

WELCOME

Keeping Workers Safe Around Machines

Objectives

During this webinar, we will discuss:

- Common hazards of machines
- Photographs of improperly or unguarded machines
- Explain adequate machine safeguarding options, and
- Offer steps for moving forward



Why Machines Must Be Properly Guarded

- 800 deaths each year
- High injury rates
 - Amputations, fractures, lacerations, and crushing
 - Electric shock and burns

OSHA Requirements

- 1910.211 – definitions
- 1910.212 – General Requirements
 - One or more methods
 - Protect operator and other employees
 - From hazards created by point of operation, ingoing nip points, rotating parts, flying chips and sparks
 - Protection may include: barrier guards, two hand tripping devices, electronic safety devices, etc.

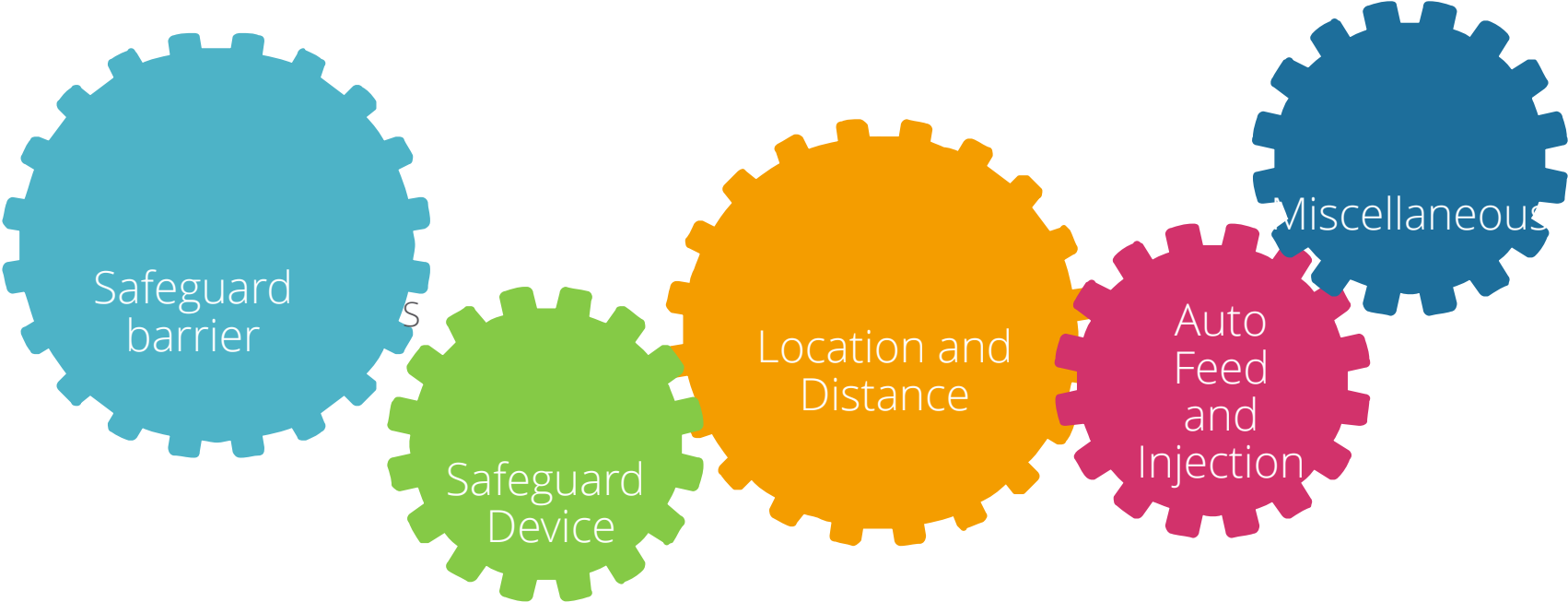
Additional Standards

1. 1910.213 – 1910.244 (Subpart O0)
 1. Woodworking
 2. Cooperage
 3. Abrasive Wheel
 4. Mills and Calenders
 5. Power Presses including certification/validation of safety systems for presence sensing device
 6. Forging machines
 7. Mechanical Power Transmission Apparatus
 1. Projecting shaft ends

Poll Question

- True or False?
- If the machine is old or is being used as provided by the manufacturer, then the safe guarding is always satisfactory.

Safeguard Classifications



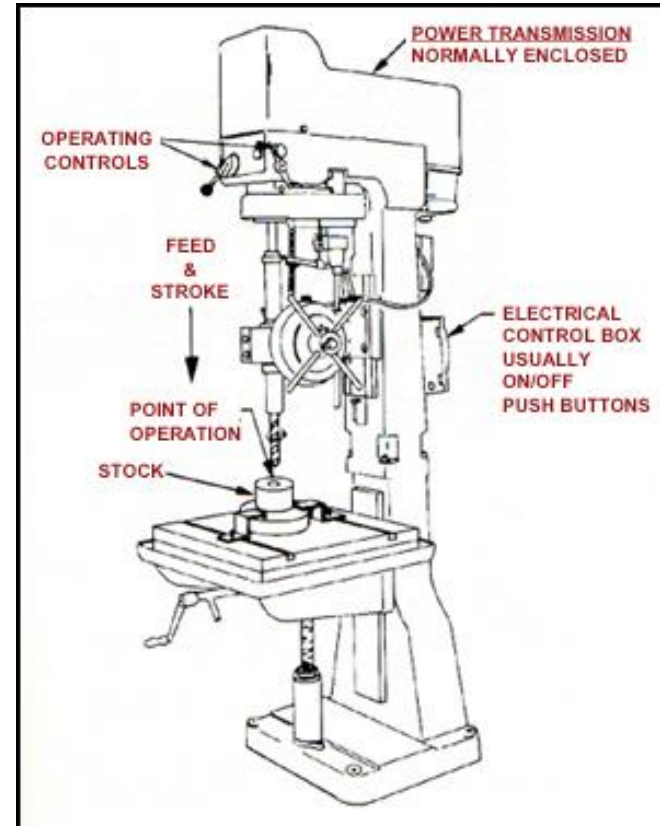
Effective Machine Guards/Safeguard Barrier

- Prevent contact with hazard zones
- Are secure
 - Fasteners require tool for removal (best practice)
- Create no new hazard
- Do not create interference
- Allow for safe lubrication
- Withstand work conditions
- Allow for safe routine maintenance



Point of Operation Functions

- Cutting
- Punching
- Shearing
- Bending
- Compressing

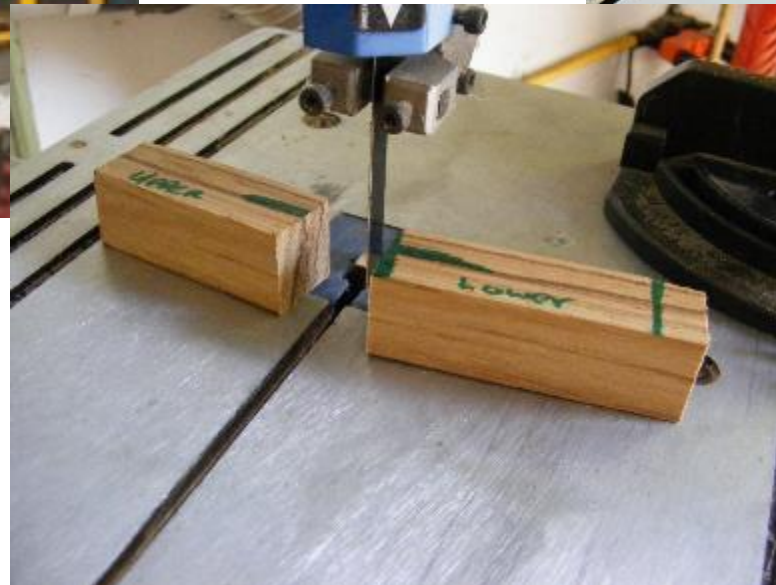


Cutting Machines and Actions

- Hazard—Cutting action, flying chips, or scrap material cut fingers or strike the head or body
- Machines
 - Band and circular saws
 - Boring or drilling
 - Lathes and milling
- Actions
 - Rotating, reciprocating, or transverse motion



Cutting Machines

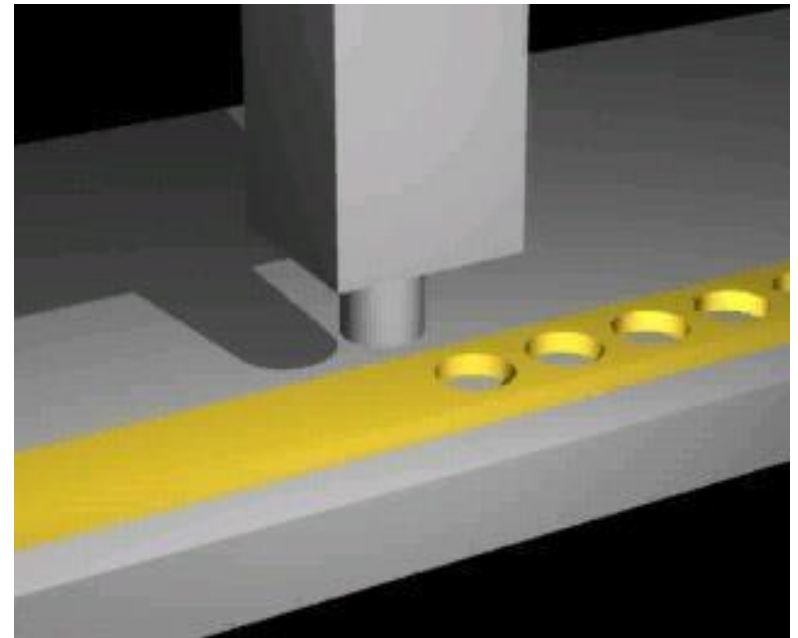


Milling Machines



Punching Machines and Actions

- Hazard—Fingers can be crushed where material is inserted, held, or withdrawn
- Machines
 - Power presses
 - Ironworking equipment
- Action of ram mechanism
 - Bending, drawing, or stamping

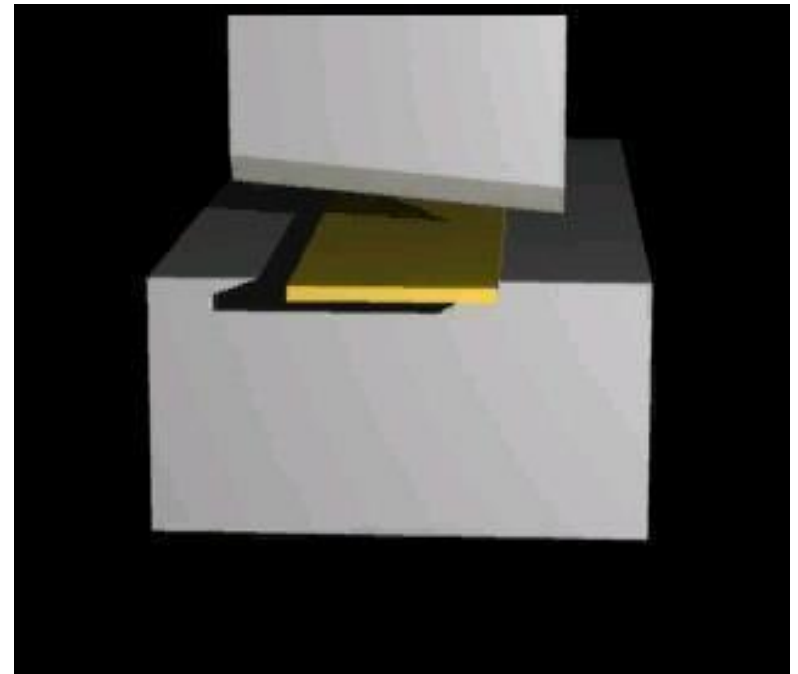


Punching Machines Example



Shearing Machines and Actions

- Hazard—Crush or tear body parts where material is inserted, held, or withdrawn
- Machines:
 - Hydraulic shears
 - Mechanical shears
 - Pneumatic shears
- Actions
 - Powered slide or knife to trim or shear metal or other materials

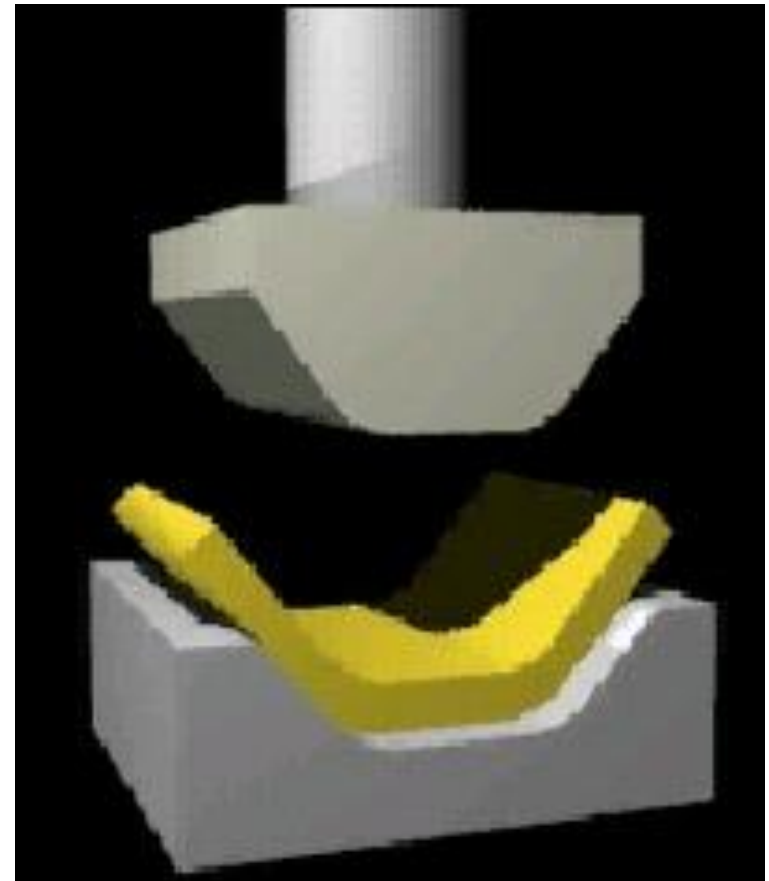


Shearing Machines Example

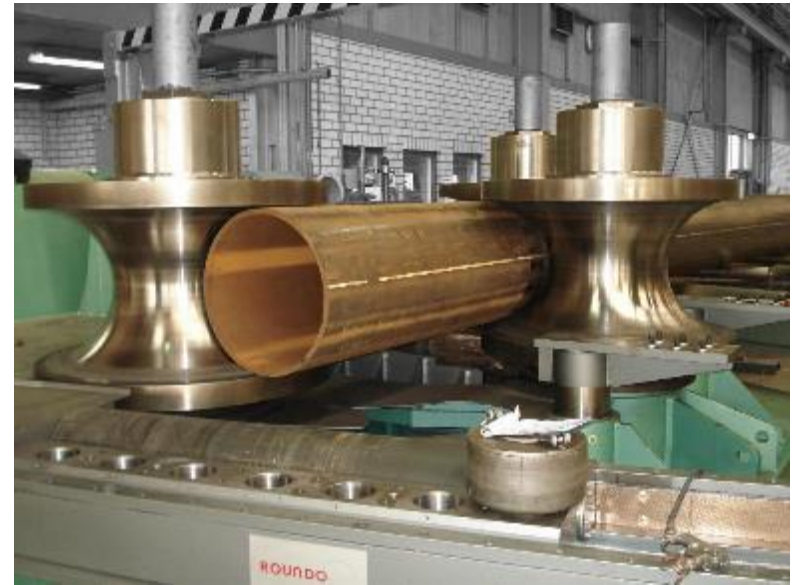


Bending Machines and Actions

- Hazard—Crushing body parts where material is inserted, held, or withdrawn
- Machines
 - Power presses and press brakes
 - Tubing benders
- Actions
 - Draw or stamp



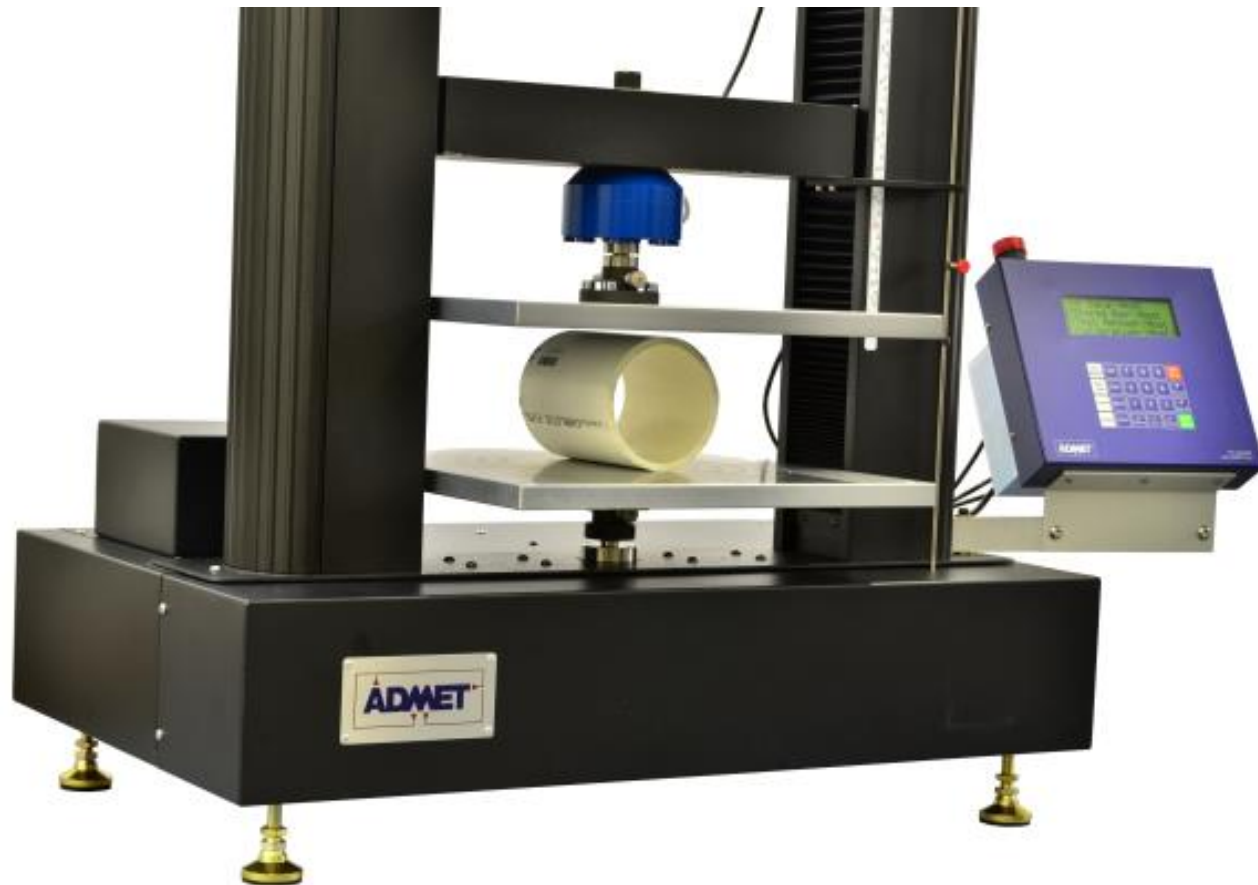
Bending Machines Example



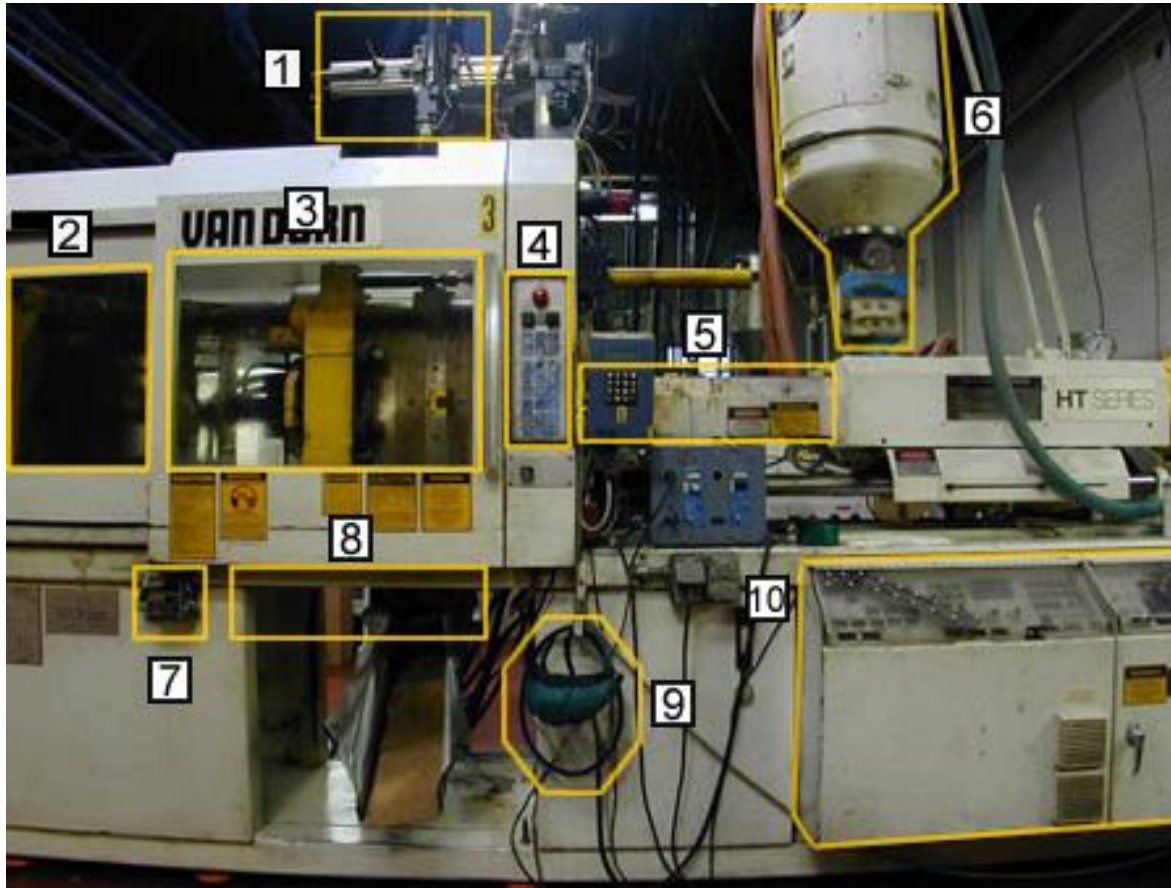
Compressing Machines and Actions

- Hazard—Compression crushes body parts
- Machines
 - Compactor (*example: trash compactor in maintenance*)
 - Molding
- Actions
 - Squeezing, extruding, and pressing

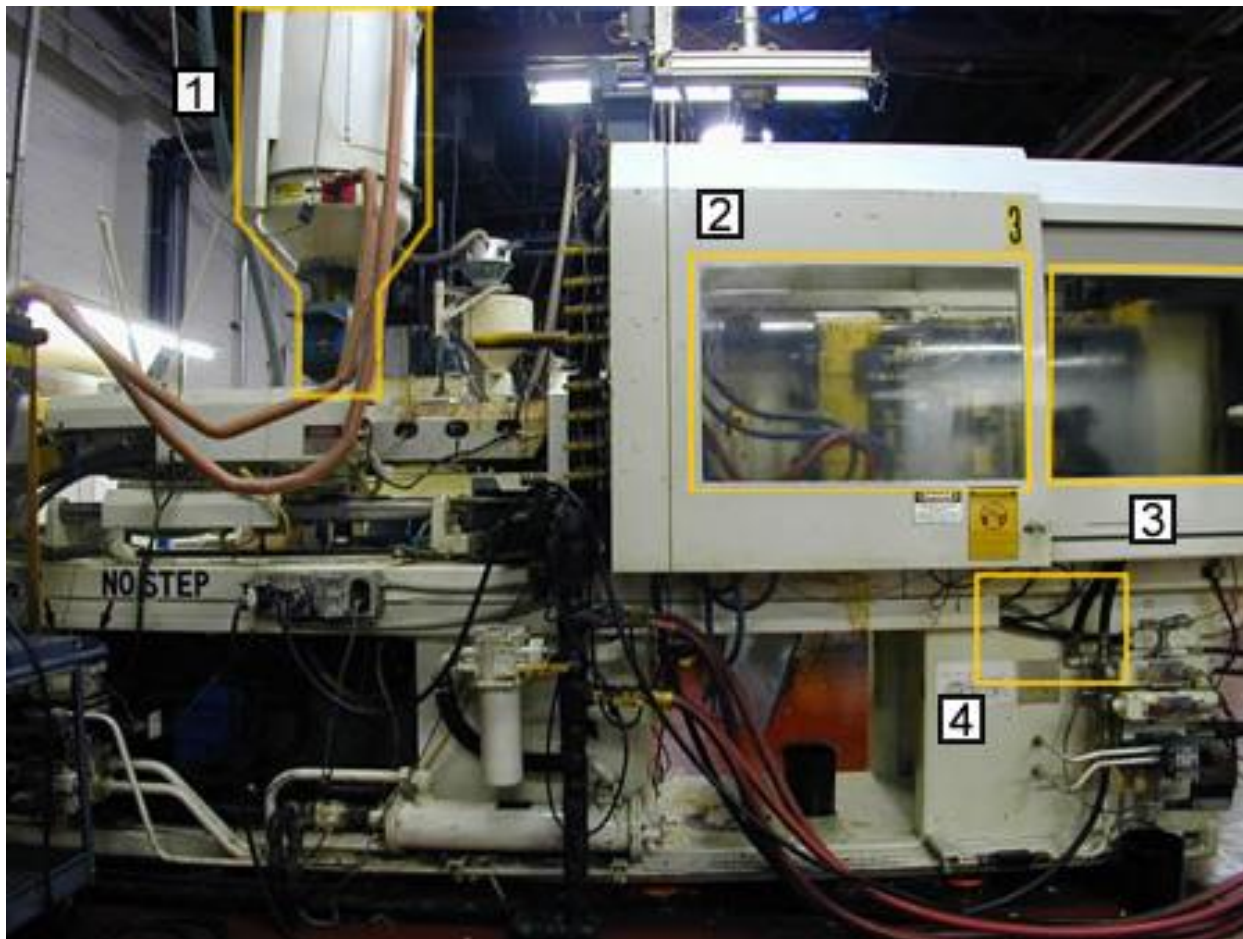
Compressing Machines Example



Horizontal Injection Molding

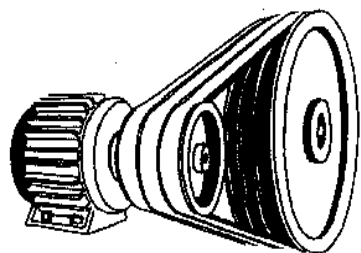


Horizontal Injection Molding



Power Transmission Apparatus

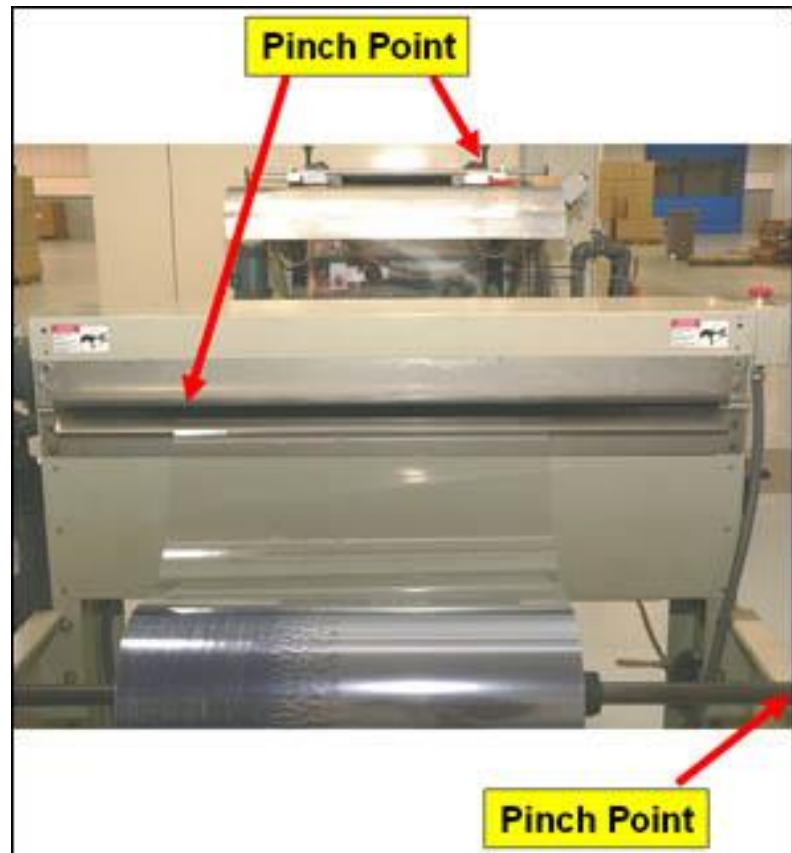
- Hazard—Grab, nip, cut, or strike body parts
- Machines and parts include:
 - Power transmission belts and pulleys, gears, sprockets and chains, shafts, collars, couplings, flywheels, clutches, and other power transmission apparatus
- Action
 - Grabbing, nipping, cutting, flying or falling objects, reciprocating motions, transverse motions, or a combination of these



Power Transmission Apparatus Example

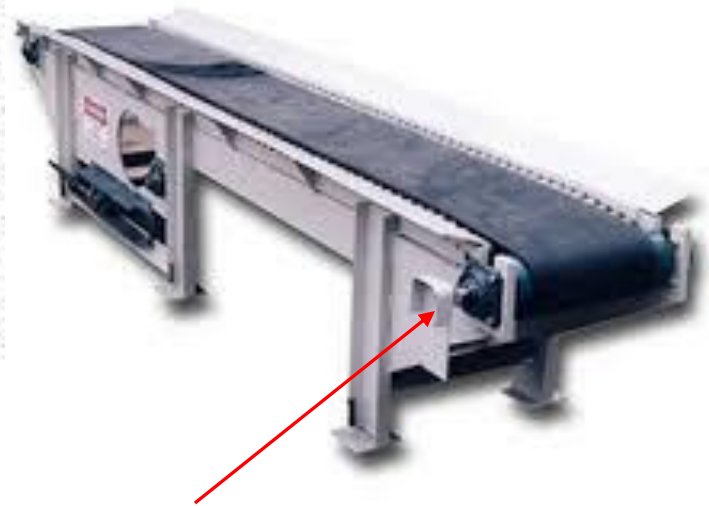
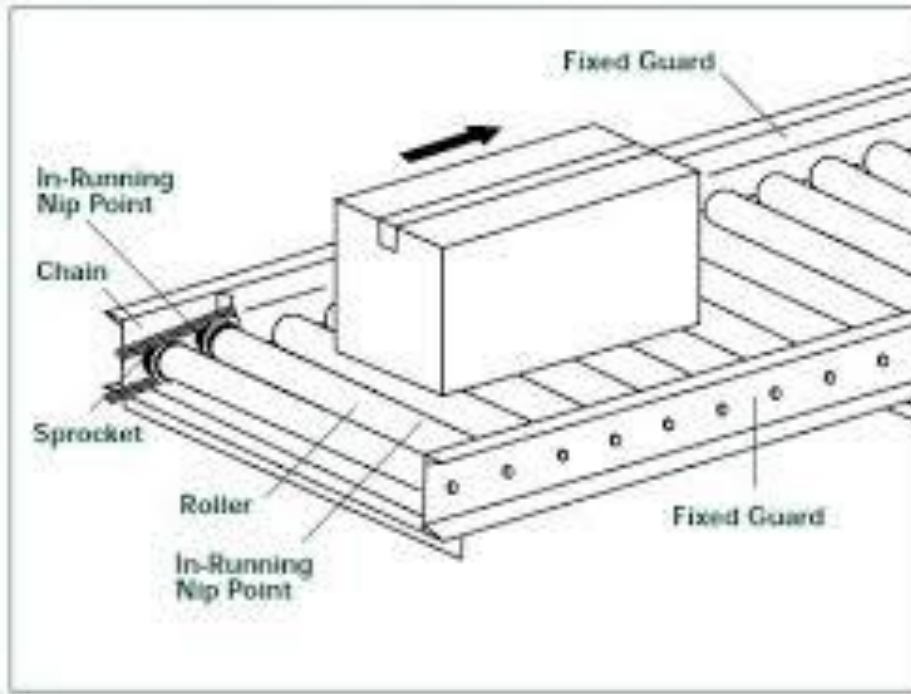


Other In Running Nip Points



Conveyors

Figure 29 Chain Driven Live Roller Conveyor



Drill Press Incident



Drill Presses:



Pedestal / Bench Grinders:

- Tongue guard must be no more than 1/4" away from the wheel
- Tool rest must be no more than 1/8" away from the wheel



Safeguard Barriers

Fixed Safeguards

- Permanent part of the machine or apparatus
- Best and simplest guard protection
- Power transmission apparatuses are best protected by fixed guards or barriers that enclose the danger area



Safeguard Barriers

Adjustable or Self-Adjusting Safeguards

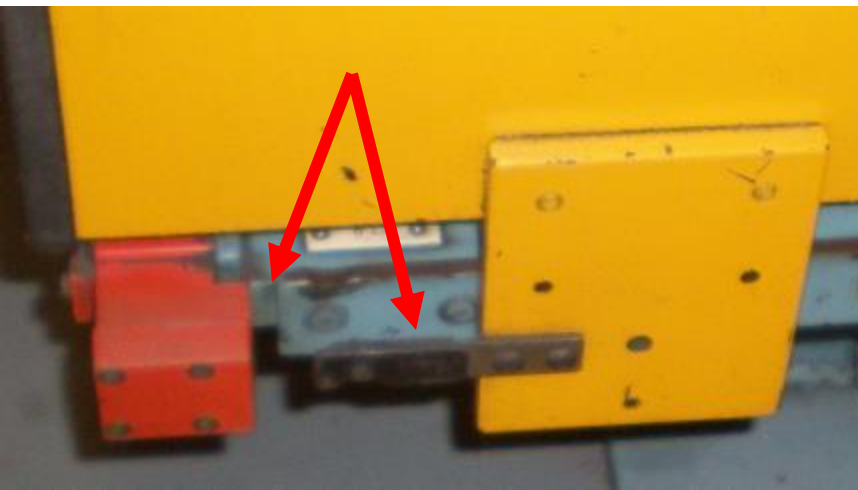
- Adjustable to accommodate varying sizes of material placed at the point of operation
- Self-adjusting types move according to the size of the stock



Safeguard Barriers

Interlocked Safeguards

- Interlock device automatically shuts off and quickly stops the machine when the barrier guard is moved to expose the hazard



Poll Question

- How frequently do you inspect and document the inspection of equipment safeguards?
 - Monthly
 - Quarterly
 - Annually
 - Periodically
 - UH?!

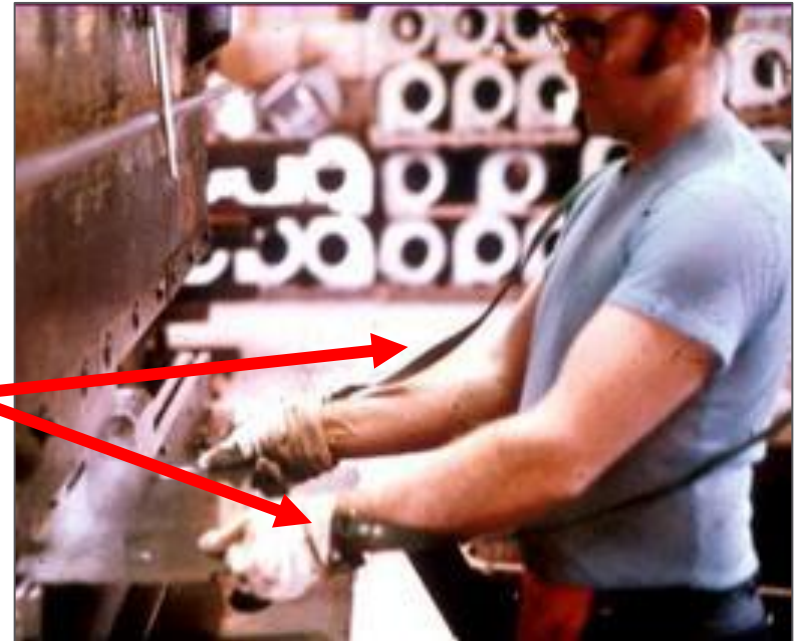
Classifications of Safeguards

- ~~1. Safeguard barrier ("hard guarding")~~
2. Safeguard device
3. Location and distance
4. Automatic stock feed and ejection method
5. Miscellaneous aids



Safeguard Devices

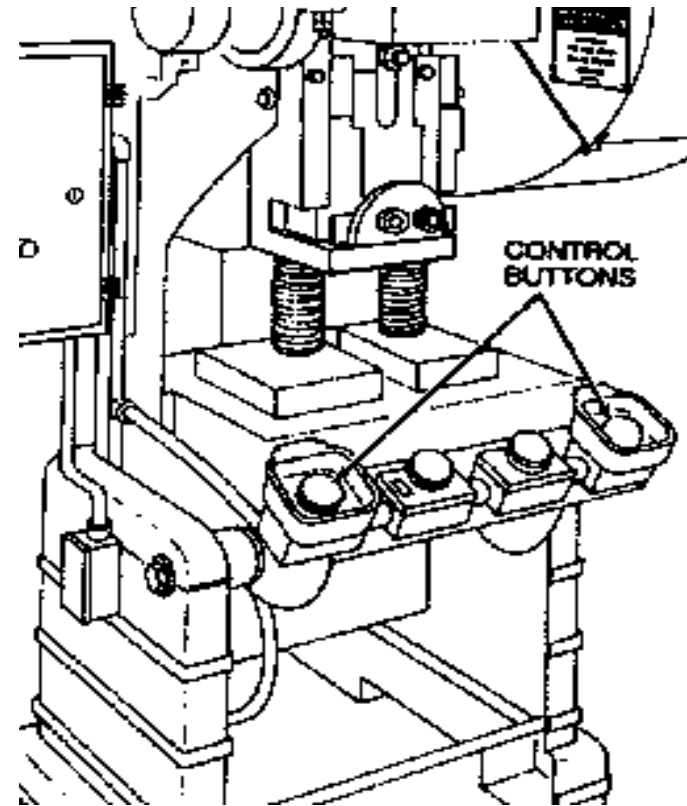
- Presence-sensing devices automatically shut down equipment
 - Photoelectrical
 - Radio frequency
 - Electromechanical
- Pullbacks or restraints
- Safety trip control
 - Pressure-sensitive body bar
 - Safety tripwire cable



Safeguard Devices

Two-hand devices

- Two-hand controls require constant two-hand pressure during the entire machine cycle
- Two-hand trips activate the machine, then allow hands to be free while machine completes its cycle



Guarding Pedal



Light Curtain



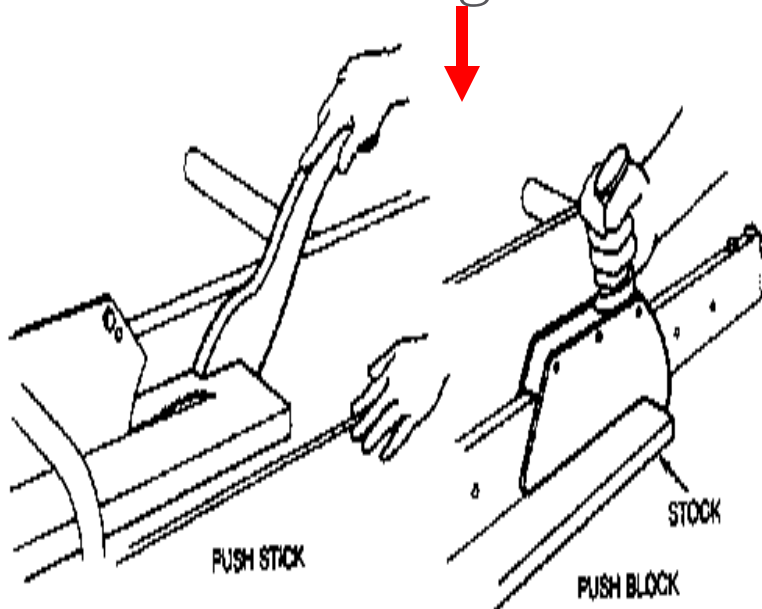
Location and Distance

- Separates operators from the equipment
- Makes it virtually impossible to contact moving parts
- Limited by the available workspace



Miscellaneous Aids

- Awareness barriers
- Protective shields
- Hand-feeding tools and holding fixtures

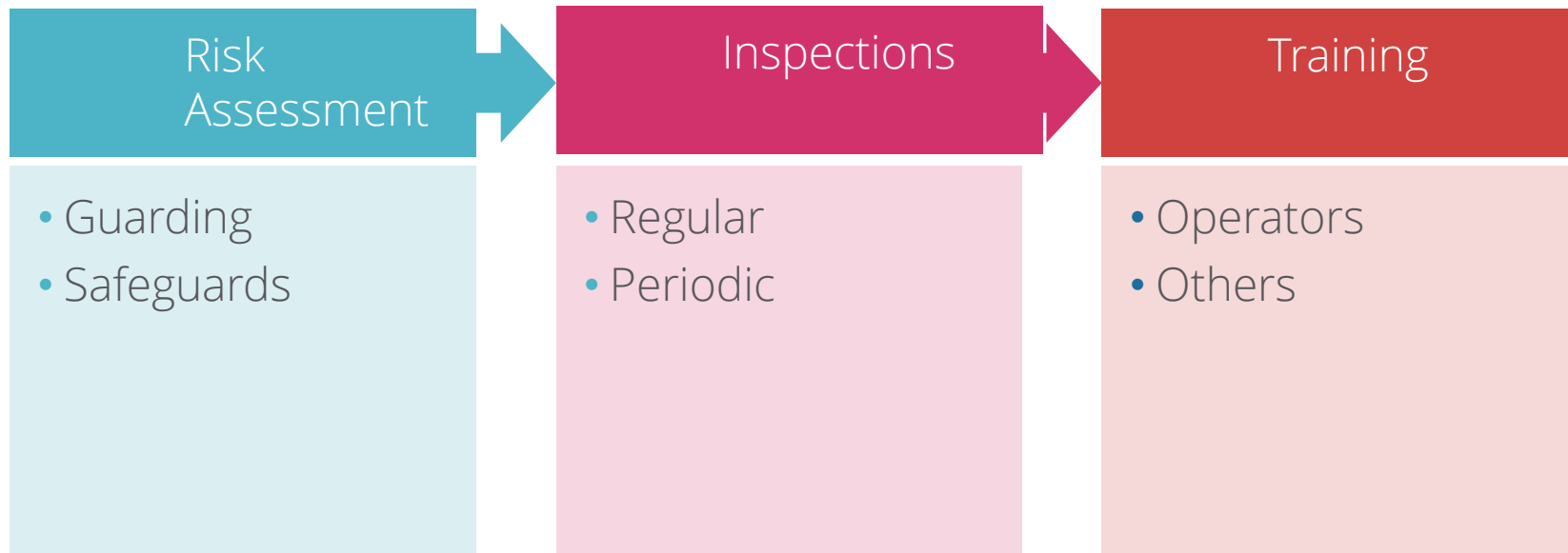


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Going Forward



Risk Assessment Machine Safeguards

- ANSI B11.0 (risk assessment)
- ISO 13849-1 and 2
- IEC 60204-1
- Acceptable Risk

Table 2 – Risk level decision matrix

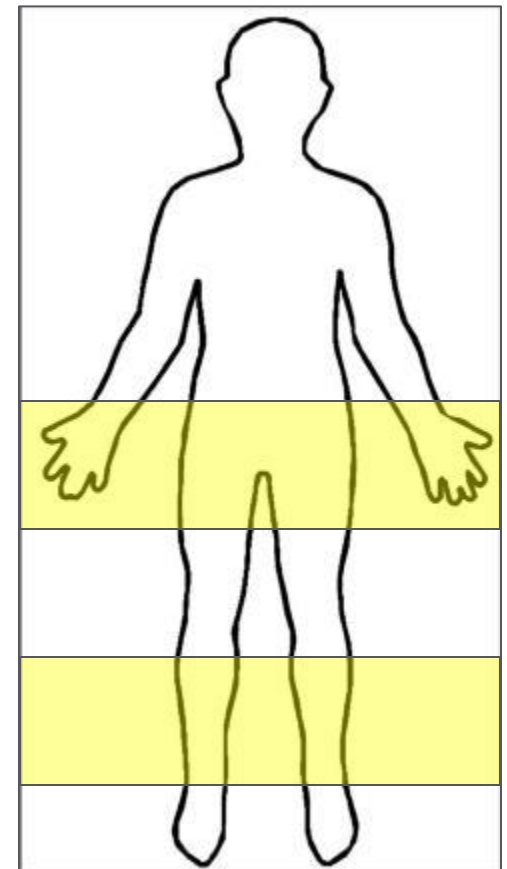
Severity of Injury	Exposure to the Hazard	Avoidance of the Hazard	Risk Level
S1 - Minor	E1 - Low E2 - High	A1 - Likely	NEGLIGIBLE
		A2 - Not Likely	LOW
		A3 - Not Possible	
S2 - Moderate	E1 - Low E2 - High	A1 - Likely	MEDIUM
		A2 - Not Likely	HIGH
		A3 - Not Possible	
S3 - Serious	E1 - Low E2 - High	A1 - Likely	HIGH
		A2 - Not Likely	
		A3 - Not Possible	VERY HIGH

Periodic and Regular Inspections

- Inspect
 - All equipment
 - Auxiliary equipment
 - Safeguards
- Record:
 - Certificate of inspection
 - Date
 - Name & signature of individual who inspected equipment
 - Press number or ID #

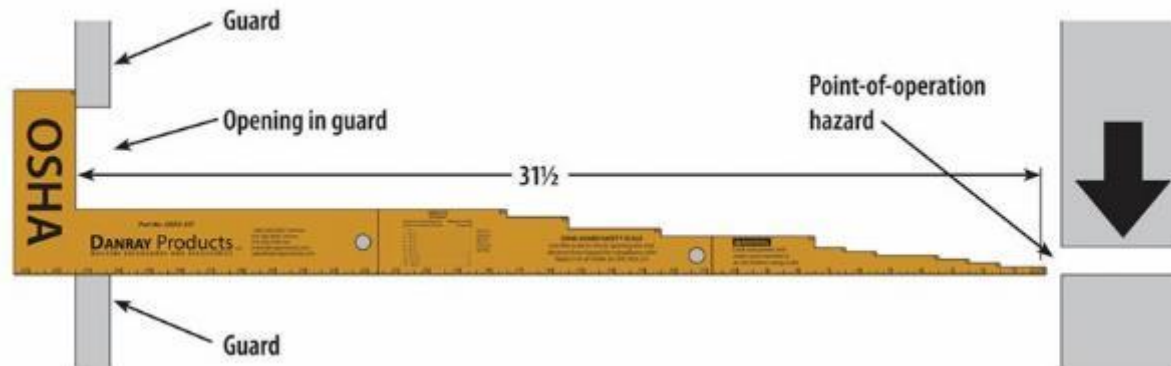
Where to Begin Looking

- Vulnerable Neutral Body Parts
 - Mid-thigh to belt buckle
 - Below knee to top of foot
- Where hand interactions occur
- Machine Guard Stickers



Essential Tools For Evaluating Machine Guards

– OSHA Guard Safety Scale



– Bench Grinder Scale



– OSHA Machine Guarding eTool:

<https://www.osha.gov/SLTC/etools/machineguarding/index.html>

Bench Grinder Safety Gauge



Poll Question

- How often are your equipment operators trained on safeguards of equipment? What to look for, how to utilize, etc.?
 - Orientation
 - Annually
 - After an accident
 - Nothing formalized

Training

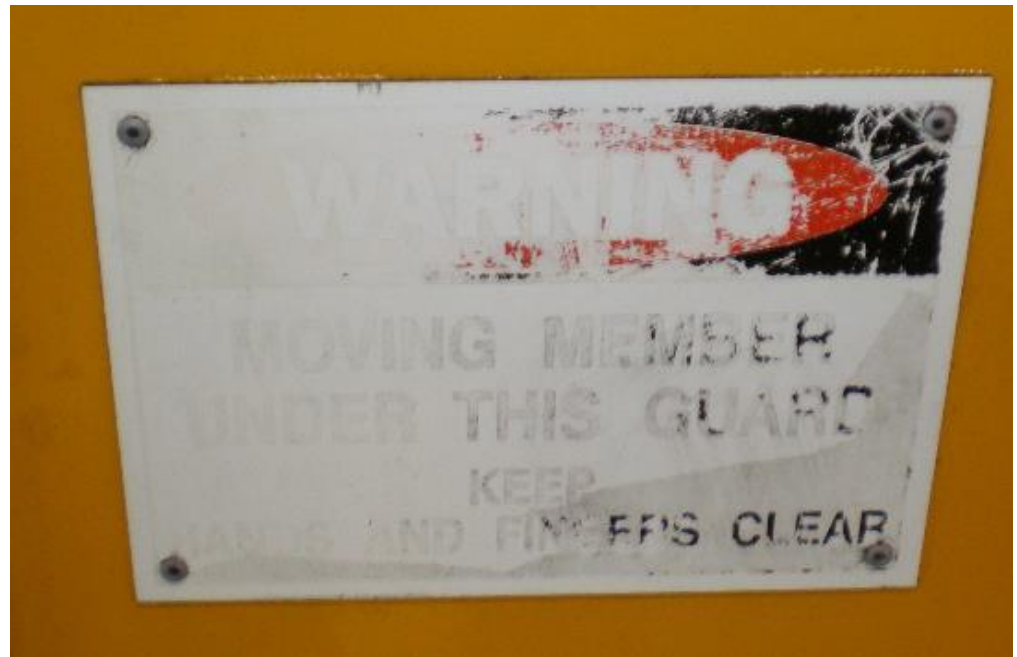
- The employer is responsible for training the following employees that are involved with power presses
 - Personnel caring for presses
 - Inspecting presses
 - Maintaining
 - Operating

Safeguarding Best Practices

- Operate equipment only when guards are in place and properly adjusted
- NEVER remove or defeat safeguards then using a machine
- Remove guards only when machine is locked / tagged out or energy is isolated in some equally effective manner (interlock devices, cord unplugged and in your control)
- No loose clothing, long hair or jewelry

Safeguarding Best Practices

- Inspect guarding daily
- Make sure warning signs are legible
- Report problems immediately



Action Items

- Assess 3 different types of machines in your facility & answer the following questions

1. *Do they have guarding now?*
2. *Is the guarding adequate or inadequate?*
3. *What type of machine guarding solution would best protect your employee?*

Resources:

- OSHA Machine Guarding eTool:

- <https://www.osha.gov/SLTC/etools/machineguarding/index.html>

- OSHA Website

- <https://www.osha.gov/SLTC/machineguarding/>

- OSHA Publication

- OSHA 3170

- <https://www.osha.gov/Publications/OSHA3170/osha3170.html>