
29 C.F.R. § 1910.217

Mechanical power presses.

(a) *General requirements.*

(1)-(3) [Reserved]

(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.

(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.

(b) *Mechanical power press guarding and construction, general—(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).

(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.

(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.

(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, or 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.

(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.

(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.

(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.

(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.

(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.

(iv) The “Inch” operating means shall be designed to prevent exposure of the workers 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.

(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.

(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.

(vi) [Reserved]

(vii) Controls for more than one operating station shall be designed to be activated and deactivated in complete sets of two operator's 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.

(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.

(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.

(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.

(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 value 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.

(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.

(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).

(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).

(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 driver motor is deenergized.

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

(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.

(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 voltages.

(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.

(vi) Electrical clutch/brake control 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.

(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.

(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.

(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 that system.

(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.

(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.

(14) *Brake system 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 such 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.

(c) *Safeguarding the point of operation—(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.

(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.

(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.

(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]

- (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 had 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.

(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.

(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 device may not be used on machines using full revolution clutches.
- (b) The device may not be used as a tripping means to initiate slide motion, except when used in total conformance with paragraph (h) of this section.
- (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).

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

(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 a press.

(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 set-up, 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.

(v) The sweep device may not be used for point of operation safeguarding.

(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.

(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.

(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 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.

(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 operators' to activate the slide.

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

(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 engaging point, T_m shall be calculated as follows: $T_m = [1/2 + (1 \div \text{Number of engaging points per revolution})] \times \text{time necessary to complete one revolution of the crankshaft (seconds)}$.

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

(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.

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

(i) The employer shall use a control system and a brake monitor which comply with paragraphs (b) (13) and (14) of this section;

(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);

(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).

(d) *Design, construction, setting and feeding of dies—(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.

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