Press brake safety

_Safety is and must always be your first, foremost and primary concern!_

Even with all of the modern safety devices available the press brake is a very dangerous machine. The loss of fingers, hands or arms is still a very real possibility. Especially, if you, the operator, are not paying attention!

There are many safety related questions that should be answered: Will the stops flip out of the way in time? Will the ram come open far enough to get the formed piece? Is the backgauge going to crash into the tooling? We’ll start with the video an old government film from the 1940’s; it’s fun to watch, but remember, basic shop safety has not changed. The rules are still the same.

How to Explain Safety Rules 1944

Safety Training Film for Workers
Courtesy of the US Government

Toward the end of this chapter on press brake and general safety we’ll take a look individual safety practices, but first well take a look at safety issues related specifically to press brakes beginning with the mechanical press brake.

The Mechanical Press Brake

The mechanical press is one of the most dangerous; it moves really fast, moves only in one direction and has to complete the stroke. The average mechanical press is also capable of producing 150% of rated tonnage at dead bottom of stroke.

Dead Bottom is where the ram has driven the eccentric to its lowest point; Top Dead Center is at the highest point. On mechanical style presses the open height and shut heights are fixed.

It is best practice to cycle the ram to just past “top dead center” and pause. Bring the ram down slowly and come to a complete stop .250-inches above the material, or less, what we now call the Mute Point. Adjust the workpiece against the stops, and using the inertia of the flywheel, slowly finish the bend, returning to any point past top dead center, figure 1.

When operating a flywheel driven mechanical press brake attention needs to be paid to “ram drift”. If the ram has not been brought back up to, or past top dead center, there is a chance the ram could start to drift down the wrong direction before the clutch re-engages. Even when the clutch and brake assembly is in adjustment there is a time lag between the brake’s release and the clutch engagement; this is the drift and it could lead to startling the operator and possibly to an injury.

Also note that flywheel driven press brakes CANNOT REVERSE the stroke! Regardless if fingers or hands are caught,

_THE STROKE HAS TO BE COMPLETED !!_

Some machines were retrofitted at the power switch so the electric motor could be reversed. Even then, it takes a few
minutes for the flywheel to wind down and than wind back up before moving the ram in the opposite direction. And, the mechanical press brake has one speed, fast!

Before trying to operate any mechanical press brake new to you, practice feathering the pedal; learn to stop and control the speed.

A modern press brake overall is a much safer machine (circa 2013). With light guards, CNC controls, reversibility at any point in the stroke, etc. However, some modern machines have pinch points that the older press brakes did not.

A pinch point is defined two ways, one that relates to you and the other, the press. On the press brake "pinch point" refers to the point where the material is pinched between the punch and die under a light load. The other is a place on the machine that can pinch you, whether it’s between the workpiece and the machine or between different parts of the machine such as a forming robot.

Nonetheless, if operated in accordance with State and Federal rules (OSHA) and with a little common sense, injuries can become rarer. When they do happen quite often it’s operator inattentiveness or error.

**Over Tonnage and Exploding Tooling**

Tooling is the next safety concern. American style planed tooling, as a general rule, is relatively soft by tooling standards. This tool steel is a high quality carbon alloy with a mean hardness of approximately 30 Rockwell-C throughout. These tools are many times, flame hardened on the working surfaces for wear.

Should you accidentally over-tonnage this style of tooling, there would be a very loud bang and a chunk of tooling most often fell to the floor; good reason for steel toed boots! Precision ground tooling, whether European, American or New Standard are quite different; they are hardened to an average of 70 Rockwell-C. When these tools are overloaded, they tend explode with some force and will throw shrapnel! The tool shown in figure 3 is a precision ground, single V-die that was over-loaded. The tool exploded and the smaller piece, four inches long, razor sharp flew 80-feet downrange and collided with the wall 6-foot from the floor; enough said.

**Tool Installation**

Because of the importance of proper tooling selection, applied tonnages and installation, you may not be aware of the real dangers that exist. First, and foremost, you need to pay special attention; Press Brake safety is a common sense issue. Most accidents are caused by operator inattentiveness or lack of training.

With that, let’s start with safe tooling installation. Before any tooling can be installed, the ram must be locked into the Shut height position; the ram is in its most extended position.

Once the press is locked into that position and the ram can no longer close any tighter, the tooling can safely be slid into the press. The gap between the ram and the bed should be just enough to allow easy installation, but not so much as to allow the tooling to fall out.

Not all tooling can be loaded universally into any press brake. Some can be loaded correctly only one way.

The best way to envision if you are installing the tooling correctly is to look at the tooling from the end view and check where the power is flowing, figure 4.

Pressure flow through the tool on the left is incorrect and could be the cause of serious bodily injury, not to mention the damage to the press brake itself. Note the power flow and the force from the
forming are passing right by each other.

The tool set to the right shows a precision ground tooling set installed correctly. Notice how the power flows through the tooling.

Of the three different forms of press brake tooling; New Standard, European, and American Planed, Standard American tooling is completely reversible as far as power flow is concerned. But, the tooling can lose its center in the die, figure 5.

*Non-safety note: It will also change the relationship from the backgauge to the bend line.*

European Precision Ground tooling is completely reversible as to center, figure 6, but it can be installed wrong, figure 4.

Also check to make sure that the tooling angles match correctly and are appropriate for the type of forming that you are attempting, figure 7.

Remember, the punch and die angles need to match or the punch angle needs to be less than the included die angle. For example, a 90° die can use a 90° or an 88° punch. When the tools are mismatched, best case, you get an ugly part; worst case, you blow up the tooling. Special care also needs to be taken to ensure that the total applied tonnage does not exceed the abilities of the tooling or the press brake.

**Warnings**

Most press brakes have placards placed on and around the machine. The purpose, of course is to warn you about some aspect of the brake at the point where it is most appropriate, for example, to warn you of pinch points or electrocution hazards. Be sure you have read them and read the manual that came with the machine. Figure 8, courtesy of Amada USA, is a good example of the placards and their placement on the press.

You also need to be aware that there are different levels of warning:

**Danger**: Indicates an imminently hazardous situation, which if not avoided can lead to serious injury or death.

**Warning**: Indicates a potentially hazardous situation, which if not avoided can lead to injury or death.

**Caution**: Indicates a potentially hazardous situation, which if not avoided may result in a minor or moderate injury.

**Safe Setups**

The mute point is set at .250-inches above the material thickness, and it is required that it be used. According to OSHA guidelines, the press is closed to the mute point before any part of your body is to get within 4-inches of the pinch point. At that point you can adjust the workpiece against the backgauge and complete the bend.

The pictures shown in figures 9 and 10 show this concept. If the press is not brought to the mute point a finger or hand can slip between the punch and die, figure 9. Set at the mute point, no part of your body can enter the die space.

**Light Curtains** Unfortunately, too many operators put way too much faith in electronic safety devices.
work very well when used properly.

Always trusting the safety device rather than practicing safety, thinking the device will protect you making the mute point and other safety measures unnecessary, is the kind of thinking that leads to injuries.

The idea behind a light guard is this: the ram must stop movement before the operator can get part of the body in between the punch and die.

Light curtains are set several inches from the front of the machine; if the beam is broken, the ram stops. If the press cannot be stopped in time the light curtains will continue to be moved further back from the front of the press until it can.

This is one of the reasons a mechanical press brake cannot be adequately guarded.

By the time the light curtains are far enough from the front of the brake to meet the guarding requirements, they make the mechanical press brake functionally impractical. **Point of operation** guarding only guards the pinch point making press brake guarding practical.

These come in several forms: cameras, two or three laser beams, even thermo-graphic photography. The following video shows an example of point of operation guarding courtesy of **Fiessler Electronics**.

**Light curtain**

Akas™, Point of Operation Guarding  
*Courtesy of Fiessler Electronics*

**General Rules**

- Never interrupt someone or allow yourself to be interrupted when operating a press brake.
- If you are drowsy walk away.
- Dry run the program/press before using any material. No matter how good an operator thinks he or she is, this is one thing that should be done religiously before starting any job.
- When two or more people are working together on the same press brake, only one should be in charge. This duty should never be shared!

It should always be the operator in charge that makes sure that the co-worker is clear of the press before beginning the bending process.

- Never apply pressure against the backgauge. Only a light touch is necessary to produce a good part. Pushing against the back gauge with unnecessary force sets the operator in the position of “leaning” into the machine. One slip and you’re on your way into the dies. It also is an inconsistent method of forming, as you cannot push equally time and time again.

- Have you ever given any thought to what happens if you get a body part between the punch and die? It is not pleasant for sure. Look at figure 11, it is a picture of a finger sized pork bone that has been formed; crushed beyond any repair regardless of how good your doctor is. Now look at figure 12; that is bone marrow smashed from within the bone.

A good way to remember safety around the press brake or any machine is this:
“The Press Brake does not like you and will
bite you badly the first chance it gets.”

These figures are meant to show just what is going to happen to the bone in your finger
should you ever get one caught in the press brake.

If the splintering in figure 12 isn’t enough to make you think safety, maybe the bone
marrow (dark spots) in the bottom of the die in figure 12 will help.

Always reach around or walk around behind the press brake, figure 14. Never reach
between the punch and die sets for any reason. Never put any part of your body between
the punch and die!

Never let your fingers or a body part come between your workpiece and the machine.

Never hold your workpiece over the top of a previous bend, figure 15.

Keep your face and upper body out of the way for workpiece
movement. This will keep you from getting slapped in the chin or
face, figure 16.

**Bad Safety Practices**

It needs to be stated clearly; if there is a safety device present on your press brake you
are required to use it with no exceptions!

The next three figures show three different safety issues: one operator installed, one
management ignored, and one, that is management approved.

**Kick-toe pedal**, has a tab at the back of the pedal that must first be moved with a light tap
of your toe to release the foot pedal and allow it to be depressed. In this picture you can
see that the operator has used a wire tie to hold the tab back out of the way, figure 17.

The safety device has been disconnected! In this photo the Emergency Stop Switch has
been covered up with a piece of metal and taped in place. This was done to over 20
press brakes in one facility.

This is another example of a disconnected safety device; the difference between this
one and the first example? This one management ignored, figure 18.

The last example is a down foot pedal that has been tapped and drilled so that a bar
could be added. The purpose was to allow the operator to invoke the press at any point
along the length of the bed without the need to lift a foot up and under the protective
cowling for the factory foot bar.

Again, another example of disengaging the safety device on over 20 presses, but this
time with management’s approval, figure 19.

What is the point? You are never to operate any machine with the safety device
disconnected! And, you cannot be forced to run one that has that done to it. The
company featured in figure 19 is no longer in business in part from the OSHA visit, one
that found the press brake physically modified; the fine was horrendous.
If and when you see something like these examples, correct it. Remove the wire tie, remove the E-stop block or remove the extra addition to the foot pedal. They’re your body parts and they do not grow back. If you operate a machine with the guarding altered, removed or disengaged, you will assume some if not all of the responsibility. You may not even have a worker’s compensation claim; you may not even get the hospital bill paid.

Best advice… DON’T DO IT!

**Shop Clown**

Some of you may remember Bozo the Clown and for kids he’s great, but a Bozo or someone like him does not belong in a shop environment!

Depending on the incident, maybe you warn him once. Maybe you fire him on the spot. Either way his ilk does not belong on the shop floor… period.

A shop clown will at some point cause severe injury to you or your co-workers.

**Do not tolerate this guy!**

Press Brake Safety courtesy of Asma LLC reviews safety from a slightly different perspective.

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*Courtesy of Asma LLC*