Latest Advancements in Press Brake Guarding

About the Presenter:
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It is the Employer's Responsibility to provide safeguarding for the point of operation.

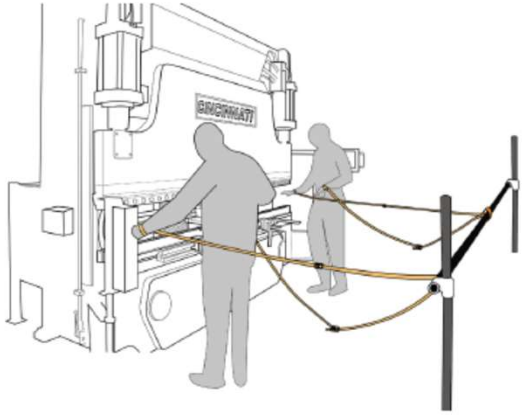
- No guarding is never an option.
- Proper safeguarding must be chosen to fit each specific application. There isn't a "one Solution fits all" when choosing press brake guarding.
- Budget constraints are always a factor.
- There is a wide range of acceptable solutions outlined in ANSI B11.3 and other industrial safety guidelines to safeguard the press brake operator and other plant personnel.
- Only the employer is in position to really know the complete usage of each piece of equipment and the type of parts being fabricated, so choosing the proper safeguarding method is important. This often is why OEM's in the US leave the guarding choice to the employer.
- We will briefly discuss several approaches and highlight the pro's and con's of each. This process will quickly lead us to focus most of this presentation on the newer technologies.

RESTRAINTS

In the illustration below, a CINCINNATI press brake is being used in a bumping operation.

Restraints are anchored in a location that restricts hands from entering the point of operation, but permits stacking finished pieces and obtaining new blanks.

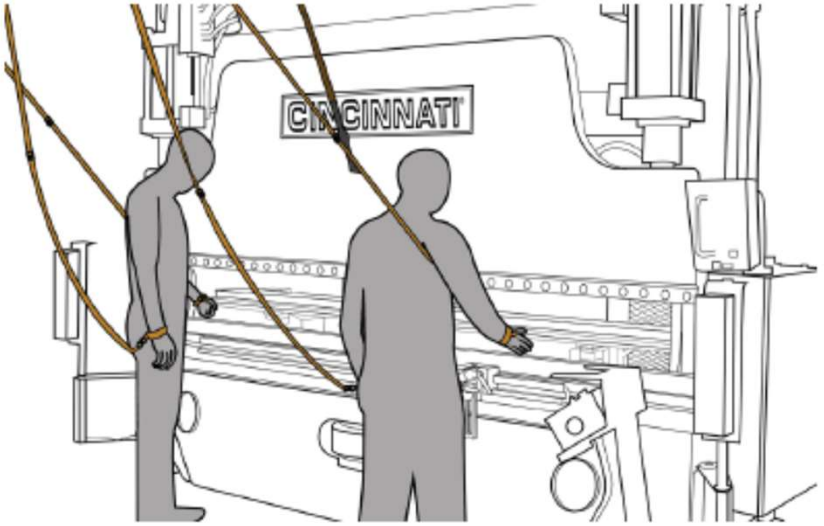
NOTE /// The properly adjusted restraints on each person. The work piece is supported from below to prevent injury when the work piece moves up.



Restraint devices restrict hands from entering the point of operation. These devices also restrict operator movement during loading and unloading of piece parts.

PULL-BACKS

In the illustration below, operators perform die set work at two locations. Pull-backs on the ram are properly adjusted to safeguard hands from the point of operation.

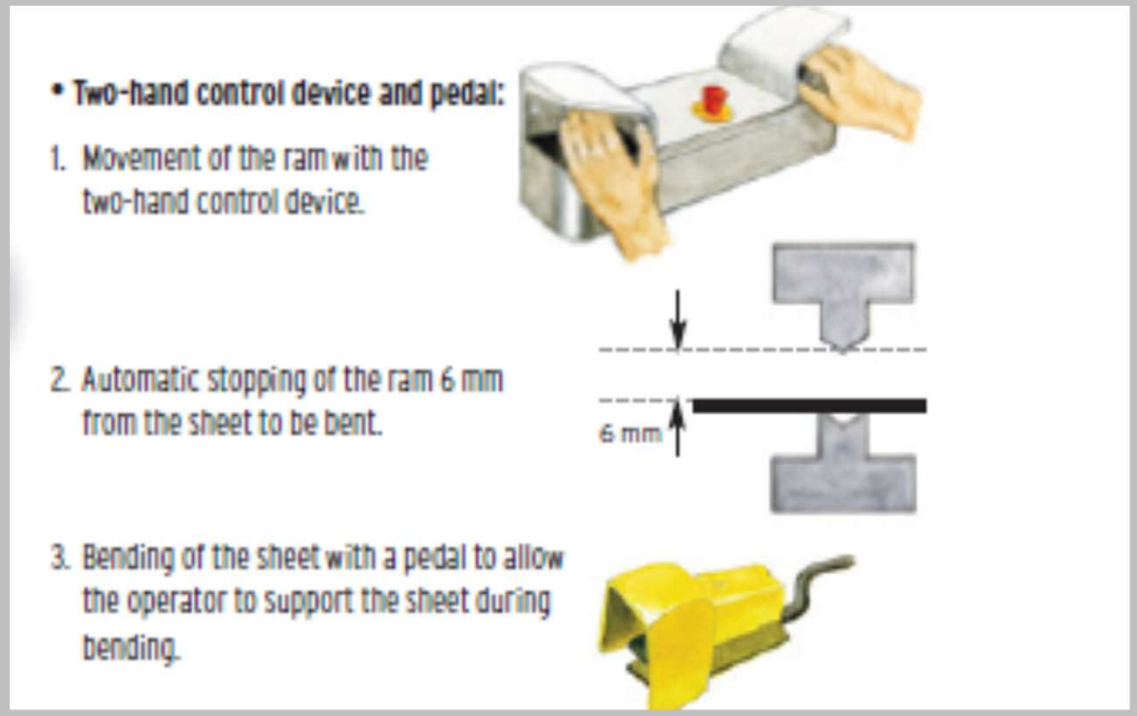


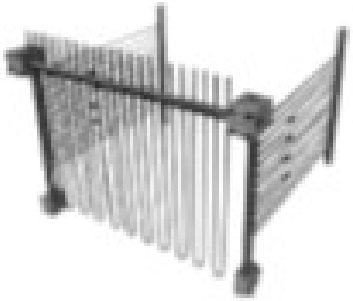
Pull-backs safeguard both operators while loading the work area.

Palm Buttons / Two Hand Controls

- Each operator requires their own set of buttons and must have proper anti tie down circuitry.
- Buttons must be located far enough from pinch points using safety distance formula as outlined by OSHA / ANSI B11.3.
- Available in Electronic Ergonomic models such as the ISB Sof-Touch as shown or Mechanical Spring-Loaded versions.
- Must be held until press brake reaches ¼” (6mm) from bottom.
- Holding parts with both hands is almost always necessary on press brakes, making two hand controls not ideal.

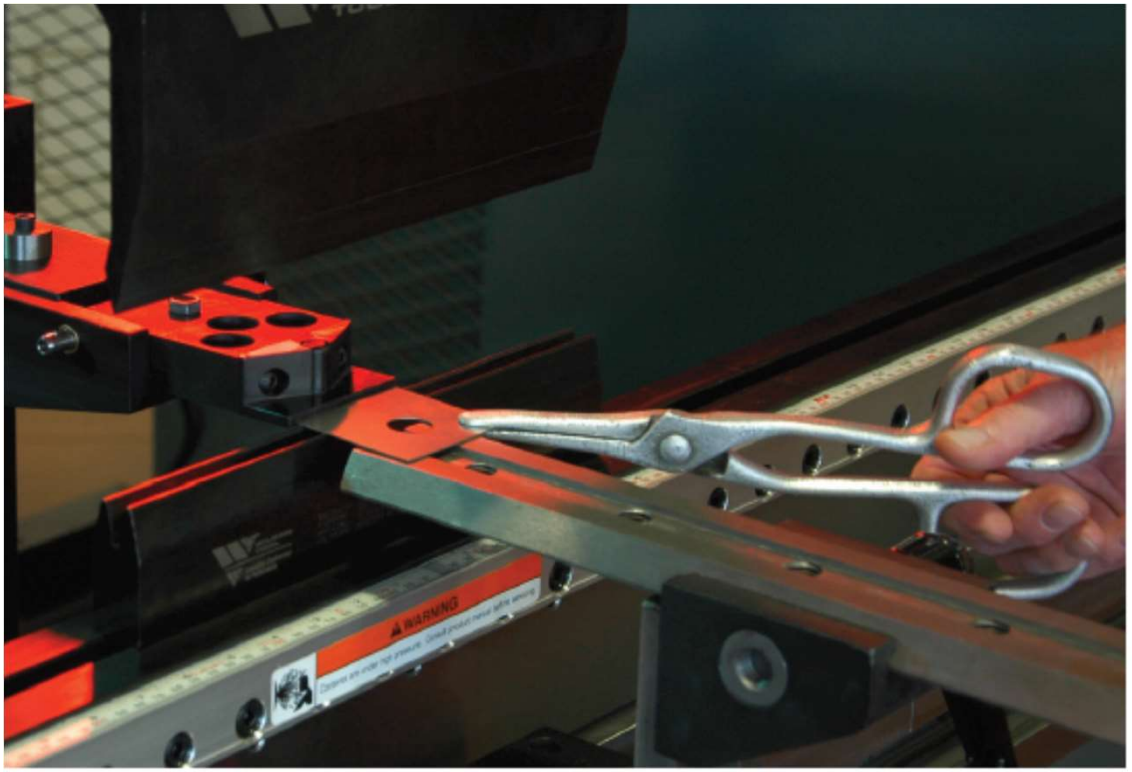
Two-Hand Control to the Stroke Stop.
Press Brake Controller Automatically Switches
to Foot switch to complete bend while holding parts.



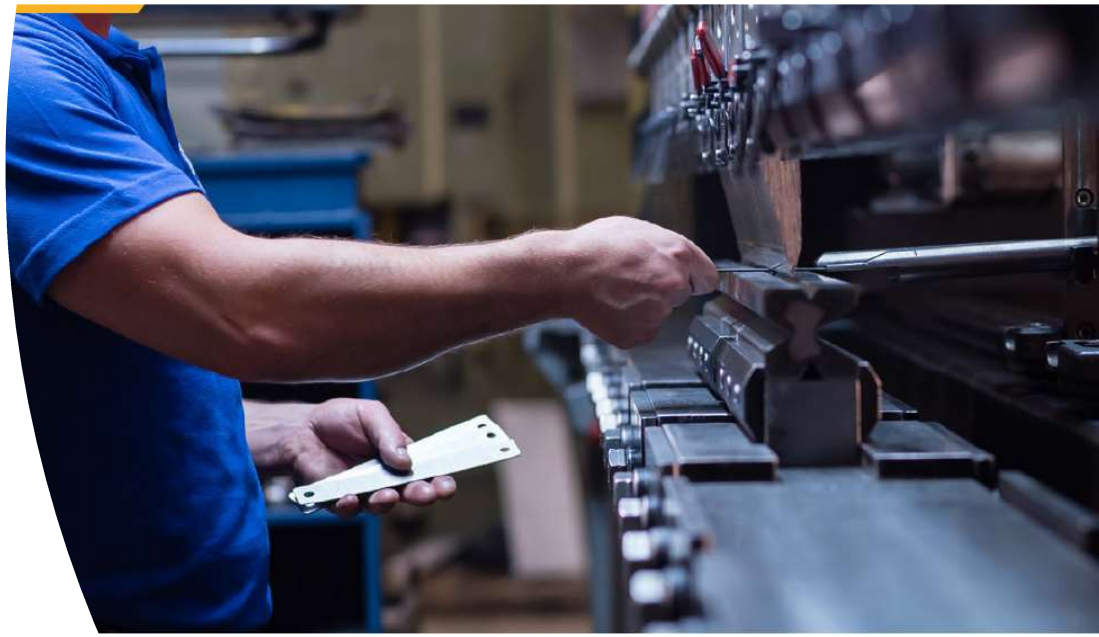


Mechanical Barrier Guards with small openings are OK for flat or dedicated parts but problematic for parts with flanges. Bigger the opening, the further away from the pinch point. Guards themselves can not create a pinch point with wiping action of bending parts. Hard guarding is best used for ends and back side of the press brakes.

Using tongs or other Hand tools to feed small parts. No hands in die policy.



Guarding By Safe Distance is almost always NOT a viable solution!

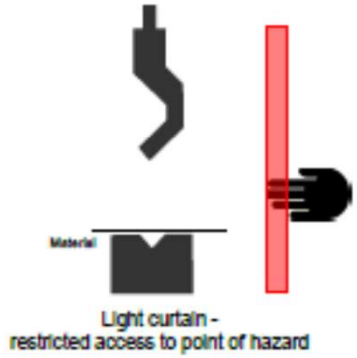


- The standard states that maintaining a safe distance (between 4 in. and 10 in., depending on the application) can qualify as a safeguarding method, BUT ONLY if the application won't allow for any of the traditional safeguarding alternatives.

- That application also needs to be either a one-time part or a small-quantity run that lasts no more than four hours per month. The standard mentions additional limitations, but the bottom line is that Safe operating distance is a safeguarding method of last resort. With all of today's safeguarding technology, few applications will qualify.
- Original purpose of rule was to accommodate simple Brakes used on construction sites for HVAC, where conventional guarding devices were not practical.

Traditional Safety Light Curtains

- With manual blanking of individual photocells by user to accommodate support arms and work-piece.
- Floating Beam Capability to allow flat items to pass through.
- Must be mounted at a safe distance using OSHA / ANSI formulas based on stopping time. Must be verified periodically. See next slide.
- Most effective to keep operator and other personnel out of entire danger area.
- Allows for unobstructed view and ease of removal of fabricated parts.
- Varying part flange heights from step to step complicate use of manual beam blanking and may interfere with production.
- Loading parts at Stroke Stop / Mute Point may allow for acceptable performance of traditional light curtains.



Safety Lights must be mounted at a safe distance.

ANSI FORMULA USED:

Ds = K x (Ts + Tc + Tr + Tbm) + D(pf)

Ds = Minimum safety distance between the device and the nearest point of operation hazard in inches.
K = Hand speed constant – OSHA sets at 63 "/sec.
Ts = Stop time of the machine measured by a stop time device.
Tc = Response time of the control system (usually included in the stop time measurement.
Tr = Response time of the presence-sensing device (given by the manufacturer).
Tbm = Additional time for the brake monitor to compensate in variations in normal stopping time.
D(pf) = Depth Penetration Factor - Use ANSI formula of 3.33 X (M.O.S. – 0.276)

Safety Light Curtain; .75" detection Capability

RESPONSE TIME <27ms
MINIMUM OBJECT SENSITIVITY – .75"
NO BLANKING - DEPTH PENETRATION FACTOR - D(pf) = 1.57"
[3.33 X(.75 – 0.276)] = 1.57"
FLOAT ONE BEAM - DEPTH PENETRATION FACTOR - D(pf) = 3.23"
[3.33 X(1.25 – 0.276)] = 3.23"
FLOAT TWO BEAMS - DEPTH PENETRATION FACTOR - D(pf) = 4.9"
[3.33 X(1.75 – 0.276)] = 4.9"
FLOAT THREE BEAMS - DEPTH PENETRATION FACTOR - D(pf) = 7.4"
[3.33 X(2.5 – 0.276)] = 7.4"

EXAMPLES OF MACHINES WITH FAST STOP TIMES USING 1/2" SPACING:

E.g. Machine has stop time of 50 ms (fairly fast stopping hydraulic press brake) – No blanking

Ds = 63 x (50 + 0 + 27+ 0)/1000 + 1.57) = 6.42"

E.g. Machine has stop time of 50 ms (fairly fast stopping hydraulic press brake) – Float 1 beam

Ds = 63 x (50 + 0 + 27 + 0)/1000 + 3.23) = 8.08"

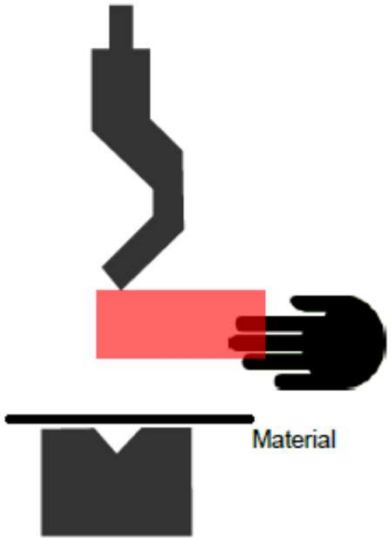
E.g. Machine has stop time of 50 ms (fairly fast stopping hydraulic press brake) – Float 2 beams

Ds = 63 x (50 + 0 + 27 + 0)/1000 + 4.9) = 9.75"

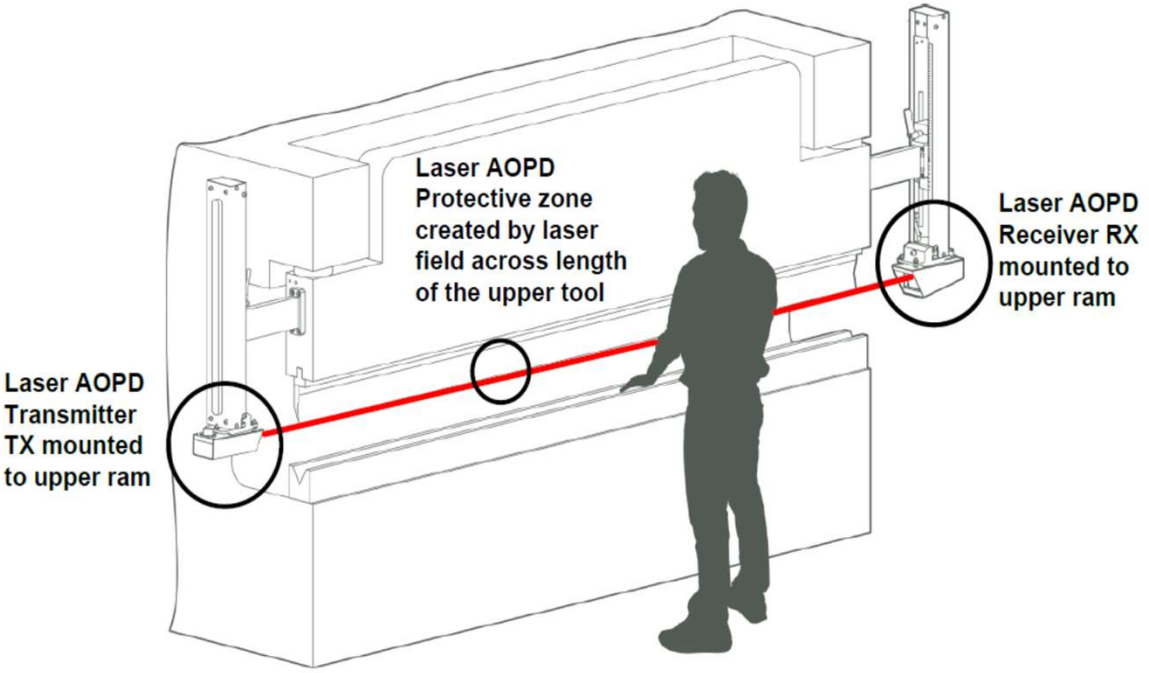
E.g. Machine has stop time of 50 ms (fairly fast stopping hydraulic press brake) – Float 3 beams

Ds = 63 x (50 + 0 + 27 + 0)/1000 + 7.4) = 12.25"

Laser AOPD Press Brake Guarding



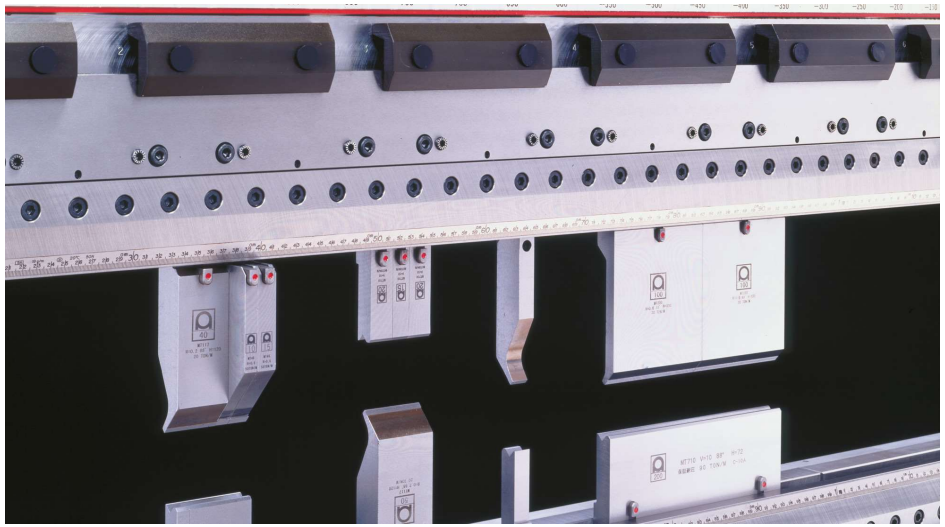
Laser AOPD -
Point of hazard protection



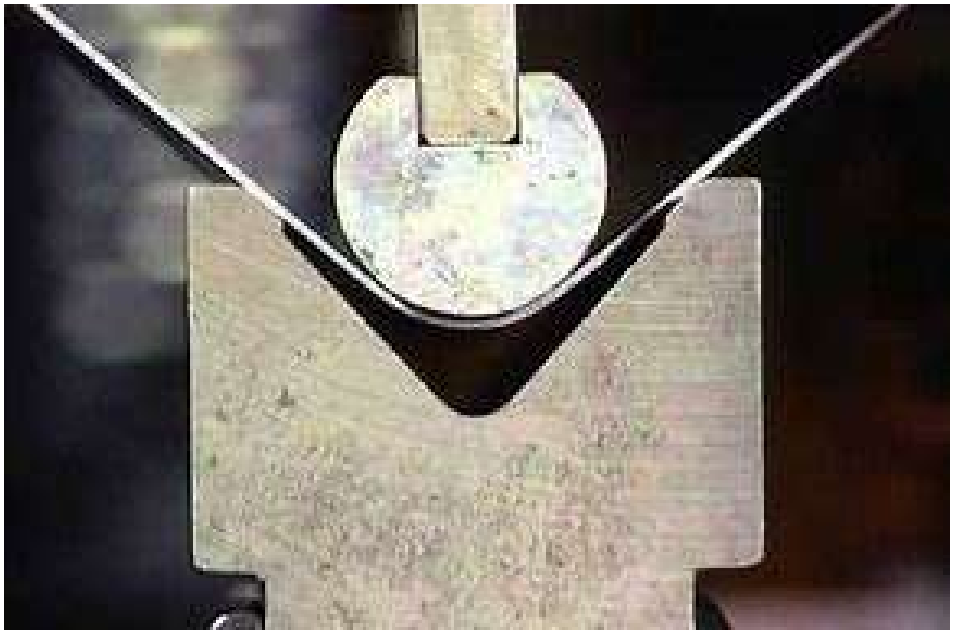
Laser AOPD Press Brake Guarding

- This technology was developed in Europe in the late 1990's and entered the US market around 2004.
- The biggest advantage of an AOPD is that operators can handle pieces up close to the dies while running the press brake with an electric foot switch.
- Small part fabrication can be done without "Double Stop" or Stroke Stopping the machine, as compared to traditional light curtains.
- Because of the importance of press brake stopping distance, (as compared to safe distance for safety light curtains) the rapid advance and bending speed of press brakes may need to be significantly reduced.
- Box shape parts with side flanges Can be fabricated with a Laser AOPD but expect the machine to go in to slow speed much higher in the stroke.
- Because the laser device is moving in unison with the tooling, its position adjustment is critical so expect some added set up time between tool changeovers.
- Retrofitting to existing machines can be complicated.

Laser AOPD Press Brake Guarding conflict; Staggered Tooling Heights.

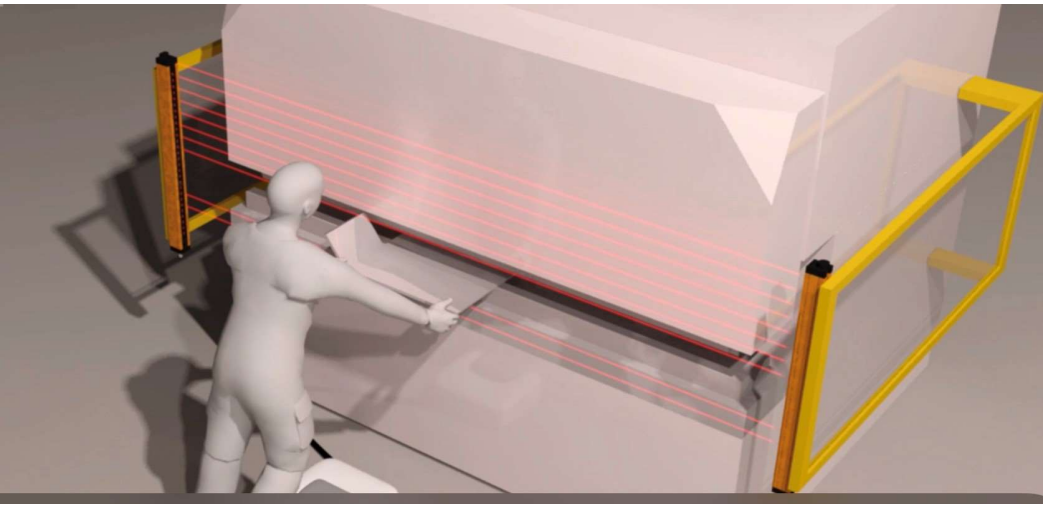


Laser AOPD Press Brake Guarding conflict: Radius tooling.



Laser AOPD Press Brake Guarding conflict; Hemming Dies.

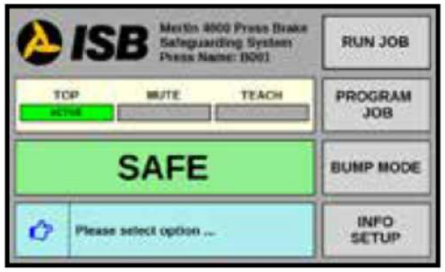
Introducing the newest concept in Press Brake Guarding; Merlin 4000.

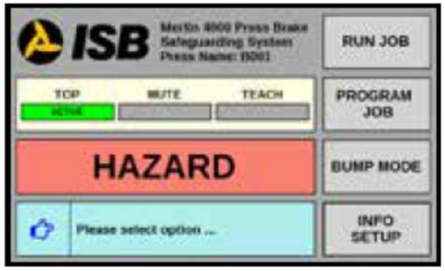


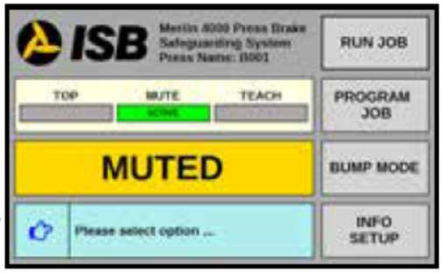
Recently introduced Light Curtain-Based Merlin 4000 Technology is the most exciting break-through in Press Brake Guarding.

- By utilizing a very-dense type 4 infrared light curtain to span the entire machine opening, the powerful controller will learn the entire profile for each step of the part fabrication in the same time it takes to make a sample part.
- By scanning the entire machine opening, it truly protects the entire point of operation, without concern for the type of press brake or shape of the tooling.
- Unlike conventional Safety Lights that simply are a binary go / no-go device based on whether an active photocell is being blocked, the Merlin 4000 takes a digital snapshot of each step of fabricating a part and stores it in memory.
- The stored digital part profile contains the exact size and position of the stationary support arms, if applicable. It also learns the exact size and location of the fabricated part flange for each step of fabricating even the most complicated part. This complete digital footprint is saved in memory and is compared to future part fabrication by the internal powerful processor.

Merlin 4000 Technology is a total solution in Press Brake Guarding. Its powerful Touch-Screen HMI makes it easy to navigate with step-by-step prompting. The Blinking LED's on the Column provide visual aid to operators.







- New compact touch screen based HMI panel for easier use.
- Unlimited job storage with job sharing.
- Each job can have up to 99 steps.
- Easy jobs back-up & restore using a USB memory stick.

Merlin 4000 Indicators Now Interactive

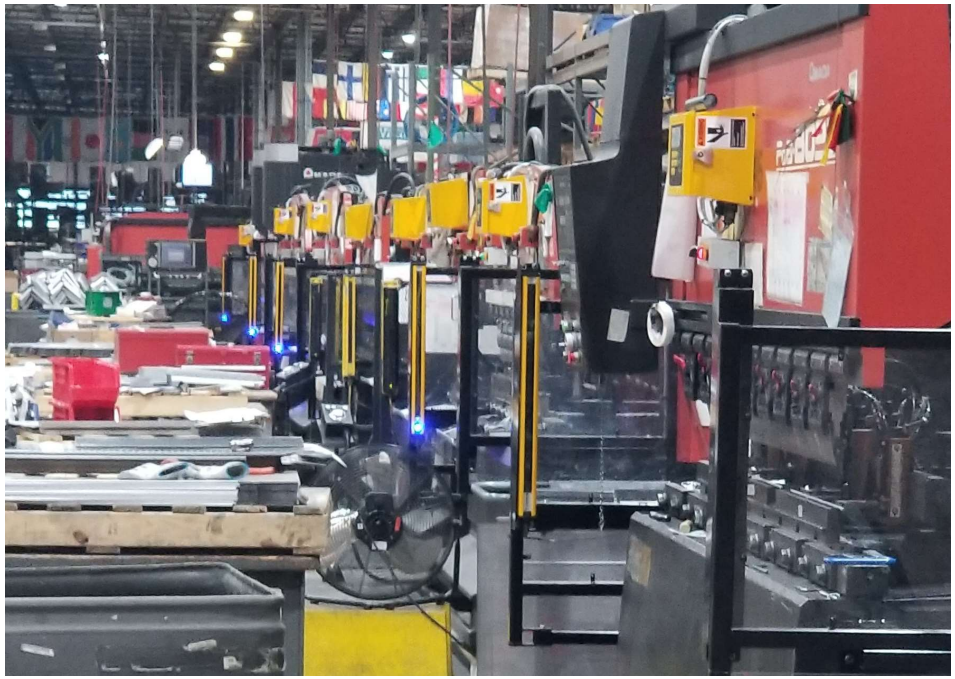
When running a programmed job in the press brake, the Merlin 4000 LED Indicators now flash from step to step to give the operator a visual aid of where to hold the proper flange size and location. Once the part is properly located, the LEDS stop flashing and the machine can then be operated.

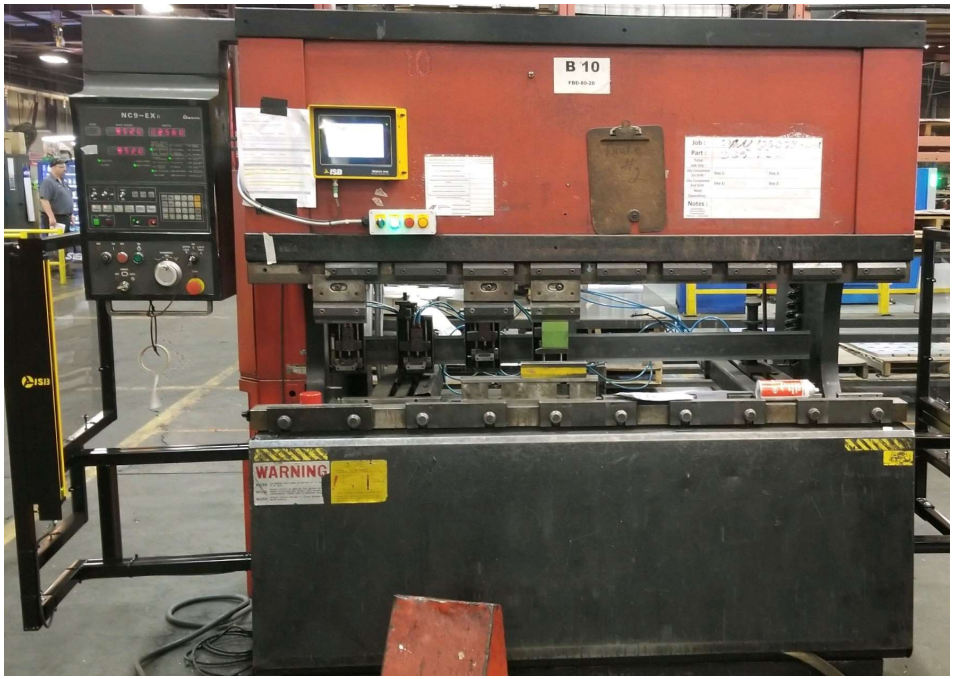
Unsatisfied Flashing Blanking Indicator | Incorrect Object Size and Placement | Correct Object Size and Placement

The Merlin 4000 Light Curtain Columns comply with the following standards:

IEC 61508 (SIL 3) | IEC 61496 (Type 4) | IEC 61062 (SILCL 3) | EN ISO 13849 (PL e, Category 4)

Now that’s a whole bunch of Press Brake Guarding!





We have worked directly with many factories to successfully safeguard their machines and welcome the opportunity to have an open dialogue with attendees to address all the challenges associated with press brake guarding.

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Please visit our Fabtech 2019 Booth # A6227 for a demonstration.