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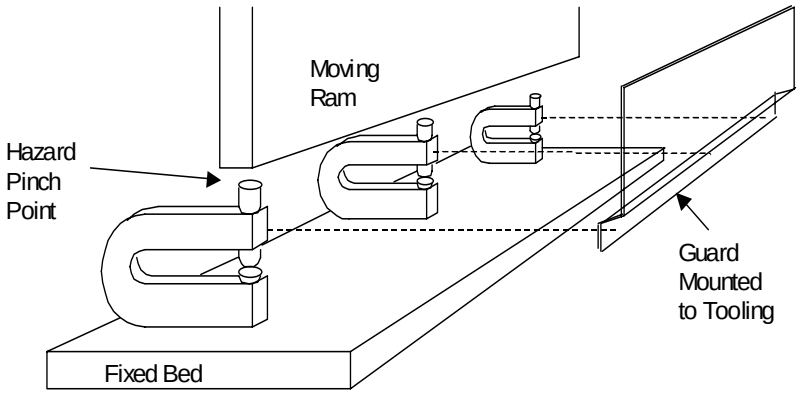
Alternative Safeguarding Methods for Power Press Brakes

In order to provide point of operation protection for operators on press brakes, users will have to do one of three things.

1) Remove the pinch point by limiting the stroke to a maximum of 1/4" tooling opening, or
2) Move the operator away from the pinch point with a barrier by greater than 42", or
3) Provide a point of operation safety device for all other operations. In our experience in the metal working industry in the last thirty years, we have found five common alternative point of operation guarding methods used on different types of press brake applications, and these are:

    1. Barrier Guards
    2. Pull Backs or Restraints
    3. Movable or Automatic Gate Guards
    4. Two Hand Control Activation
    5. Presence Sensing Devices

Barrier Guards:

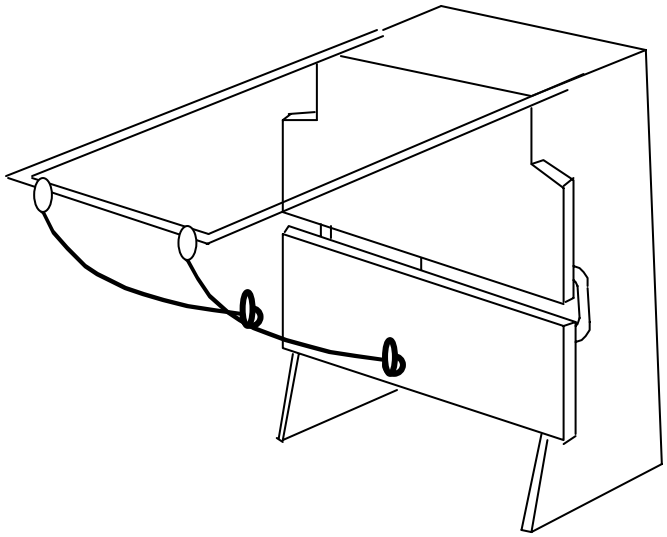


On some press brake applications being used like a punch press or where unitized tooling is employed, mechanical barrier guarding can be provided for operator protection. When unitized or similar tooling is used, the upper stem or striker may be the only hazard if the point of operation is limited to 1/4" opening. In that case, then the opening between the striker plate and stem pinch point must be protected.

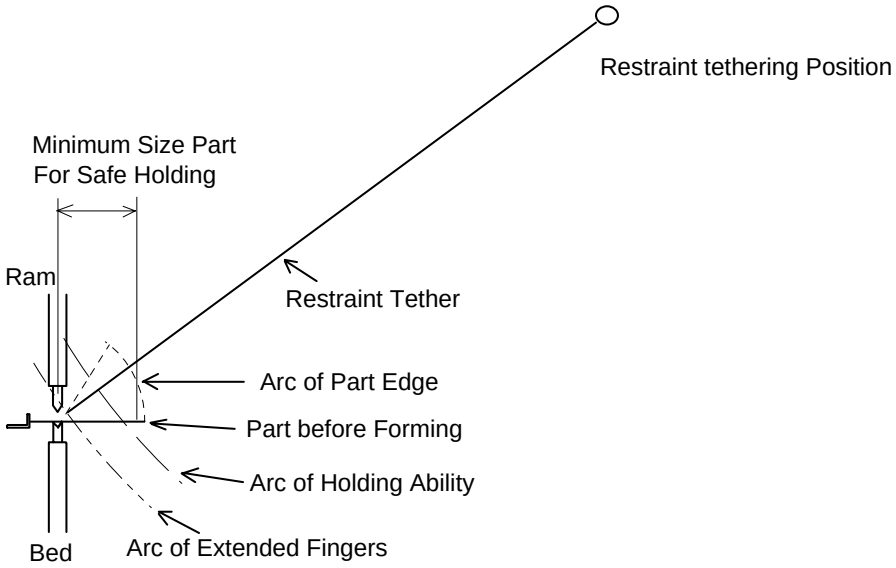
These applications are more commonly used on press brakes having an expanded bed. These barrier guards when properly applied and installed will physically prevent anyone from reaching in, over, under, around or through into the hazard area. They are most often made of metal and/or poly- carbonate materials. The barriers can have openings for material to be fed into the die area, but do not allow for hands into that area. They are required to be mounted to the machine or non-movable portion of the tooling with fasteners not easily removable by the operator.

These types of barriers can be interlocked to the control to prevent operations when the guards are not in place. You should be aware that when using die sets or anytime a press brake is used as a punch press, then other requirements such as brake monitoring will be required if hand feeding.

Restraints:



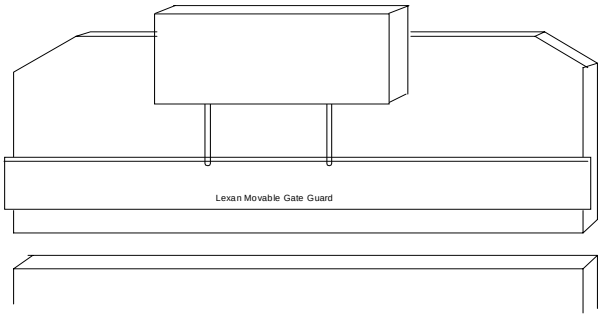
Restraints are generally connected to bars, slides or eyebolts on the fixed end (behind the operator) and to each of the operator's wrists and hands on the other. Restraints work for primary operations where bend lines are greater than 7" to 8" from the holding points. Hand tools (hand extenders) would be required for smaller parts.

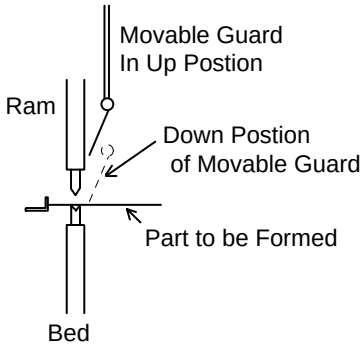


Supervisory involvement per OSHA: At the beginning of each work shift, break, operator change or die change, the supervisor is required to inspect for good mechanical condition, adjust and test the restraint for correct function, and make necessary adjustments for best operator safety for the specific job. The final adjustment should be checked to make sure that extended fingers of the hands are at least two inches clear of the dies. Then after initialing off the inspection record kept at the machine, the operator is authorized to use the restraint and begin production. If the operator un-straps for any reason, he can not re-strap without the same supervisory involvement per this paragraph.

Best applications for these devices are where forklifts do not get close to the front of the machine (where it might run into the restraint mounts) and intermediate size parts only are used. Pullbacks and restraints will inhibit the movement of the operator to go cross handed or turn around. Large parts are difficult to pick up (or stack) with one hand from the side since you can not help with the other hand or go cross handed while wearing restraints. They are very dependent upon good maintenance, proper adjustment, worker acceptance and use and require high supervisor involvement and frequent OSHA documentation from the supervisor. There is no practical method to interlock these devices into the control to insure their proper use and adjustment and therefore close supervision is always required

Movable Barrier Guards:

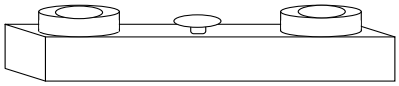




Automatic and movable gate guarding devices are systems where the side facing the operator has a movable portion (generally clear polycarbonate) that automatically opens from an adjustable control allowing access to the die area after reaching 1/4" opening.

When the guard is down and closed, the operator cannot reach into the hazard area. The sides are generally guarded using fixed or adjustable sections. The gate is so interlocked as to not allow activation of the clutch until the guard is fully down or closed. These devices work well on some flat piece parts fed under the guard, or secondary operations where the part is fully contained within the guarded area Large or flanged parts which would extend beyond the guarded area are problematic. The safe use of these movable guarding systems is dependent upon good maintenance and proper adjustment for each setup and part alignment if flanged parts are made. Again, if used as a punch press, some additional requirements may be needed to qualify the safety system.

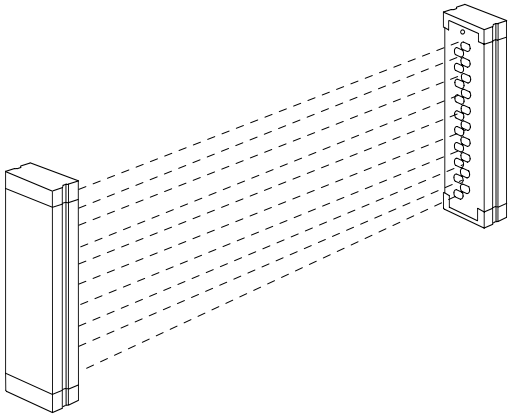
Hand Controls:



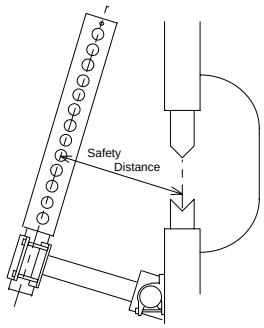
Two hand button activation works well for operations that do not require hand holding while in the forming process like might be used on a punch press. When the buttons are place at the proper and safe distance (depending upon the stopping performance of the machine), release of one or both of the buttons would not expose the operator's hands to a die closing hazard. Hand activation generally does not require adjustments and is interlocked in the control in single stroke operations. Each operator or helper must have their own set of palm buttons and stop control in order to provide adequate protection.

This is one of the most common and effective methods of protection used on punch presses but may have some production penalties when compared to foot switch activation. A special application made for press brakes is "Hand Down - Foot Through". This method requires hand control activation down to the 1/4" die opening (Safety Point), then the part can be inserted (even held in place), and then formed using the foot switch to complete the part forming cycle.

Presence Sensing:



Presence Sensing optical devices, provide good visibility and access to the machine. They are generally placed near vertical in front of the point of operation and at a horizontal safety distance proportional to the stopping performance of the machine it's on. On some systems, small profile (less than 3/8") material can be fed or placed in the machine at any point of the cycle.



Large profile parts, or those with flanges should be placed wholly inside the guarded area. This method uses the fewest number of moving parts, requires fewer adjustments than mechanical devices, and will allow the highest percentage of normal production parts at peak production rates.

Optical presence sensing does not require high supervisory involvement. They must be interlocked into the main control in all modes of operation in order to provide protection to any number of persons. Mechanical side guards should be provided if the tooling extends to or near the ends of the bed of the machine. We do not recommend mirror side guarding because of the common use of blankout functions used with the light curtain. This would also provide unguarded areas on the sides as well.
Common Modes include:

a. Auto Stop & Muting
b. Beam Blanking & Muting
c. Programmable Blankout & Muting
d. Horizontal Placement & Muting

When small parts or unusual size parts are to be worked, **"Auto Stop"** is often used. In this mode, the brake is activated from top of stroke (the light curtain providing protection) and then automatically stops at the pre selected 1/4" Safety Point die opening. The light curtain is then automatically **"Muted"** (taken out of the circuitry). The part is placed between the dies and held against the back gage. The foot control is activated as necessary to close the dies and form up the part and holding the foot control active until the ram returns to the top of the stroke, ready for the next part.

When parts have to be loaded into the tooling at top of stroke, **"Beam Blanking"** is often used. In this mode the part profile is "blanked" by a selection in the light curtain. All areas above and below the part are still light curtain protection active. The best blankout functions allow only the profile of the part through the beam plane, and any change to that will lock out the light curtain, even if the part is removed. The profile should be small enough not to allow easy and open access to the point of operation on either side of the part. If a hand can easily go around the part, then other guarding must be provided to meet safety requirements. The part will be held in place from outside the beam plane and the brake activated in the normal manner. When the ram gets close to the part, **"Muting"** is activated and the part can bend up through the light curtain to finishing the cycle.

Floating window functions are sometimes used but require placement at a greater distance from the point of operation depending upon the opening allowed (penetration factor). The reason this is not more frequently used is that the selected window profile opening is anywhere in the sensing field at any time. The additional distance on a slow stopping machine may allow an undetected person to be between the light curtain and the point of operation. Additional protection will have to be provided if that is ever the situation.

When automatic back gauging is used, **"Programmable Blanking"** is available. This works very similar

to the Beam Blanking above but additionally puts each cycle, profile, and location for each job into memory. In this way, once the part has been run, each same part can be formed with about the same speed as without the light curtain when using the automatic back gage system. The exception to this would be when a small part needs to be held in place inside the light curtain's protective screen. In that case, Auto Stop function can be programmed for that cycle. Because of the overall safety effectiveness and good production qualities, light curtains offer a good guarding alternative for many press brakes.

Safety is the responsibility of everyone involved with each application and job that is run on a press brake. There is no one method that will provide complete protection for every job that you might have in your shop. Some methods are more adaptable than others and may require a combination of guarding methods be used to provide the necessary level of protection for your employees. I try to think, 'What would I do for this application if my kids had to run this job'. That makes safety a lot more personal. That kind of thought along with the application of good guarding alternatives, might just bring fabrication work closer toward the goal of good protection for operators on press brakes.

For more information or a free in plant analysis of your power press and press brake guarding requirements contact:

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