.3.3.5 Operator-maintained continuous

Requires selection and a prior action or decision by the operator.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

PART REVOLUTION CLUTCHES

(AIR AND MECHANICAL FRICTION CLUTCHES) (continued)

(b)(7) MACHINES USING PART REVOLUTION CLUTCHES (continued)

Multiple operating stations

(vii) Controls for more than one operating station shall be designed to be activated and deactivated in complete sets of two operators' hand controls per operating station by means capable of being supervised by the employer. The clutch/brake control system shall be designed and constructed to prevent actuation of the clutch if all operating stations are bypassed.

Continuous

(viii) Those clutch/brake control systems which contain both single and continuous functions shall be designed so that completion of continuous circuits may be supervised by the employer. The initiation of continuous run shall require a prior action or decision by the operator in addition to the selection of Continuous on the stroking selector, before actuation of the operating means will result in continuous stroking.

Hand/foot selection

(ix) If foot control is provided, the selection method between hand and foot control shall be separate from the stroking selector and shall be designed so that the selection may be supervised by the employer.

Foot control

(x) Foot operated tripping controls, if used, shall be protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control.

Clutch/brake air valve failure

(xi) 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 operating valve mechanism, and to inhibit further operation if such failure does occur. This requirement shall apply only to those clutch/brake air valve controls manufactured and installed on or after August 31, 1971, but shall not apply to machines intended only for continuous, automatic feeding applications.
(Refer to (c)(5)(iii) on page 12.)

ANSI B11.1-2001 REQUIREMENTS

6.12.3.3.6 Continuous-on-demand

- a) Requires selection and a prior action or decision by the operator.
- b) A timer shall be provided to prevent cycling in the continuous-on-demand mode if the time between the demand signals exceeds predetermined time established by the user.

6.12.3.3.7 Automatic single stroke

- a) Requires selection and a prior action or decision by the operator.
- b) A timer shall be provided to prevent cycling in the automatic single stroke mode if the time between the demand signals exceeds predetermined time established by the user.

6.12.3.5.4 Same.

6.12.3.3.4 Same.

6.12.3.4(1) Same.

- (2) Only one means of actuation shall be in use at a single operator station at one time.

6.12.3.5.3 Same.

6.12.4.1 Same.

6.12.4.2 Exhaust systems used with clutch/brake air valves shall be designed to prevent a significant increase in the normal stopping time of the press.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

PART REVOLUTION CLUTCHES

(AIR AND MECHANICAL FRICTION CLUTCHES) (continued)

(b)(7) MACHINES USING PART REVOLUTION

CLUTCHES (continued)

Press drive motor interlock

(xii) The clutch/brake control shall incorporate an automatic means to prevent initiation or continued activation of the Single Stroke or continuous functions unless the press drive motor is energized and in the forward direction.

Engaging method failure

(xiii) The clutch/brake control shall automatically deactivate in event of failure of the power or pressure supply for the clutch engaging means. Reactivation of the clutch shall require restoration of normal supply and the use of the tripping mechanism(s).

Air counterbalance supply

(xiv) The clutch/brake control shall automatically deactivate in event of failure of the counterbalance(s) air supply. Reactivation of the clutch shall require restoration of normal air supply and use of the tripping mechanism(s).

Turnover bar operation

(xv) Selection of bar operation shall be by means capable of being supervised by the employer. A separate pushbutton shall be employed to activate the clutch, and the clutch shall be activated only if the drive motor is deenergized.

(c)(5) ADDED REQUIREMENTS

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 or Type B gate or movable barrier (on a part revolution clutch) is used for safeguarding:

(i) The employer shall use a control system and a brake monitor which comply with paragraphs (b)(13) and (14) of this section. This requirement shall be complied with by November 1, 1975;

(ii) The exception in paragraph (b)(7)(v)(d) of this section for two-hand controls manufactured and installed before August 31, 1971, is not applicable under this paragraph (c)(5) (see page 19);

(iii) 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 operating valve mechanism, and to inhibit further operation if such failure does occur, where a part revolution clutch is employed. The exception in paragraph (b)(7)(xi) of this section for controls manufactured and installed before August 31, 1971, is not applicable under this paragraph (c)(5).

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6.12.4.3 Same.

6.12.4.4 Same.

6.3.2.3(1) Same.

6.12.5 Same.

(No equivalent.)

(No equivalent.)

(No equivalent.)

(See 6.12.4.1 on page 11.)

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

PART REVOLUTION CLUTCHES

(AIR AND MECHANICAL FRICTION CLUTCHES) (continued)

(b)(13) CONTROL RELIABILITY

When required by paragraph (c)(5) of this section, the control system 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 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.

(b)(14) BRAKE MONITORING

When required by paragraph (c)(5) of this section, the brake monitor shall meet the following requirements:

(i) Be so constructed as to 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 paragraph (c)(3)(iii)(e) or (c)(3)(vii)(c) of this section. 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 normal limit reasonably established by the employer;

(ii) Be installed on a press so that it indicates when the performance of the braking system has deteriorated to the extent described in paragraph (b)(14)(i) of this section; and

(iii) Be constructed and installed in a manner to monitor brake system performance on each stroke.

ANSI B11.1–2001 REQUIREMENTS

8.7 Performance of the safety-related function(s)

When a component, module, device or system failure occurs, such that it or a subsequent failure of another component, module, device or system would lead to the inability of the safety-related function(s) to respond to a normal stop command or an immediate stop command, the safety-related function shall:

- prevent initiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or
- initiate an immediate stop command and prevent reinitiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or
- prevent reinitiation of hazardous machine motion (or situation) at the next normal stop command until the failure is corrected or until the control system is manually reset.

6.8 Performance of the safety-related function(s)

6.8.1 Ladder diagram

A ladder diagram designed for electromechanical relays shall not be converted for use in a programmable logic controller or other programmable microprocessor logic system nor permitted to be used for the clutch/brake control or trip control.

6.8.2 Programmable logic controllers

Programmable logic controllers or other microprocessor-based logic systems used to control clutch/brake control circuits shall be designed to meet the requirements of 8.7.

E6.8.2 See Annexes D, E and F.

6.9 Stopping-performance monitor (brake monitor)

6.9(d) If provided, the stopping-performance monitors shall be capable of supervisory control for adjustment.

E6.9 Types include:

- a) stopping position (top stop)
- b) stopping angle
- c) stopping time

A stopping-performance monitor may not prevent a repeat cycle (stroke) in the event of a major mechanical failure or multiple simultaneous component failures.

Factors affecting press stopping performance:

- clutch air supply
- counterbalance air supply
- tooling weight
- machine cycle (stroke) speed
- brake wear adjustment
- clutch wear adjustment
- exhaust restrictions

Readjusting the stopping-performance monitor requires recalculating the safety distance and possibly relocating two-hand controls or presence-sensing devices.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

CONSTRUCTION OF THE PRESS AND ITS CONTROLS—FOR ALL PRESSES

(b)(1) HAZARDS TO PERSONNEL ASSOCIATED WITH BROKEN OR FALLING MACHINE COMPONENTS

Machine components shall be designed, secured or covered to minimize hazards caused by breakage or loosening and falling or release of mechanical energy (i.e. broken springs).

(b)(2) BRAKES

Friction brakes provided for stopping or holding a 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.

(b)(8) ELECTRICAL

Disconnect

(i) A main power disconnect switch capable of being locked only in the Off position shall be provided with every power press control system.

Starter

(ii) The motor start button shall be protected against accidental operation.

(iii) All mechanical power press controls shall incorporate a type of drive motor starter that will disconnect the drive motor from the power source in 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.

Transformer

(iv) All a.c. control circuits and solenoid valve coils shall be powered by not more than a nominal 120-volt a.c. supply obtained from a transformer with an isolated secondary. Higher voltages that may be necessary for operation of machine or control mechanisms shall be isolated from any control mechanism handled by the operator, but motor starters with integral Start-Stop buttons may utilize line voltage control. All d.c. control circuits shall be powered by not more than a nominal 240-volt d.c. supply isolated from any higher voltage.

Ground

(v) 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.

ANSI B11.1–2001 REQUIREMENTS

8.2 Same.

E8.2 The hazards that can exist can include:

- a) broken shafts
- b) loose mounting bolts
- c) broken springs

6.1(1) Same.

(2) If stopping action of a press is dependent upon spring action, the spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of the spring coils in the event of breakage.

E6.1(1) The brake may be disengaged during cycling (stroking), or, on full-revolution-clutch presses, it may be a constant-drag type.

6.2.1 The electrical equipment shall be in accordance with ANSI/NFPA 79.

EXCEPTION—A plug/socket shall not be used as the main disconnecting means.

NFPA 79-2002 5.3.3.1(3) Same.

6.2.2 Same.

E6.2.2 Example include:

- recessed buttons
- flush buttons
- pull on/push off
- ring guards
- fabricated shields

6.2.3 Same.

E6.2.3 Magnetic motor starters or manual motor starters with under-voltage release are commonly used.

NFPA 79-2002 9.1.1.1 Same. However, 9.1.1.3 states that transformers shall not be required if the supply voltage does not exceed 120 volts ac and the available short-circuit current does not exceed 1000 amperes rms.

NFPA 79-2002 9.1.2.1 Same except that **all** control circuits, including motor starters with integral start-stop buttons, shall not exceed 120 volts, ac single phase.

NFPA 79-2002 9.1.2.2 Same.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

CONSTRUCTION OF THE PRESS AND ITS CONTROLS—FOR ALL PRESSES (continued)

(b)(8) ELECTRICAL (continued)

Control circuit

(vi) All clutch/brake control electrical circuits shall incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches, and static output circuits.

(b)(9) SLIDE COUNTERBALANCE SYSTEMS

(i) Spring counterbalance systems, when used, shall incorporate means to retain system parts in event of breakage.

(ii) Spring counterbalances, when used, shall have the capability to hold the slide and its attachments at midstroke, without brake applied.

(iii) Air counterbalance cylinders shall incorporate means to retain the piston and rod in case of breakage or loosening.

(iv) Air counterbalance cylinders shall have adequate capability to hold the slide and its attachments at any point in stroke, without brake applied.

(v) Air counterbalance cylinders shall incorporate means to prevent failure of capability (sudden loss of pressure) in event of air supply failure.

(b)(10) 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.

(b)(11) 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 the system.

(b)(12) 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, which is incorporated by reference as specified in §1910.6.

ANSI B11.1–2001 REQUIREMENTS

See **6.8 and 8.7 Performance of the safety-related function(s)**. See also Annexes D, E, and F.

6.3.1.1 Same.

6.3.1.2 Same.

6.3.2.1 Same.

6.3.2.2 Same.

6.3.2.3 Same.

E6.3.2.3 Common practice is to use a check valve in the air supply to the counterbalance.

6.3.2.3(1) and (2) The control shall be automatically deactivated in the event of a failure of the counterbalance(s) air supply. Reactivation of the clutch shall require restoration of normal air supply and use of the initiating means.

E6.3.2.3(1) and (2) An air pressure switch on the counterbalance air supply, downstream from pressure regulators, is a method of meeting this requirement.

9.2.3.2(3) Counterbalance pressure settings shall provide sufficient force to counterbalance slide attachment weights.

9.2.6(5) Slide counterbalance systems shall not be used as a die/slide safety means.

6.4 Same.

E6.4 Common practice is to use an air filter, regulator, and lubricator assembly.

6.6 Same. See also:

6.7 Fluid-powered die-clamping system

6.7.1 Capability

6.7.2 Fluid-supply failure

6.7.3 Loss of clamping capability

6.5 All pressure vessels used in conjunction with presses shall conform to Section VIII of the ANSI/ASME Boiler and Pressure Vessel Code.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(c)(1) GENERAL REQUIREMENTS

(i) It shall be the responsibility of the employer to provide and insure the usage of "point-of-operation guards" or properly applied and adjusted point-of-operation devices on every operation performed on a mechanical power press. See Table O-10.

(ii) The requirement of paragraph (c)(1)(i) of this section shall not apply when the point-of-operation opening is one-fourth inch or less. See Table O-10.

(c)(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 section.

(c)(3) POINT OF OPERATION DEVICES

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

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

(b) 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

(c) Preventing the operator from inadvertently reaching into the point of operation at all times; or

(d) [Reserved] (formerly sweep device)

ANSI B11.1-2001 REQUIREMENTS

8.3.1 The user shall have the responsibility to provide and ensure that point-of-operation guards or devices are used, checked, maintained, and, where applicable, adjusted on every operation performed on a press production system for every individual exposed to a point-of-operation hazard.

E8.3.1 The user should consider all aspects of the hazards associated with the point of operation. A combination of various safeguarding methods may be required to protect operators, helpers, passersby, or others.

8.3.2 EXCEPTION Same. (See Figure C.10 and Table C.1, Annex C.)

See also **8.6.1** Safe-opening safeguarding.

9.3.4(1) Same.

E9.3.4(1) The use of hand-feeding tools should prevent the need for the operator to place hands or fingers within the point-of-operation. However, these tools may not prevent the operator from inadvertently placing hands or fingers within the point of operation. Therefore, a guard or device should be used for protection.

9.3.4(2) The materials used in the design and construction of hand tools shall not shatter in the event of involvement with the machine or its tooling.

E9.3.4(2) Materials such as aluminum or other material softer than the machine tooling, fixtures, or other components will satisfy this requirement. Hand tools should be designed with human factors engineering (ergonomics) principles to minimize fatigue and stress to the hand, wrist, arm, and shoulder. (See Figure 15, Annex A).

8.5.1 Methods of controlling access to point-of-operation hazards include but are not limited to the following:

8.5.1(a) Same.

E8.5.1(a) See Presence-sensing safeguarding device (8.5.3).

8.5.1(b) Same.

E8.5.1(b) See Pull-back device (8.5.4).

8.5.1(c) Same.

E8.5.1(c) See Restraint device (8.5.5).

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(continued)

(c)(3) POINT OF OPERATION DEVICES (continued)

(e) 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

(f) 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

(g) 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.

Two-hand trip

(viii) The two-hand trip device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

(a) 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 operator controls to activate the slide.

(b) Each two-hand trip shall meet the construction requirements of paragraph (b)(6) of this section.

(b)(6) TWO-HAND TRIP

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

(ii) Two-hand trip systems on full revolution clutch machines shall incorporate an antirepeat feature.

(iii) If two-hand trip systems are used on multiple operator presses, each operator shall have a separate set of controls.

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8.5.1(d) Same.

E8.5.1(d) See Two-hand actuating control devices (8.5.2).

8.5.1(e) Same.

E8.5.1(e) See type-A movable-barrier device (8.5.6.1).

8.5.1(f) Same.

E8.5.1(f) See type-B movable-barrier device (8.5.6.2).

8.5.2.2.1 A two-hand trip, when used, shall protect the operator as specified in 8.5.1(d).

8.5.2.2.3 Same.

8.5.2.2.4 Each two-hand trip device shall meet the construction requirements of 6.11.4.5.1.

6.11.4.5.1 Same.

8.5.2.2.2 The two-hand trip device shall be designed and constructed to require the release of all operator's hand trip devices and re-actuation of all controls before a press cycle (stroke) can be reinitiated.

8.5.2.2.3 Same, plus all sets shall be concurrently operated before the press is tripped.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(continued)

(c)(3) POINT OF OPERATION DEVICES

Two-hand trip (continued)

(viii)(c) The safety distance (D_m) between the two-hand trip and the point of operation shall be greater than the distance determined by the following formula:

$D_m = 63 \text{ inches/second} \times T_m$; where:

D_m = minimum safety distance (inches);

63 inches/second = hand speed constant; and

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 crankshaft. For full revolution clutch presses with more than one en

$$T_m = \left[\frac{1}{2} + \frac{1}{\text{Number of engaging points per revolution}} \right] \times \text{time necessary to complete one revolution of the crankshaft (seconds)}$$

(d) Two-hand trips shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.

Two-hand control (part revolution only)

(vii) The two-hand control device shall protect the operator as specified in paragraph (c)(3)(i)(e) of this section.

(a) 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 operators' controls to activate the slide. The removal of a hand from any control button shall cause the slide to stop.

(b) Each two-hand control shall meet the construction requirements of paragraph (b)(7)(v) of this section.

(b)(7) MACHINES USING PART REVOLUTION CLUTCHES

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

(a) Each hand control shall be protected against unintended operation and arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press.

ANSI B11.1-2001 REQUIREMENTS

8.5.2.2.5 Each actuating control shall be located at a distance from the point of operation so that the operator cannot release either hand trip actuating control and reach into the point of operation prior to die closure.

E8.5.2.2.5

$$D_m = K \times T_m$$

D_m = minimum safety distance in inches

K = 63 inches/second (hand speed constant)

T_m = maximum die closure time after press has been tripped

$$T_m = \left(\frac{1}{2} + \frac{1}{N} \right) \times T_{Cr}$$

N = number of engagement points

T_{Cr} = time necessary to complete one crankshaft revolution

For part-revolution clutch presses, T_m should be calculated as follows:

$$T_m = \frac{1}{2} \times T_{Cr}$$

8.5.2.2.6 Means shall be taken to ensure that the two-hand trip device is not located closer to the point of operation than the distance determined in 8.5.2.2.5. See also Annex C.

8.5.2.1.1 A two-hand control device, if used, shall protect the operator as specified in 8.5.1(a).

8.5.2.1.3 Same.

8.5.2.1.2 Each two-hand control device shall conform to the construction requirements of 6.12.3.5.1.

6.12.3.5.1 Same.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(continued)

(b)(7) MACHINES USING PART REVOLUTION CLUTCHES

(continued)

(b) The control system shall be designed to permit an adjustment which will require concurrent pressure from both hands during the die closing portion of the stroke.

(c) The control system shall incorporate an antirepeat feature.

(d) The control systems shall be designed to require release of all operators' hand controls before an interrupted stroke can be resumed. This requirement pertains only to those single stroke, two-hand controls manufactured and installed on or after August 31, 1971. (Refer to (c)(5) (ii) on page 12.)

(c)(3) POINT OF OPERATION DEVICES

(vii)(c) The safety distance (D_S) between each two-hand control device and the point of operation shall be greater than the distance determined by the following formula:

$D_S = 63 \text{ inches/second} \times T_S$; where:

D_S = minimum safety distance (inches)

63 inches/second = hand speed constant; and

T_S = stopping time of the press measured at approximately 90° position of the crankshaft rotation (seconds).

(d) Two-hand controls shall be fixed in position so that only a supervisor or safety engineer is capable of relocating the controls.

ANSI B11.1-2001 REQUIREMENTS

6.12.3.3.3(a) and E8.5.2.1.3 Same.

6.12.3.3.3(b) and **8.5.2.1.4** Same.

6.12.3.3.3(c) Same.

8.5.2.1.5 Each operator's hand actuating control shall be located at a distance from the point-of-operation so that the operator(s) cannot release either hand actuating control and reach into the point-of-operation prior to die closure or prior to cessation of slide motion during the closing portion of the cycle (stroke).

E8.5.2.1.5 The total stopping time of the press should include the total response time of the control system and the time it takes the press to cease slide motion. The following formula should be used when calculating the safety distance (D_S):

$$D_S = K(T_S + T_C + T_{bm})$$

Where:

K = 63 inches/second (hand speed constant).

T_S = the stop time of the press measured from the final de-energized control element, usually the air valve.

T_C = the response time of the control.

T_{bm} = the additional time allowed by the brake monitor before it detects stop time deterioration.

NOTE: $T_S + T_C$ are usually measured by a stop time measuring device.

When the press stopping-performance monitor timer or stop position sensor is changed, the safety distance should be recalculated. (See Figure C.8 in Annex C.)

8.5.2.1.6 Means shall be taken to ensure that the hand actuating controls are not located closer to the point of operation than the distance determined in 8.5.2.1.5. See also Annex C.

8.5.2.1.7 The two-hand control device shall be in compliance with 6.8 (and 8.7).

8.5.2.1.8 When two-hand control device is used on a part revolution clutch press in a single-stroke mode and when the protection of the operator is dependent upon the stopping action of the press, a stopping-performance monitor shall be required in conformance to 6.9.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION (continued)

c)(3) POINT OF OPERATION DEVICES (continued)

Presence sensing

(iii) A presence sensing point of operation device shall protect the operator as provided in paragraph (c)(3)(i)(a) of this section, 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 downstroke of the press slide.

(a) The devices may not be used on machines using full revolution clutches.

(b) The devices may not be used as a tripping means to initiate slide motion, except when used in total conformance with paragraph (h) of this section.

Note: Paragraph (h) on presence-sensing device initiation (PSDI) has been intentionally omitted.

ANSI B11.1–2001 REQUIREMENTS

8.5.3.1 A presence-sensing device, when used for safeguarding, shall protect the operator as specified in 8.5.1(a).

8.5.3.2 The device shall be interfaced with the control circuit to prevent or stop slide motion if any object is within the sensing field of the device during the hazardous portion of the cycle (stroke).

8.5.3.3 Same.

8.5.3.5 When the device is used in the PSDI mode, reinitiation of the press motion shall be in accordance with 6.12.3.3.8.

6.12.3.3.8 Presence-Sensing Device Initiation

- 1) Requires a setup/reset action after selecting PSDI.
- 2) The PSDI system shall discriminate between a (regular) break and rapid changes of the presence-sensing device output.
- 3) PSDI shall be used to initiate single cycles only.
- 4) A timer shall be provided to disarm PSDI if there is too much time between cycles.
- 5) Any stop signal shall stop and prevent further cycling until PSDI is manually rearmed.
- 6) Selection of the number of breaks, when provided, shall be capable of supervision.
- 7) A break sequence indicator is required when more than one break is used.
- 8) A PSDI armed indicator is required in view of operator.
- 9) Any change in mode or number of breaks shall stop and prevent further cycling until PSDI is manually rearmed.

10 Additional requirements for PSDI operation

10.1 All previous clauses apply to PSDI.

10.2 No PSDI if pass through is possible.

10.3 Multiple PSDI on same press requires selected number of breaks for each presence-sensing device.

10.4.1 PSDI shall be implemented only with PSDs that meet 8.5.3.

E10.4.1 (Typically light curtains used for PSDI).

10.4.2 The entire PSDI sensing-field indicator shall be in clear view of the operator.

10.4.3 Light curtains used for PSDI require MOS not to exceed 32 mm (1¼").

10.4.4 Blanking shall be permitted in the PSDI mode if it meets 10.4.3 (MOS limits).

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION (continued)

Presence sensing (continued)

(c) 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.

(d) Muting (bypassing of the protective function) of such device during the upstroke of the press slide is permitted for the purpose of parts ejection, circuit checking, and feeding.

(e) The safety distance (D_S) from the sensing field to the point of operation shall be greater than the distance determined by the following formula:

$$D_S = 63 \text{ inches/second} \times T_S$$

Where:

D_S = minimum safety distance (inches);

63 inches/second = hand speed constant; and T_S = stopping time of the press measured at approximately 90° position of crankshaft rotation (seconds).

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8.5.3.13 and **8.5.3.14** The device and its interface shall conform to 6.8 and 8.7 (**Performance of safety-related function(s)**).

8.5.3.6 Muting of the device shall be permitted only during the non-hazardous portion of the press cycle (stroke).

E8.5.3.6 Hazards are possible during the upstroke.

8.5.3.7 Muting of the device shall conform to 6.8 and 8.7 (**Performance of safety-related function(s)**).

8.5.3.16 The effective sensing field of the device shall be located at a distance from the nearest point-of-operation hazard so that individuals cannot reach into the point of operation with a hand or other body part before cessation of motion during the hazardous portion of the cycle (stroke).

E8.5.3.16

$$D_S = K(T_S + T_C + T_R + T_{bm}) + D_{pf}$$

where

K = 63 inches/second (hand speed constant).

T_S = the stop time of the press measured from the final de-energized control element, usually the air valve.

T_C = the response time of the press control.

T_R = the response time of the presence-sensing device and its interface, if any, as stated by the manufacturer or measured by the user.

T_{bm} = the additional time allowed by the stopping-performance monitor before it detects stop time deterioration.

D_{pf} = the added distance due to the penetration factor as recommended in Figure 2, Annex C. The minimum object sensitivity is stated by the manufacturer. If beam blankouts or floating window features are used, these figures should be added to the object sensitivity figure before using the chart.

NOTE: $T_S + T_C$ are usually measured by a stop time measuring device.

See also Annex C.

Whenever the press-cycle (stroke) stop command or stopping-performance monitor time or angle setting is changed, the safety distance should be recalculated. See also Stopping-performance monitor (6.9).

NOTE: No increase in safety distance is required for fixed blanking applications if the blanked area is entirely occupied by the material or fixtures.

In some instances, the use of blanking does not allow efficient production of certain piece parts. horizontal placement of the sensing field, so that it detects that operator's waist area, may present a solution. In this application, the operator may freely manipulate the workpiece and operate the press as long as the operator stands outside of the horizontal sensing field.

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SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(continued)

Presence sensing (continued)

(f) Guards shall be used to protect all areas of entry to the point of operation not protected by the presence sensing device.

Pull-out (pullback)

(iv) The pull-out device shall protect the operator as specified in paragraph (c)(3)(i)(b) of this section and shall include attachments for each of the operator's hands.

(a) Attachments shall be connected to and operated only by the press slide or upper die.

(b) 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.

(c) A separate pull-out device shall be provided for each operator if more than one operator is used on the press.

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8.5.3.19 All areas of entry to the point of operation not protected by the presence-sensing device shall be otherwise safeguarded.

8.5.3.17 If the position of the device will allow the operator or others to place themselves between the sensing field and the point of operation, additional means shall be provided in conjunction with the device to prevent the operator or others from exposure to the point-of-operation hazard.

8.5.3.4 Use of the stroke-actuating means shall be required after clearing the sensing field when the sensing field has been interrupted.

8.5.3.8 The device shall have an identifiable minimum object sensitivity so that an obstruction of equal or greater size will be detected anywhere in the sensing field.

8.5.3.9 The device shall have a maximum response time and shall not be affected by object sensitivity adjustments or environmental changes.

8.5.3.10 Devices with blanking capabilities shall be designed so they are able to be supervised.

8.5.3.11 There shall be visible means to indicate proper functioning of the device, which channels are being blanked, if float blanking is in use, and if the device is being bypassed.

8.5.3.12 The presence of an individual's hand or other body part shall be detected regardless of the presence of a reflective object or workpiece.

8.5.3.15 Sensitivity shall not be adversely affected by changing conditions around the press. (See also Figure C.9 in Annex C, Variable Detection Area on Radio Frequency Devices).

8.5.3.18 The response time shall not be affected by ambient light or by light-source decay.

8.5.3.21 A stopping-performance monitor shall be required for presses used in the single stroke mode in accordance with 6.9.

8.5.4.1 A pull-back device, if used, shall protect the operator as specified in 8.5.1(b).

8.5.4.2 Same.

8.5.1(b) Same.

(No equivalent.)

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION

(continued)

Pull-out (pullback) (continued)

(d) Each pull-out device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die setup, and when operators are changed. Necessary maintenance or repair or both shall be performed and completed before the press is operated. Records of inspections and maintenance shall be kept in accordance with paragraph (e) of this section.

Sweep

(v) The sweep device may not be used for point-of-operation safeguarding after December 31, 1976.

Holdout or restraint

(vi) A holdout or a restraint device shall protect the operator as specified in paragraph (c)(3)(i)(c) of this section 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 operator is required on a press.

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8.5.4.3 The hand attachments, including wristlets, snaps, and cables, shall be used in a manner prescribed by the manufacturer.

Each device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die set-up, when operators are changed, and after any repair or maintenance that can affect the performance of the pull-back.

8.5.4.4 Necessary maintenance or repair, or both, shall be performed and completed before the press production system is operated.

8.5.4.5 Fasteners, pins, and other components used to secure and maintain the setting of the device shall be applied in such a manner as to prevent loosening, slipping, or failure during use.

8.5.4.6 The pulling or holding members or cables and the hand and wrist attachments of the device shall be of a substantial material that will resist deterioration from environmental conditions.

8.5.4.7 Die or tooling set-ups that have bolts, nuts, studs, stops, blow-off tubes, or other objects that protrude from the point of operation shall be protected so that they shall not interfere with the normal pulling action of the hand attachments.

8.5.4.8 If work gloves are worn by the operator, the user shall ensure that the gloves are worn over the hand attachments and worn when the adjustment is checked.

(No equivalent.)

8.5.5.1 A restraint device, if used, shall protect the operator as specified in 8.5.1(c).

8.5.5.2 Hand and wrist attachments shall be anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation at all times.

8.5.5.3 Each device in use shall be visually inspected and checked for proper adjustment at the start of each operator shift, following a new die set-up, and when operators are changed.

8.5.5.4 Fasteners, pins, and other components used to secure and maintain the setting and adjustment of the restraint device (holdout) shall be applied in such a manner as to prevent loosening, slipping, or failure during use.

8.5.5.5 Holding members or cables and the hand and wrist attachments of the device shall be of a substantial material that will resist deterioration from environmental conditions.

(Continued on next page.)

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SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION (continued)

Gate or movable barrier device

(ii) A gate or movable barrier device shall protect the operator as follows:

(a) A Type A gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(f) of this section, and

(b) A Type B gate or movable barrier device shall protect the operator in the manner specified in paragraph (c)(3)(i)(g) of this section.

ANSI B11.1–2001 REQUIREMENTS

8.5.6 Movable barrier device

- 1) When a movable barrier device is used, it shall enclose the point of operation before a press cycle (stroke) is initiated.
- 2) The device (when closed) shall prevent an individual from reaching over, under, around, or through into the point-of-operation hazard.
- 3) In conjunction with the press control, the device shall actuate the clutch and initiate the press cycle (stroke).
- 4) The barrier shall be capable of returning to the open position if it encounters an obstruction before enclosing the point of operation.
- 5) The barrier shall open in order to reset the antirepeat system every time the press stops before the next cycle (stroke) can be initiated.
- 6) The device shall be in compliance with 6.8 (and 8.7).
- 7) The device shall provide visibility to the point of operation for safe operation of the press.
- 8) The device itself shall not create a hazard to the operator or others.

8.5.6.1.1 A Type-A movable barrier device, when used, shall protect the individuals as specified in 8.5.1(e).

E8.5.6.1.1 The device should be designed so the operator cannot easily open the gate during the cycle, and it should prevent re-entry into the point of operation in the event of a failure of the press or its components.

8.5.6.1.2 The device shall be designed to stay in the closed position until completion of the cycle (stroke) when in single-stroke operation.

8.5.6.2.1 A Type-B movable barrier device shall protect the individuals as specified in 8.5.1(f).

8.5.6.2.2 The device shall not be used on full-revolution clutch presses.

8.5.6.2.3 In normal single-stroke operation, the device shall be held in the closed position or until the slide motion has stopped during the closing portion of the cycle (stroke).

8.5.6.2.4 A stopping-performance monitor shall be required when the operator is dependent on the stopping action of the press when the device is used while in the single-stroke mode of operation.

8.6 Safe-opening safeguarding

8.6.1 (a) The opening in the safeguarding, when the workpiece is in place, shall be small enough to prevent any part of the operator's body from entering the hazard area.

(b) Means shall be provided to prevent the press from cycling when the workpiece is not in place.

8.6.2 The control system shall require that the actuating means be operated and the workpiece in place prior to initiating a cycle.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION (continued)

(c)(2) POINT OF OPERATION GUARDS

(i) Every point of operation guard shall meet the following design, construction, application, and adjustment requirements:

(a) It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;

(b) It shall conform to the maximum permissible openings of Table O-10;

(c) It shall, in itself, create no pinch point between the guard and moving machine parts;

(d) It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts;

(e) It shall facilitate its inspection, and

(f) It shall offer maximum visibility of the point of operation consistent with the other requirements.

(ii) A die enclosure guard shall be attached to the die shoe or stripper in a fixed position.

(iii) A fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.

(iv) An interlocked press barrier guard shall be attached to the press frame or bolster and shall be interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of Table O-10.

(v) The hinged or movable sections of an interlocked press barrier guard shall not be used for manual feeding. The guard shall prevent opening of the interlocked section and reaching into the point of operation prior to die closure or prior to the cessation of slide motion. See paragraph (c)(3)(ii) of this section regarding manual feeding through interlocked press barrier devices.

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8.4 Guards

A guard used to prevent access to the point of operation, by the operator or others, shall conform to the following requirements:

8.4.1.1 Same.

E8.4.1.1 See Figure C.10 and Table C.1 in Annex C.

8.5.1.2 Same.

8.4.1.4 Same.

8.4.1.5 The material of the guards shall be designed and constructed so as to protect the operator and others from point-of-operation hazards.

E8.4.1.5 Guards are intended to keep individuals out of the point-of-operation; they are not intended to contain die or press parts in the event of a catastrophic failure.

8.4.1.6 Construction of the guards shall be free of sharp edges, burrs, slag welds, fasteners, or other hazards that can cause injury.

(No equivalent.)

8.4.1.3 Same.

8.4.2 Same.

8.4.3 A fixed barrier guard, if used, shall be attached to the press frame, bolster plate, or other fixed surface(s).

8.4.5.1 An interlocked barrier guard, if used for safeguarding the point of operation, shall prevent cycling (stroking) of the press when the interlocked section of the guard is not in the protecting position.

8.4.5.3 Same.

8.4.5.4 Same.

8.4.5.2 Interlocked barrier guards used to safeguard the point of operation shall be so designed and installed that when the interlock is opened, reclosing the interlock shall not cause any motion of the press.

(Continued on next page.)

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SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

METHODS OF SAFEGUARDING THE POINT OF OPERATION (continued)

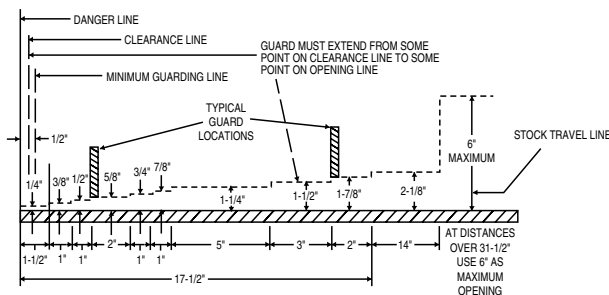
(vi) The adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with Table O-10 and the requirements of this subparagraph. Adjustments shall be made only by authorized personnel whose qualifications include a knowledge of the provisions of Table O-10 and this subparagraph.

(vii) A point-of-operation enclosure which does not meet the requirements of this subparagraph and Table O-10 shall be used only in conjunction with point-of-operation devices.

TABLE O-10

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.....	3/4
5 1/2 to 6 1/2.....	1
6 1/2 to 7 1/2.....	1 1/4
7 1/2 to 12 1/2.....	1 1/2
12 1/2 to 15 1/2.....	1 3/4
15 1/2 to 17 1/2.....	2
17 1/2 to 31 1/2.....	2 1/2

This table shows the distances that guards shall be positioned from the danger line in accordance with the required openings.



Explanation of above diagram:

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 clearance line.

The various openings are such that for average size hands an operator's fingers won't 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.

ANSI B11.1-2001 REQUIREMENTS

8.4.4 Adjustable barrier guards

a) The guard shall be attached to the press frame, bolster, die shoe, or other fixed surface;

b) The guard shall be adjusted and used in compliance with the requirements of 8.4.1.1;

c) Adjustments shall be made only by personnel whose qualifications include an understanding of the application of Table C.1 (Annex C).

E8.4.4 If the adjustment and operation of the adjustable barrier guard is not closely supervised, inadequate safeguarding can result.

See Figure 13, Annex A.

8.4.6 Partial enclosure

Physical barriers that do not conform to the requirements of 8.4.1.1 shall be used only in conjunction with safeguarding devices covered in this clause and in combinations that conform to the intent of this clause.

Table C.1 in Annex C is the same.

Figure C.10 in Annex C is the same.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

DESIGN, CONSTRUCTION, SETTING AND FEEDING OF DIES

(d)(1) GENERAL REQUIREMENTS

The employer shall: (i) use dies and operating methods designed to control or eliminate hazards to operating personnel, and

(ii) furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die, so that no employee need reach into the point of operation for such purposes.

(d)(2) [RESERVED] (Previously "No Hands in Die" Feeding)

(d)(3) 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) of this section and with § 1910.219.

(d)(4) 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 (c) of this section.

(d)(5) 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) of this section.

(d)(6) TONNAGE, STROKE, AND WEIGHT DESIGNATION

All dies shall be:

(i) Stamped with the tonnage and stroke requirements; or have these characteristics recorded if these records are readily available to the die setter;

(ii) Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment; and

(iii) Stamped to indicate complete die weight when handling equipment may become overloaded.

ANSI B11.1-2001 REQUIREMENTS

9.2.1 Die design

The user shall use dies and operating methods designed to control or eliminate hazards to operating personnel. Where the design of the die does not eliminate hazards associated with the use of the die, safeguarding in accordance with clause 8 shall be used.

9.3.5 Same.

(No equivalent.)

8.1 Hazards associated with movable parts (other than point-of-operation hazards)

The user shall have the responsibility to provide and ensure that hazards associated with moving parts, such as power transmission apparatus, are safeguarded in accordance with ANSI/ASME B15.1.

E8.1 These hazards include but are not limited to pinch points between the slide and the stationary press components, or other auxiliary equipment (e.g., feeders, conveyors).

8.3.2 Same except also includes similar pinch points between the slide or moving die and fixed die or press attachments.

(No equivalent.)

9.2.3.1 Die setter information

Personnel responsible for setting dies shall be provided with necessary information including but not limited to:

- a) rated press capacity requirements for the die;
- b) weight of the upper die and other slide attachments required for the job set-up, when needed for setting counterbalance air pressure;
- c) total die weight;
- d) die shutheight.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

DESIGN, CONSTRUCTION, SETTING AND FEEDING OF DIES (continued)

(d)(7) DIE FASTENING

Provision shall be made in both the upper and lower shoes for securely mounting the die to the bolster 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.

(d)(8) DIE HANDLING

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

(d)(9) DIESETTING

(i) The employer shall establish a die setting procedure that will insure compliance with paragraph (c) of this section.

(ii) The employer shall provide spring loaded turnover bars, for presses designed to accept such turnover bars.

(iii) 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.

(iv) The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.

ANSI B11.1-2001 REQUIREMENTS

9.2.4 Die fastening

Die fastening provisions shall conform to the following requirements:

- 1) Both upper and lower dies need to have secure mounting.
- 2) Additional means of securing the upper die shall be used if clamp caps or set screws are used in conjunction with punch stems.
- 3) If fluid powered die clamps are used, they shall hold dies securely in place throughout the cycle.

9.2.2 Die handling

To ensure safe handling, the user shall conform to the following requirements:

- 1) Dies shall be configured for ease of handling during installation into and removal from the press.
- 2) Stops or other means shall be provided to prevent losing control of the die while setting dies into, or removing dies from, presses that are inclined.

9.2.3.2(1) Same.

E9.2.3.2 See also ANSI B11.TR3 for more information on risk assessment and risk reduction.

9.2.5 Turnover bar

For presses equipped with a turnover bar, the user shall provide means to ensure removal of the turnover bar from the bar hole before the press can be energized.

9.2.2(2) Same.

9.2.6 Die adjustment, cleaning, repair

When it is necessary to place hands or other body parts into the point of operation for repair with the die(s) in the press or adjustment and cleaning which is not integral to the production process, means shall be provided to prevent the initiation of hazardous movements. To meet this requirement, the following procedures shall be followed:

- 1) The press drive motor shall be off and the clutch/brake control or trip-control system shall be deactivated.
- 2) Safety blocks or other die/slide support means (e.g., slide locks, chain locks, locking pins) that restrict hazardous motion shall be designed, constructed, and installed to either:
 - a) hold the full working force of the machine and tooling members when machine actuation can take place while the mechanisms are in place; or
 - b) be interlocked with the machine to prevent actuation of hazardous motion of the machine while in place in its protecting position and be designed and constructed to hold the maximum anticipated load (normally the static weight) of the movable portion of the machine, its tooling, and attachments.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

DESIGN, CONSTRUCTION, SETTING AND FEEDING OF DIES (continued)

(d)(9) DIESETTING (continued)

(iv) (continued)

(v) The employer shall provide brushes, swabs, lubricating rolls, and automatic or manual pressure guns so that operators and die setters shall not be required to reach into the point of operation or other hazard areas to lubricate material, punches or dies.

INSPECTION, MAINTENANCE, AND MODIFICATION OF PRESSES

(e)(1) INSPECTION AND MAINTENANCE RECORDS

(i) Under the general component of the inspection program, the employer shall: (A) Conduct periodic and regular inspections of each power press to ensure that all of its parts, auxiliary equipment, and safeguards, including the clutch/brake mechanism, antirepeat feature, and single-stroke mechanism, are in a safe operating condition and adjustment; (B) Perform and complete necessary maintenance or repair, or both, before operating the press; and (C) Maintain a certification record of each inspection, and each maintenance and repair task performed, under the general component of the inspection program that includes the date of the inspection, maintenance, or repair work, the signature of the person who performed the inspection, maintenance or repair work, and the serial number, or other identifier, of the power press inspected, maintained, and repaired.

(ii) Under the directed component of the inspection program, the employer shall: (A) Inspect and test each press on a regular basis at least once a week to determine the condition of the the clutch/brake mechanism, antirepeat feature, and single-stroke mechanism; (B) Perform and complete necessary maintenance or repair, or both, on the clutch/brake mechanism, antirepeat feature, and single-stroke mechanism before operating the press; and (C) Maintain a certification record of each maintenance task performed under the directed component of the inspection program that includes the date of the maintenance task, the signature of the person who performed the maintenance task, and the serial number, or other identifier, of the power press maintained.

NOTE TO PARAGRAPH(e)(1)(ii): Inspections of the clutch/brake mechanism, antirepeat feature, and single-stroke mechanism are exempt from the requirement to maintain certification records, but inspections of the clutch/brake mechanism, antirepeat feature, and single-stroke mechanism are not exempt from this requirement.

(iii) Paragraph (e)(1)(ii) of this section does not apply to presses that comply with paragraphs (b)(13) and (14) of this section.

(e)(2) MODIFICATION

It shall be the responsibility of any person modifying a power press to furnish instructions with the modification to establish new or changed guidelines for use and care of the power press so modified.

(e)(3) TRAINING OF MAINTENANCE PERSONNEL

It shall be the responsibility of the employer to insure the original and continuing competence of personnel caring for, inspecting, and maintaining power presses.

ANSI B11.1–2001 REQUIREMENTS

3) Electrical interlocking of manually installed safety block(s) or other die/slide support means shall automatically de-energize the clutch and drive motor circuits when safety blocks are removed from their storage locations.

4) Manually installed safety blocks shall not be utilized until the flywheel has stopped.

9.3.6 Same.

9.4 Inspection and maintenance

9.4.1 Program

Inspection and maintenance programs shall conform to the following requirements:

1) The user shall establish a program of periodic and regular inspection to ensure that all parts, auxiliary equipment, and safeguarding are in safe operating condition and adjustment.

2) The user shall ensure that all scheduled inspections are performed.

3) If an inspection reveals a potentially hazardous condition, the user shall remove the press from production and lock it out until all necessary adjustments or repairs have been made.

(No equivalent.)

(No equivalent.)

9.5 Training shall be provided for:

9.5(1) All personnel associated with press production systems.

9.5(2) Operators.

9.5(3) Die setters.

9.5(4) Maintenance personnel.

9.5(5) Supervisors.

9.5(6) Personnel, as required by assigned functions, for lockout/tagout of hazardous energy sources in accordance with ANSI Z244.1.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

OPERATION OF POWER PRESSES

(f)(1) [RESERVED]

(f)(2) INSTRUCTION TO OPERATORS

The employer shall train and instruct the operator in the safe method of work before starting work on any operation covered by this section. The employer shall insure by adequate supervision that correct operating procedures are being followed.

(f)(3) WORK AREA

The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. Ample room for cleaning machines, handling material, work pieces, and scrap shall also be provided. All surrounding floors shall be kept in good condition and free from obstructions, grease, oil, and water.

(f)(4) OVERLOADING

The employer shall operate his presses within the tonnage and attachment weight ratings specified by the manufacturer.

ANSI B11.1–2001 REQUIREMENTS

9.5(2) Same.

9.6 Supervision

The user shall ensure that the operation of press production systems is continually supervised by trained personnel to ensure the following:

1) The designated supervisor shall ensure that, for each job set-up and prior to release for production, the proper point-of-operation safeguarding has been installed or activated, and is operational for production use by the operator.

2) The designated supervisor shall ensure that correct operating procedures are followed, and that the press production system is being used as intended and within the rated capacities of the press and associated system components.

9.3.2(1), (2), (3), and 7.2.1 Same.

9.3.2(4) and 7.2.2 The layout provides necessary clearance between machines, associated equipment, and building columns or walls to ensure that cleaning, maintenance, or repair tasks can be performed without introducing hazards to personnel.

9.3.2.2(2) Die capacity requirements shall not exceed press capacity.

(Continued on next page.)

SECTION 3 — MECHANICAL POWER PRESSES

Mechanical Power Press Safety

OSHA REQUIREMENTS

REPORTS OF INJURIES TO EMPLOYEES OPERATING MECHANICAL POWER PRESSES

(g)(1) The employer shall, within 30 days of the occurrence, report to either the Director of the Directorate of Safety Standards Programs, OSHA, U.S. Department of Labor, Washington, D.C. 20210, or the State agency administering plan approved by the Assistant Secretary of Labor for Occupational Safety and Health, all point of operation injuries to operators or other employees. The following information shall be included in the report:

(i) Employer's name, address and location of the workplace (establishment).

(ii) Employee's name, injury sustained, and the task being performed (operation, set-up, maintenance, or other).

(iii) Type of clutch used on the press (full revolution, part revolution or direct drive).

(iv) Type of safeguard(s) being used (two-hand control, two-hand trip, pullouts, sweeps or other). If the safeguard is not described in this section, give a complete description.

(v) Cause of the accident (repeat of press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use or other).

(vi) Type of feeding (manual with hands in dies or with hands out of dies, semi-automatic, automatic or other).

(vii) Means used to actuate press stroke (foot trip, foot control, hand trip, hand control or other).

(viii) Number of operators required for the operation and the number of operators provided with controls and safeguards.

Paragraph (h) on presence-sensing device initiation (PSDI) has been intentionally omitted.

ANSI B11.1-2001 REQUIREMENTS

(No equivalent.)

(No equivalent.)

(No equivalent.)

(No equivalent.)

(No equivalent.)

(No equivalent.)

(No equivalent.)

(No equivalent.)

(No equivalent.)

(Continued on next page.)

SECTION 4 — MECHANICAL POWER-TRANSMISSION APPARATUS

Mechanical Power Press Safety

(a) General Requirements. (1) This section covers all types and shapes of power-transmission belts, except the following when operating at two hundred and fifty (250) feet per minute or less: (i) Flat belts one (1) inch or less in width, (ii) flat belts two (2) inches or less in width which are free from metal lacings or fasteners, (iii) round belts one-half (1/2) inch or less in diameter; and (iv) single strand V-belts, the width of which is thirteen thirty-seconds (13/32) inch or less.

(2) Vertical and inclined belts (paragraphs (e) (3) and (4) of this section) if not more than two and one-half (2 1/2) inches wide and running at a speed of less than one thousand (1,000) feet per minute, and if free from metal lacings or fastenings may be guarded with a nip-point belt and pulley guard.

(3) For the Textile Industry, because of the presence of excessive deposits of lint which constitutes a serious fire hazard, the sides and face sections only of nip-point belt and pulley guards are required, provided the guard shall extend at least six (6) inches beyond the rim of the pulley on the in-running and off-running sides of the belt and at least two (2) inches away from the rim and face of the pulley in all other directions.

(4) This section covers the principal features with which power-transmission safeguards shall comply.

(b) Prime-mover guards—(1) Flywheels. Flywheels located so that any part is seven (7) feet or less above floor or platform shall be guarded in accordance with the requirements of this subparagraph:

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

(ii) With guard rails placed not less than fifteen (15) inches nor more than twenty (20) inches from rim. When flywheel extends into pit or is within twelve (12) inches of floor, a standard toeboard shall also be provided;

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

(iv) For flywheels with smooth rims five (5) feet or less in diameter, where the preceding methods cannot be applied, the following may be used: a disk attached to the flywheel in such manner as to cover the spokes of the wheel on the exposed side and present a smooth surface and edge, at the same time providing means for periodic inspection. An open space, not exceeding four (4) inches in width, may be left between the outside edge of the disk and the rim of the wheel if desired, to facilitate turning the wheel over. Where a disk is used, the keys or other dangerous projections not covered by disk shall be cut off or covered. This subdivision does not apply to flywheels with solid web centers.

(v) Adjustable guard to be used for starting engine or for running adjustment may be provided at the flywheel of gas or oil engines. A slot opening for jack bar will be permitted.

(vi) Wherever flywheels are above working areas, guards shall be installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure.

(2) Cranks and connecting rods. Cranks and connecting rods, when

exposed to contact, shall be guarded in accordance with paragraphs (m) and (n) of this section, or by a guardrail as described in paragraph (o) (5) of this section.

(3) Tail rods or extension piston rods. Tail rods or extension piston rods shall be guarded in accordance with paragraphs (m) and (o) of this section, or by a guardrail on sides and end, with a clearance of not less than fifteen (15) nor more than twenty (20) inches when rod is fully extended.

(c) Shafting—(1) Installation. (i) Each continuous line of shafting shall be secured in position against excessive endwise movement.

(ii) Inclined and vertical shafts, particularly inclined idler shafts, shall be securely held in position against endwise thrust.

(2) Guarding horizontal shafting. (i) All exposed parts of horizontal shafting seven (7) feet or less from floor or working platform, excepting runways used exclusively for oiling, or running adjustments, shall be protected by a stationary casing enclosing shafting completely or by a trough enclosing sides and top or sides and bottom of shafting as location requires.

(ii) Shafting under bench machines shall be enclosed by a stationary casing, or by a trough at sides and top or sides and bottom, as location requires. The sides of the trough shall come within at least six (6) inches of the underside of table, or if shafting is located near floor within six (6) inches of floor. In every case the sides of trough shall extend at least two (2) inches beyond the shafting or protuberance.

(3) Guarding vertical and inclined shafting. Vertical and inclined shafting seven (7) feet or less from floor or working platform, excepting maintenance runways, shall be enclosed with a stationary casing in accordance with requirements of paragraphs (m) and (o) of this section.

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

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

(5) Power-transmission apparatus located in basements. All mechanical power-transmission apparatus located in basements, towers, and rooms used exclusively for power-transmission equipment shall be guarded in accordance with this section, except that the requirements for safeguarding belts, pulleys, and shafting need not be complied with when the following requirements are met:

(i) The basement, tower, or room occupied by transmission equipment is locked against unauthorized entrance.

(ii) The vertical clearance in passageways between the floor and power-transmission beams, ceiling, or any other objects, is not less than five feet six inches (5 ft. 6 in.).

(iii) The intensity of illumination conforms to the requirements of ANSI A11.1-1965 (R-1970), which is incorporated by reference as specified in §1910.6.

(iv) [Reserved]

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(v) The route followed by the oiler is protected in such manner as to prevent accident.

(d) Pulleys—(1) Guarding. Pulleys, any parts of which are seven (7) feet or less from the floor or working platform, shall be guarded in accordance with the standards specified in paragraphs (m) and (o) of this section. Pulleys serving as balance wheels (e.g., punch presses) on which the point of contact between belt and pulley is more than six feet six inches (6 ft. 6 in.) from the floor or platform may be guarded with a disk covering the spokes.

(2) Location of pulleys. (i) Unless the distance to the nearest fixed pulley, clutch or hanger exceeds the width of the belt used, a guide shall be provided to prevent the belt from leaving the pulley on the side where insufficient clearance exists.

(ii) [Reserved]

(3) Broken pulleys. Pulleys with cracks or pieces broken out of rims shall not be used.

(4) Pulley speeds. Pulleys intended to operate at rim speed in excess of manufacturers normal recommendations shall be specially designed and carefully balanced for the speed at which they are to operate.

(e) Belt, rope, and chain drives—(1) Horizontal belts and ropes. (i) Where both runs of horizontal belts are seven (7) feet or less from the floor level, the guard shall extend to at least fifteen (15) inches above the belt or to a standard height (see Table O-12), except that where both runs of a horizontal belt are 42 inches or less from the floor, the belt shall be fully enclosed in accordance with paragraphs (m) and (o) of this section.

(ii) In power plants or power-development rooms, a guardrail may be used in lieu of the guard required by subdivision (i) of this subparagraph.

(2) Overhead horizontal belts. (i) Overhead horizontal belts, with lower parts seven (7) feet or less from the floor or platform, shall be guarded on sides and bottom in accordance with paragraph (o)(3) of this section.

(ii) Horizontal overhead belts more than seven (7) feet above floor or platform shall be guarded for their entire length under the following conditions:

(a) If located over passageways or work places and traveling 1,800 feet or more per minute.

(b) If center to center distance between pulleys is ten (10) feet or more.

(c) If belt is eight (8) inches or more in width.

(iii) Where the upper and lower runs of horizontal belts are so located that passage of persons between them would be possible, the passage shall be either:

(a) Completely barred by a guardrail or other barrier in accordance with paragraphs (m) and (o) of this section; or

(b) Where passage is regarded as necessary, there shall be a platform over the lower run guarded on either side by a railing completely filled in with wire mesh or other filler, or by a solid barrier. The upper run shall be so guarded as to prevent contact therewith either by the worker or by objects carried by him. In power plants only the lower run of the belt need be guarded.

(iv) Overhead chain and link belt drives are governed by the same rules as overhead horizontal belts and shall be guarded in the same manner as belts.

(3) Vertical and inclined belts. (i) Vertical and inclined belts shall be enclosed by a guard conforming to standards in paragraphs (m) and (o) of this section.

(ii) All guards for inclined belts shall be arranged in such a manner that a minimum clearance of seven (7) feet is maintained between belt and floor at any point outside of guard.

(4) Vertical belts. Vertical belts running over a lower pulley more than seven (7) feet above floor or platform shall be guarded at the bottom in the same manner as horizontal overhead belts, if conditions are as stated in paragraphs (e)(2)(ii) (a) and (c) of this section.

(5) Cone-pulley belts. (i) The cone belt and pulley shall be equipped with a belt shifter so constructed as to adequately guard the nip point of the belt and pulley. If the frame of the belt shifter does not adequately guard the nip point of the belt and pulley, the nip point shall be further protected by means of a vertical guard placed in front of the pulley and extending at least to the top of the largest step of the cone.

(ii) If the belt is of the endless type or laced with rawhide laces, and a belt shifter is not desired, the belt will be considered guarded if the nip point of the belt and pulley is protected by a nip-point guard located in front of the cone extending at least to the top of the largest step of the cone, and formed to show the contour of the cone in order to give the nip point of the belt and pulley the maximum protection.

(iii) If the cone is located less than three (3) feet from the floor or working platform, the cone pulley and belt shall be guarded to a height of three (3) feet regardless of whether the belt is endless or laced with rawhide.

(6) Belt tighteners. (i) Suspended counterbalanced tighteners and all parts thereof shall be of substantial construction and securely fastened; the bearings shall be securely capped. Means must be provided to prevent tightener from falling, in case the belt breaks.

(ii) Where suspended counterweights are used and not guarded by location, they shall be so encased as to prevent accident.

(f) Gears, sprockets, and chains—(1) Gears. Gears shall be guarded in accordance with one of the following methods:

(i) By a complete enclosure; or

(ii) By a standard guard as described in paragraph (o) of this section, at least seven (7) feet high extending six (6) inches above the mesh point of the gears; or

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(iii) By a band guard covering the face of gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. Where any portion of the train of gears guarded by a band guard is less than six (6) feet from the floor a disk guard or a complete enclosure to the height of six (6) feet shall be required.

(2) Hand-operated gears. Paragraph (f)(1) of this section does not apply to hand-operated gears used only to adjust machine parts and which do not continue to move after hand power is removed. However, the guarding of these gears is highly recommended.

(3) Sprockets and chains. All sprocket wheels and chains shall be enclosed unless they are more than seven (7) feet above the floor or platform. Where the drive extends over other machine or working areas, protection against falling shall be provided. This subparagraph does not apply to manually operated sprockets.

(4) Openings for oiling. When frequent oiling must be done, openings with hinged or sliding self-closing covers shall be provided. All points not readily accessible shall have oil feed tubes if lubricant is to be added while machinery is in motion.

(g) Guarding friction drives. The driving point of all friction drives when exposed to contact shall be guarded, all arm or spoke friction drives and all web friction drives with holes in the web shall be entirely enclosed, and all projecting belts on friction drives where exposed to contact shall be guarded.

(h) Keys, setscrews, and other projections. (1) All projecting keys, setscrews, and other projections in revolving parts shall be removed or made flush or guarded by metal cover. This subparagraph does not apply to keys or setscrews within gear or sprocket casings or other enclosures, nor to keys, setscrews, or oilcups in hubs of pulleys less than twenty (20) inches in diameter where they are within the plane of the rim of the pulley.

(2) It is recommended, however, that no projecting setscrews or oilcups be used in any revolving pulley or part of machinery.

(i) Collars and couplings—(1) Collars. All revolving collars, including split collars, shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.

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

(j) Bearings and facilities for oiling. All drip cups and pans shall be securely fastened.

(k) Guarding of clutches, cutoff couplings, and clutch pulleys—(1) Guards. Clutches, cutoff couplings, or clutch pulleys having projecting parts, where such clutches are located seven (7) feet or less above the floor or working platform, shall be enclosed by a stationary guard constructed in accordance with this section. A “U” type guard is

permissible.

(2) Engine rooms. In engine rooms a guardrail, preferably with toeboard, may be used instead of the guard required by paragraph (k)(1) of this section, provided such a room is occupied only by engine room attendants.

(l) Belt shifters, clutches, shippers, poles, perches, and fasteners—(1) Belt shifters. (i) Tight and loose pulleys on all new installations made on or after August 31, 1971, shall be equipped with a permanent belt shifter provided with mechanical means to prevent belt from creeping from loose to tight pulley. It is recommended that old installations be changed to conform to this rule.

(ii) Belt shifter and clutch handles shall be rounded and be located as far as possible from danger of accidental contact, but within easy reach of the operator. Where belt shifters are not directly located over a machine or bench, the handles shall be cut off six feet six inches (6 ft. 6 in.) above floor level.

(2) Belt shippers and shipper poles. The use of belt poles as substitutes for mechanical shifters is not recommended.

(3) Belt perches. Where loose pulleys or idlers are not practicable, belt perches in form of brackets, rollers, etc., shall be used to keep idle belts away from the shafts.

(4) Belt fasteners. Belts which of necessity must be shifted by hand and belts within seven (7) feet of the floor or working platform which are not guarded in accordance with this section shall not be fastened with metal in any case, nor with any other fastening which by construction or wear will constitute an accident hazard.

(m) Standard guards—general requirements—(1) Materials. (i) Standard conditions shall be secured by the use of the following materials: expanded metal, perforated or solid sheet metal, wire mesh on a frame of angle iron or iron pipe securely fastened to floor or to frame of machine.

(ii) All metal should be free from burrs and sharp edges.

(2) Methods of manufacture. (i) Expanded metal, sheet or perforated metal, and wire mesh shall be securely fastened to frame.

(n) [Reserved]

(o) Approved materials—(1) Minimum requirements. The materials and dimensions specified in this paragraph shall apply to all guards, except horizontal overhead belts, rope, cable or chain guards more than seven (7) feet above floor or platform.

(i) [Reserved]

(a) All guards shall be rigidly braced every three (3) feet or fractional part of their height to some fixed part of machinery or building structure. Where guard is exposed to contact with moving equipment additional strength may be necessary.

(2) Wood guards. (i) Wood guards may be used in the woodworking and chemical industries, in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration

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of metal guards; also in construction work and in locations outdoors where extreme cold or extreme heat make metal guards and railings undesirable. In all other industries, wood guards shall not be used.

(3) Guards for horizontal overhead belts. (i) Guards for horizontal overhead belts shall run the entire length of the belt and follow the line of the pulley to the ceiling or be carried to the nearest wall, thus enclosing the belt effectively. Where belts are so located as to make it impracticable to carry the guard to wall or ceiling, construction of guard shall be such as to enclose completely the top and bottom runs of belt and the face of pulleys.

(ii) [Reserved]

(iii) Suitable reinforcement shall be provided for the ceiling rafters or overhead floor beams, where such is necessary, to sustain safely the weight and stress likely to be imposed by the guard. The interior surface of all guards, by which is meant the surface of the guard with which a belt will come in contact, shall be smooth and free from all projections of any character, except where construction demands it; protruding shallow roundhead rivets may be used. Overhead belt guards shall be at least one-quarter wider than belt which they protect, except that this clearance need not in any case exceed six (6) inches on each side. Overhead rope drive and block and roller-chain-drive guards shall be not less than six (6) inches wider than the drive on each side. In overhead silent chain-drive guards where the chain is held from lateral displacement on the sprockets, the side clearances required on drives of twenty (20) inch centers or under shall be not less than one-fourth inch from the nearest moving chain part, and on drives of over twenty (20) inch centers a minimum of one-half inch from the nearest moving chain part.

(4) Guards for horizontal overhead rope and chain drives. Overhead-rope and chain-drive guard construction shall conform to the rules for overhead-belt guard.

(5) Guardrails and toeboards. (i) Guardrail shall be forty-two (42) inches in height, with midrail between top rail and floor.

(ii) Posts shall be not more than eight (8) feet apart; they are to be permanent and substantial, smooth, and free from protruding nails, bolts, and splinters. If made of pipe, the post shall be one and one-fourth (1 1/4) inches inside diameter or larger. If made of metal shapes or bars, their section shall be equal in strength to that of one and one-half (1 1/2) by one and one-half (1 1/2) by three-sixteenths (3/16) inch angle iron. If made of wood, the posts shall be two by four (2 x 4) inches or larger. The upper rail shall be two by four (2 x 4) inches or two one by four (1 x 4) strips, one at the top and one at the side of posts. The midrail may be one by four (1 x 4) inches or more. Where panels are fitted with expanded metal or wire mesh as noted in Table O-12, the middle rails may be omitted. Where guard is exposed to contact with moving equipment, additional strength may be necessary.

(iii) Toeboards shall be four (4) inches or more in height, of wood, metal or of metal grill not exceeding one (1) inch mesh.

(p) Care of equipment—(1) General. All power-transmission equipment shall be inspected at intervals not exceeding 60 days and be kept in good working condition at all times.

(2) Shafting. (i) Shafting shall be kept in alignment, free from rust and excess oil or grease.

(ii) Where explosives, explosive dusts, flammable vapors or flammable liquids exist, the hazard of static sparks from shafting shall be carefully considered.

(3) Bearings. Bearings shall be kept in alignment and properly adjusted.

(4) Hangers. Hangers shall be inspected to make certain that all supporting bolts and screws are tight and that supports of hanger boxes are adjusted properly.

(5) Pulleys. (i) Pulleys shall be kept in proper alignment to prevent belts from running off.

(ii) [Reserved]

(6) Care of belts.

(i) [Reserved]

(ii) Inspection shall be made of belts, lacings, and fasteners and such equipment kept in good repair.

(7) Lubrication. The regular oilers shall wear tight-fitting clothing. Machinery shall be oiled when not in motion, wherever possible.

SECTION 5 — MACHINE SAFEGUARDING SEMINAR

Mechanical Power Press Safety

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To register for one of our seminars, please call, fax, e-mail, or visit us online to request our seminar catalog or to obtain further details.



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