Mechanical Power Presses
Mechanical power presses

- OSHA 1910.217 is the vertical regulation
- OSHA 1910.212, general requirement; 1910.219 MPTA
- ANSI B11.1 - 1998 for best safety practices
- 350,000 in the U.S.
  - Full revolution clutch since 1857
  - Part revolution clutch since 1927
Full Revolution Clutch
Part Revolution Clutch
Capacity

• 1/4 to bench-top to 5000 lbs.
• Smaller one likely to be Gap (C) Frame
  – If inclinable, OBI, if not incliniable, OBS
• Larger ones tend to be straight side frame
  – 4 columns from bed (bottom) to crown (top)
• Distinctive features: flywheel, crankshaft, clutch, brake, ram (slide) goes up and down
Part revolution bench top press
Bench top press (cont’d)

Overhead Guard

Light Curtain
Full vs. Part Revolution Clutch?

• Is an air line going to the clutch?

• If yes, it’s a part revolution clutch press

• If no, then look for an operating rod coming down the side of machine to identify it as a full revolution clutch
Part revolution clutch

Air line going to clutch
Full revolution clutch
Hydraulic Power Presses

- OSHA 1910.212, general requirements, 1910.219 MPTA
- ANSI B11.2 - 1995 for best safety practices
Power Press Brakes

• OSHA 1910.212, general requirements, 1910.219 MPTA

• ANSI B11.4 - 1993 for best safety practices
Press Brake
Modes of operation for mechanical power press

• **Inch**: Short hops of ram used for setup, maintenance, but not for production

• **Single stroke**: Often hand fed, sometimes with H.I.D. feeding. Safeguarding Devices most common

• **Continuous**: Makes many cycles without stopping using an automatic feed & coil stock. Sging: Guards most common
Modes of Operation, Control Selector inch, single stroke, continuous

Emergency stop button
Primary operations

- Automatics or blankers
- Coil stock with automatic feeds
- Payoff reels or cradles to unwind
- Continuous mode
Secondary operations?

- Single-stroke mode of operation
- Manually fed - one at a time
- Often use Hands-in-Die Feeding
- Hand feeding tools are the BSP
- Cycle initiation can be hand or foot
- Ergonomic issues if high repetition
Types of mechanical presses

- Two general frame configurations
  - "C" frame
    - Used for maximum rated forces up 300 tons
    - Similar to "C" clamp in appearance
    - Three subcategories
      - OBI (Open Back Inclinable)
      - Gap Press (OBS)
      - Horn Press
Open Back Inclinable Press

Hand operated inclining mechanism on OBI. Turning hand crank rotates screw to tilt press back to desired position.
Open Back Stationery Press

Flywheel is located at the rear of the press frame on front-to-back presses, eliminating obstruction around the die frame.
Horn Press
General frame configurations (cont’d)

• Straight side frame
  – Used on most presses that can develop a maximum rated tonnage of 20 tons or more
    • Consist of bed with a four corner post arrangement called uprights.
Part Revolution Straight-Side Press - Left Side View

- Main Drive
- Air Surge Drive
- Air Releasing Brake
- Dual Solenoid Valve
- Air Pressure Switch for Clutch/Brake
- Air Pressure Switch for Counterbalance
- Air Pressure-Gauge & Lubricator Assembly for Clutch/Brake
- Operator’s Station
- Lifting Lug
- Crown
- Lubricator
- Side Guard
- Bed
- Filter-Regulator-Gauge for Die Cushion
Types of mechanical power presses (cont’d)

• Functional type

• Operating characteristics
  – Full revolution clutch
  – Part revolution clutch
    • Electric motor is primary drive source
    • Motor drives press flywheel, which generates energy that’s applied by way of the crankshaft and ram to the lower dies.
Full revolution clutch

• Uses keys, pins, or jaws to engage crankshaft to flywheel
• Once engaged, clutch drags crankshaft through one complete revolution before it can be disengaged
• Uses friction brake that is always applied to hold slide stationery when clutch is not engaged
• Will not stop until it has completed one full stroke
Clutch Pin
Clutch pin
Clutch Pin
Jaw type

- Striking plate on flywheel
- Sliding sleeve with multiple engaging jaws
- Rotary air seal
- Direct-acting pneumatic chamber
Friction Brake
Part revolution clutch

- Engaged and disengaged at any point in slide
- Engaged with air pressure/released with absence of air pressure
- A friction brake that is air released and spring applied is used to stop and hold slide in position when clutch is not engaged
- Can be stopped at any point in
Air line for clutch engagement. Engaged with air pressure, released with absence of air pressure.

Part revolution clutch
Part revolution brake

Air released and spring applied
Mechanical power presses and their controls - (full revolution clutch)

- Machines using full revolution clutches
  - Will incorporate single stroke mechanism
  - Single stroke mechanism dependent on spring action
  - Springs will be compression type operating on a rod or guide within a hole or tube
  - Designed to prevent interleaving of spring coils in event of breakage
Single stroke mechanism

Compression spring operating on a rod or guided within a hole or tube.
Methods of initiating press cycle

• Foot pedals - treadle
  – Protected to prevent unintended operation from falling or moving objects.
  – Pad with nonslip contact area firmly attached to pedal
  – Pedal return springs will be compression type
  – If counterweights are provided, path of travel of weight will be enclosed
    • Enclose the weight’s path of travel to prevent interference with its movement.
Foot treadle

- Canopy guard
- Treadle
- Removable foot pedal
Foot Control

Protection from unintended objects

Compression type spring

Manufactures Specifications

Applicable Safety Warnings
Hand operated levers

• Will be equipped with a spring latch on the operating lever to prevent premature and accidental tripping
• Operating levers, if provided are required for each operator, and require concurrent operation
Two-Hand trips

• Protected against unintentional operation

• Requires both hands, concurrent operation, and provided for all operators
Two-Hand Trips/Controls

Note: Red stop button normally not present
Two-Hand Trips/Controls
Two-Hand Trip/Controls

- Prior Action Button
- Two Hand Control
- Top Stop
- Emergency Stop
Part revolution clutches

• Machines using part revolution clutches
  – Clutch release and brake will be applied when external clutch engaging means is removed, deactivated or de-energized
  – Stop control
    • Red stop control, required at each station
    • Top stop, if provided, will be yellow
  – Stop control will override any other control
Part revolution clutches (cont’d)

• Press stroking selector
  – A means of selecting off, inch, single stroke and continuous will be available.
  – Means capable of being supervised

• Inch Operation
  – Designed to prevent exposure of worker’s hands by:
    • Requiring concurrent use of both hands
    • Being a single control protected against accidental actuation
    • Will not be used for production (ANSI)
Part revolution clutches (cont’d)

• Multiple operating stations
  – Control station for each operator capable of being supervised

• Continuous
  – Will be supervised, and require prior action or decision by the operator in addition to the selection of the continuous mode

• Hand-foot selection
  – If provided, selection method for foot control will be separate from stroking selector
    Will be supervised by employer
Part revolution clutches (cont’d)

- Foot control
  - Protected against unintentional operation

- Clutch/brake air valve failure
  - Control of air-clutch machines will be designed to prevent significant increase in normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur.
Part revolution clutches
(cont’d)

• **Press drive motor interlock**
  – Clutch/brake control should not initiate the press stroke unless the drive motor is in the forward direction

• **Engaging method failure**
  – Clutch/brake control will automatically deactivate in event of power failure or pressure supply for the clutch engaging means
  – Reactivation will require restoration of normal supply and the use of the tripping mechanism
Part revolution clutches (cont’d)

• Air counterbalance supply
  – Clutch/brake control will automatically deactivate in event of failure of the counterbalance air supply
  – Reactivation of the clutch will require restoration of normal air supply and use of the tripping mechanism

• Turnover bar operation
  – Selection of bar operation will be by means capable of being supervised by the employer
Part revolution clutches - control reliability

• When required, control system will 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 detected.

• Failure will be detectable by a simple test, or indicated by the control system.
Part revolution clutches - control reliability (cont’d)

• Dual-air valves

• Air-filter regulator

• Air Pressure switch

• Rotating cam switch assembly
Dual-Air Valve  Single-Air Valve
Part revolution clutches - brake monitoring

- Be constructed to automatically prevent the activation of a successive stroke if stopping time or braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements.

- Used with the Type “B” gate or movable barrier device, will be installed to detect slide top-stop overrun beyond the normal limit.
Solid State Diagnostic Display Panel
Part revolution clutches - brake monitoring (cont’d)

• Be installed so indicates when performance of the braking system has deteriorated

• Be constructed and installed to monitor brake system performance on each stroke
Part revolution clutch - top stop overrun brake monitors

• Top stop brake monitor checks the crankshaft position at the end of each stroke, and will not let the operator initiate another stroke if the crankshaft is too far past top dead center.
Other safety requirements - electrical

- Control circuit
  - All clutch/brake control circuits will incorporate features to minimize unintended stroke in event of control component failure

- Disconnects
  - Main power disconnect capable of being locked only in the Off position

- Starters
  - Protect against accidental operation
  - Drive motor with a magnetic motor restart function
Other safety requirements - electrical (cont’d)

• Transformer
  – Used to reduce voltage of operator controls

• Ground
  – Electrical circuits shall be protected against an accidental grounding
Disconnect switch capable of being locked in off position

Motor starter control panel start/stop switch
Disconnect Switch, turns to locked position

Solid control panel
Motor starter and fused disconnect switches

MOTOR START SWITCH

MOTOR START STOP CONTROL

SWITCH TURNS TO LOCKED POSITION

MOTOR START SWITCH

MOTOR START STOP CONTROL
Solid state control panel

- Light curtain switch
- Control selector
- Motor stop button
Other safety requirements (cont’d)

• Counterbalance
  – Air counterbalance system with adequate capacity that will hold slide and attachments

• Air controlling equipment
  – Protected against foreign material and water entering pneumatic system

• Hydraulic equipment
  – Maximum working pressure will not exceed working pressure rating of any components

• Pressure vessels
  – Must meet ANSI/ASME code for pressure vessels, 1968 edition
Point of operation safeguarding - Two-Hand Trip

• Point of operation devices - will protect operator by
  – Preventing and/or stopping normal stroking of the press if the operator’s hands are placed in the point of operation
  – Preventing the operator from reaching into the point of operation, or withdrawing his hands if they are inadvertently located in the point of operation as the dies close
Point of operation safeguarding - Two-Hand Trip (cont’d)

- Preventing the operator from reaching into the point of operation at all times

- Requiring application of both of the operator’s hands to machine operating controls and locating such controls at a safe 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.
Point of operation safeguarding - Two-Hand Trip (cont’d)

• 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

• 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
Point of operation safeguarding - Two-Hand Trips

- Require use of both operator’s hands
- Located at safe distance from P.O.O.
- Provided for each operator
- Require concurrent application
- Incorporate antirepeat feature
- Fixed so only a supervisor is capable of relocating the trips
Point of operation safeguarding - Two-Hand Trips (cont’d)

- Incorporate antirepeat feature
- Fixed in position so only a supervisor is capable of relocating the trips

- Safety distance calculation
  - \( T_m = \frac{1}{2} + \frac{1}{\text{Time necessary to complete one point per revolution}} \times \text{Time} \)

\[ \text{# of engaging points per revolution} \]
Two-Hand controls - part revolution only

- Require use of both operator’s hands
- Located a safe distance from P.O.O.
- Provided for each operator
- Require concurrent application
- Protected against unintentional operation
- Incorporate antirepeat feature
Two-Hand Controls

Key Selector capable of being supervised
Top Stop
Emergency Stop
Indicator Light
Two-Hand Controls - part revolution only (cont’d)

• Fixed in position so only a supervisor is capable of relocating the controls

• Safety distance

  \[ D_s = 63 \text{ inches/second} \times T_s; \text{ where} \]
  \[ D_s = \text{minimum safety distance (inches)} \]
  \[ 63 \text{ inches/second} = \text{hand speed constant}; \text{ and} \]
  \[ T_s = \text{stopping time of the press measured at} \]
Presence sensing device

- Device will be interlocked into control circuit to prevent or stop slide motion if the operator’s hand or other part of his/her body is within the sensing field of the device during the downstroke of the press slide.
Presence sensing device
(cont’d)

• May not be used on machines using full revolution clutches
• May not be used as a tripping means to initiate slide motion
• Will be constructed so failure within system does not prevent the normal stopping action from being applied to press when required, but does prevent initiation of a successive stroke until the failure is corrected
• Muting (bypassing) of protective function of such device during the upstroke of press slide is permitted
Presence sensing device (cont’d)

• Guards will be used to protect all areas of entry to the P.O.O. not protected by the presence sensing device

• Safety distance from sensing field to P.O.O. will 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/seconds = hand speed constant;
- and \( T_s \) = stopping time of the press measured at approximately 90 degree position of crankshaft rotation (seconds)
Light Curtain - Presence Sensing Device

Features

* Meets industry standards
* Self-checking circuitry
* Strobe-light and weld flash immunity without increasing response time
* Detects objects 1” or larger
* Channel blanking
* 50’ max operating range
Light Curtain - Flex Systems Applications
Presence sensing device

Control box

Light curtain
Presence sensing device

Top guard assembly

Light curtain
Presence sensing devices
light curtain

Horizontal mounted light curtain

Vertical mounted light curtain
Pullbacks

- Device will include attachments for each operator’s hands
  - Attachments will be connected to and operated only by the press slide or upper die
  - Attachments will be adjusted to prevent operator from reaching into P.O.O.
  - A separate pull-out device will be provided for each operator
Arm-Type Pullback
Overhead Type Pullback
Two-Man Operation
Two-Man Operation

- Side Guard Panel
- Light Curtain
- Pullbacks
Wristlets and Cables
Point-of Operation Devices Protect Hands

Ram Up - Die Open

Ram Descending - Die Closing
Point-of-Operation Devices Protect Hands (cont’d)

Ram Down - Die is Closed
Pullbacks (cont’d)

• Inspected, checked and adjusted at start of each operator’s shift, following a new die setup, and when operators are changed

• Necessary maintenance, repair or both will be performed and completed before press is operated

• Records of adjustments, inspections and maintenance will be kept in accordance with paragraph (e) of this section

• Sweep device may not be used for point-of-operation safeguarding after December
Restraint Devices

- Device will include attachments for each operator’s hands
- Attachments will be securely anchored and adjusted so that operator is restrained from reaching into P.O.O.
- Separate set of restraints will be provided for each operator if more than one operator is required on a press
- Records of adjustments, inspection and maintenance will be kept in accordance with paragraph (e) of this section
Two-person sliding restraint
Gates

• A gate or movable device will protect the operator as follows:
  – Type “A” gate or movable barrier device will protect the operator as specified in paragraph (c)(3)(l)(f)
  – Type “B” gate or movable barrier device will protect the operator as specified in paragraph (c)(3)(l)(g)
Guards

• Every point-of-operation guard will meet the following design, construction, application and adjustment requirements:
  – Prevent entry of hands/fingers into P.O.O. by reaching through, over, under or around guard
  – Conform to the maximum permissible openings of Table 0-10
  – Create no pinch point between guard and moving machine parts
Guards (cont’d)

- Utilize fasteners not readily removable by the operator
  - Exception: Electrical interlock switch
- Facilitate its inspection
- Offer maximum visibility of the point of operation consistent with the other requirements
Guards (cont’d)

- A die enclosure guard will be attached to the die shoe or stripper in a fixed position
  - Good for one particular press
- A fixed barrier guard will be secured to the frame of the press or to the bolster plate
  - No openings
Guards (cont’d)

• An interlocked press barrier guard will be attached to the press frame or bolster plates, and will be interlocked with the press clutch control

• The adjustable barrier guard will be securely attached to the press bed, bolster plate, or die shoe, and will be adjusted and operated in conformity with Table 0-10
  – A point-of-operation enclosure which does not meet the requirements of Table 0-10 will be used only in conjunction with P.O.O. devices
Front Guard

Interlock switch
Side Guard

- Fixed Panel
- Adjustable guard
Barrier Guard

Fixed panel in back of machine
Expanded metal lexan guarding materials

Adjustable guarding sections
Various Guards
Various guards (cont’d)
Various guards (cont’d)
Various guards (cont’d)
Spring lift guard

- Black square mesh
- Adjustable hairpins
- Mechanical motor springs
Spring lift guard

- Air cylinders
- Nonadjustable portion of panel with black mesh
- Key-operated control station
- Linear bearing assembly
- Adjustable hairpins
- Nonadjustable portion of panel with black mesh
Design, setting and feeding of dies

- **Die setting**
  - Establish die setting procedures
  - Provide and require use of hand tools for removing scrap pieces

- **Scrap handling**
  - Provide means for handling scrap material

- **Guide post hazard**
  - Hazard created by a guide post when separated from its bushing
• **Unitized tooling**
  – Opening between top of the punch holder and face of the slide, or striking pad will be guarded

• **Tonnage, stroke and weight designation**
  – All dies will be:
    • Stamped with the tonnage and stroke requirements
    • Stamped to indicate upper die weight
    • Stamped to indicate complete die weight
Tonnage, stroke and weight designation

Model number

Tonnage

Stroke
Tonnage, stroke and weight designation

- Model number
- Tonnage
- Stroke
Design, setting and feeding of dies (cont’d)

• Die fastening
  – Securely mount die to bolster plate and slide
  – When clamp caps or setscrews are used in conjunction with punch stems, additional means of securing the upper shoes to the slide will be used

• Die handling
  – Handling equipment attach points will be provided on all dies requiring mechanical handling
Design, setting and feeding of dies (cont’d)

• Die setting
  – Employer will establish a die setting procedure that will enhance compliance with paragraph (c) of this section
    • Provide spring loaded turnover bars
    • Provide die stops, or other means to prevent losing control of the die while setting or removing dies
    • Provide and enforce the use of safety blocks
    • Provide brushes, swabs, lubricating rolls, and automatic/manual pressure guns so
Spring loaded turnover bar

- Vinyl-coated yellow handle
- Made of high tensile steel
- Fully enclosed spring
Design, setting and feeding of dies (cont’d)

• Inspection and maintenance records
  – Periodic and regular inspections of all presses and safeguards
  – Inspected and tested no less than weekly; clutch/brake, antirepeat, and single stroke mechanism

• Modifications
  – Establish new or changed guidelines for care and use
## Sample Press Inspection Report

<table>
<thead>
<tr>
<th>Parts Inspected</th>
<th>OK</th>
<th>Defective Condition</th>
<th>Corrective Action</th>
<th>Date Repaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame/Motor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flywheel/Gears</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crankshaft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clutch/Brake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection and slide adjusting screw</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slide and Gibs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slide counterbalance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air/Electrical system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot switch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.O.O. safeguarding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guards and presence sensing devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pullbacks/Restraints</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“A” or “B” Gate/ Two Hand Trip or Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Guide for inspecting mechanical power presses

• **Frame**
  – Cracks, broken or loose parts

• **Motor**
  – Clean, and lubricated

• **Flywheel**
  – Rotates in correct direction, free running

• **Gears**
  – Loose, broken/cracked teeth, excess noise?

• **Crankshaft**
  – Cracks, bent, proper clearance in
Guide for inspecting mechanical power presses

(cont’d)

• Clutch
  – Full revolution
    • single stroke capability, loose or worn parts, weak or broken springs
  – Part revolution
    • Air or oil leaks, proper alignment, disengagement, stopping position, worn clutch lining, weak or broken springs

• Brake
  – Linings worn, properly adjusted, does it stop slide quickly
Guide for inspecting mechanical power presses
(cont’d)

• Slide and gibbs
  – Face of slide parallel to bolster, proper gib clearance, any scoring

• Connection & slide adjusting screw
  – Proper bearing and ball seat clearance, screw turns freely

• Slide counterbalance
  – Spring type
    • Proper adjustment, broken springs or loose nuts
  – Pneumatic type
    • Air leakage, proper pressure, loose connection to slide
Guide for inspecting mechanical power presses (cont’d)

- Air system
  - Proper air pressure, valve operation, pressure gauges, leaks

- Electrical system
  - Can main power switch be locked only in “off” position, grounding, condition of wiring

- Foot switch
  - Nonslip pad on contact area, shielded from accidental operation
Guide for inspecting mechanical power presses (cont’d)

- **Point-of-operation safeguarding**
  - **Guard**
    - Barrier that prevents entry of operator’s hands or fingers into point-of-operation area
  - **Presence sensing**
    - Reliable design and proper electrical tie-in to control
    - Fixed at proper distance
  - **Pullback**
    - Enough or too much pull on cables
    - Is adjustment being made for change of operator, die, shift
    - Records of inspection/maintenance
Guide for inspecting mechanical power presses (cont’d)

- **Point-of-operation-safeguarding**
  - “A” or “B” Gate
    - Point of operation enclosed before press cycle can be initiated
  - Restraint
    - Adjusted so operator’s fingers cannot reach into dies
    - Securely anchored
    - Adjusted for each operator
  - Two-hand Trip or Control
    - Shielded against unintended operation
    - Concurrent antirepeat
    - Fixed at proper “safety distance” from pinpoint
Design, setting and feeding of dies (cont’d)

• Instructions to operators
  – Training shall be provided for press operators

• Work area
  – Adequate clearance between machines for movement of operator
  – Ample room for cleaning, and material handling
  – Floors kept in good condition
Design, setting and feeding of dies (cont’d)

• Overloading
  – Operate presses within manufacturer specifications

• Report of injuries
  – Report injuries within 30 days
Bellows safety shield
Die set shields

Bellows safety shield

Bellows safety shield
Hand feeding and retrieving tools
Die safety block accessories

Two-piece aluminum safety wedges

Adjustable screw device
Die safety block accessories (cont’d)

Safety plug is disconnected. Press is inoperable.

Block in use
Die safety block accessories (cont’d)

Electric safety plug is connected. Block in storage
Control circuit is made and press can be operated
Die safety block accessories (cont’d)

Interlock must be interfaced into the control system so that when plug is pulled, power to the main drive motor is disconnected.
Die safety block accessories (cont’d)

- Electrical power cut-off system
- Die safety block
- Wedges
- Die safety block holder
Types of Press brakes

- Press brakes are machines that have a long narrow bed and slide, usually supported by “C” form frames on the ends of the bed and slide
  - Part revolution clutch - mechanical friction
  - Part revolution clutch - air
  - Hydraulic
  - Hydra-Mechanical
Two-speed air-clutch press brake

Light curtain on floor stands

Two operator stations

Barriers

Custom control box
Hydraulic press brake

- Control box
- Interface box
- Light curtain
- Side guards and mounting brackets
- Foot switch
Hydra-mechanical press brake

- Control box
- Hydraulic valve
- Light curtain
Press brake

Side shield

Light curtain
Press brake

- Side shield
- Light curtain
Application of press brakes

• Press brakes are used to perform a variety of operations on sheet, plate, and other metals
  – The primary application of a press brake is to bend sheet metal at an angle to form flanges, boxes, channels, etc.
Press brake bending metal
Safeguarding point of operation (guards)

- Barrier guards
- Adjustable guards
- Self-adjusting guards
- Interlock guards
Safeguarding point of operation (devices)

- Two-Hand controls
- Restraints/Pullbacks
- Presence sensing devices
- Gates
Safeguarding standards

- Section 5(a)(1)
- ANSI B11.3
Table 0 -10

Distance of opening from P.O.O. hazard | Max width of opening
---------------------------------------|------------------------
1/2 to 1-1/2                           | 1/4                    
1-1/12 to 2-1/2                        | 3/8                    
2-1/2 to 3-1/2                         | 1/2                    
3-1/2 to 5-1/2                         | 5/8                    
5-1/2 to 6-1/2                         | 3/4                    
6-1/2 to 7-1/2                         | 7/8                    
7-1/2 to 12-1/2                        | 1-1/4                  
12-1/2 to 15 -1/2                      | 1-1/2                  
15-1/2 to 17-1/2                       | 1-7/8                  
17-1/2 to 31 -1/2                      | 2-1/8                  

Guarding must extend from some point on clearance line to some point on opening line.

Typical guard locations

At distances over 31-1/2" use 6" as maximum opening.

Travel Stock Line

Distance of opening from P.O.O. hazard

Max width of opening

Table 0 -10

1/2" to 1-1/2" 1-1/2" 1" 1" 2" 1" 1" 5" 3" 2" 14" 1-1/2" 17-1/2" 1-7/8" 2-1/8" 6" Maximum