WORLD CLASS HEALTH & SAFETY EVENT

Michigan Safety Conference

Lock-Out Tag-Out
LOTO
Applying the rules

Instructor: Dean Phillips DTM

Technical Director
Precision Metalforming Association

PMA PRECISION METALFORMING ASSOCIATION
TECHNICAL TRAINING

FIND YOUR SAFETY
MINDSET | MOTIVATION | INNOVATION

WORLD CLASS HEALTH & SAFETY EVENT
Michigan Safety Conference

APRIL 15-16, 2025 · LANSING CENTER, LANSING MI

615-714-4442
phillips@pma.org

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94 Years - Find Your Safety _____!

PMA PRECISION METALFORMING ASSOCIATION
TECHNICAL TRAINING

Bio

Dean Phillips

Nearly 40 years in Forming & Fabricating

Service Tech
Niagara, Clearing Niagara Bliss

Product Mgr / Regional Mgr, Natl Sales Mgr
CNB, Seyi

Product Design
Piranha, Tennsmith

Safety / Controls / Automation
Link Systems

Safety Committee / Technical Director
PMA

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Overview

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Outline

In this presentation we will feature various forms of energy isolation including:

Lock-out Tag-out, Key Control, Die Blocks

Safety Device Integration

Practical Application, Escalation of Safety (3 levels)

Risk Analysis / Time of Exposure

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Assessment

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Risk Assessment

Likelihood of Occurrence or Exposure	Severity of Injury or Illness Consequence and Remedial Action			
	CATASTROPHIC Death or permanent total disability	**CRITICAL** Disability in excess of 3 months	**MARGINAL** Minor injury, lost workday accident	**NEGLIGIBLE** First Aid or Minor Medical Treatment
Frequent Likely to Occur Repeatedly	**HIGH** Operation not permissible	**HIGH** Operation not permissible	**SERIOUS** High Priority action	**MEDIUM** Take Remedial action at appropriate time
Probable Likely to occur several times	**HIGH** Operation not permissible	**HIGH** Operation not permissible	**SERIOUS** High Priority action	**MEDIUM** Take Remedial action at appropriate time
Occasional Likely to occur sometime	**HIGH** Operation not permissible	**SERIOUS** High Priority action	**MEDIUM** Take Remedial action at appropriate time	**LOW** Risk Acceptable: Remedial Action Discretionary
Remote Not likely to occur	**SERIOUS** High Priority action	**MEDIUM** Take Remedial action at appropriate time	**MEDIUM** Take Remedial action at appropriate time	**LOW** Risk Acceptable: Remedial Action Discretionary
Improbable Very unlikely – may assume exposure will not happen	**MEDIUM** Take Remedial action at appropriate time	**LOW** Risk Acceptable: Remedial Action Discretionary	**LOW** Risk Acceptable: Remedial Action Discretionary	**LOW** Risk Acceptable: Remedial Action Discretionary

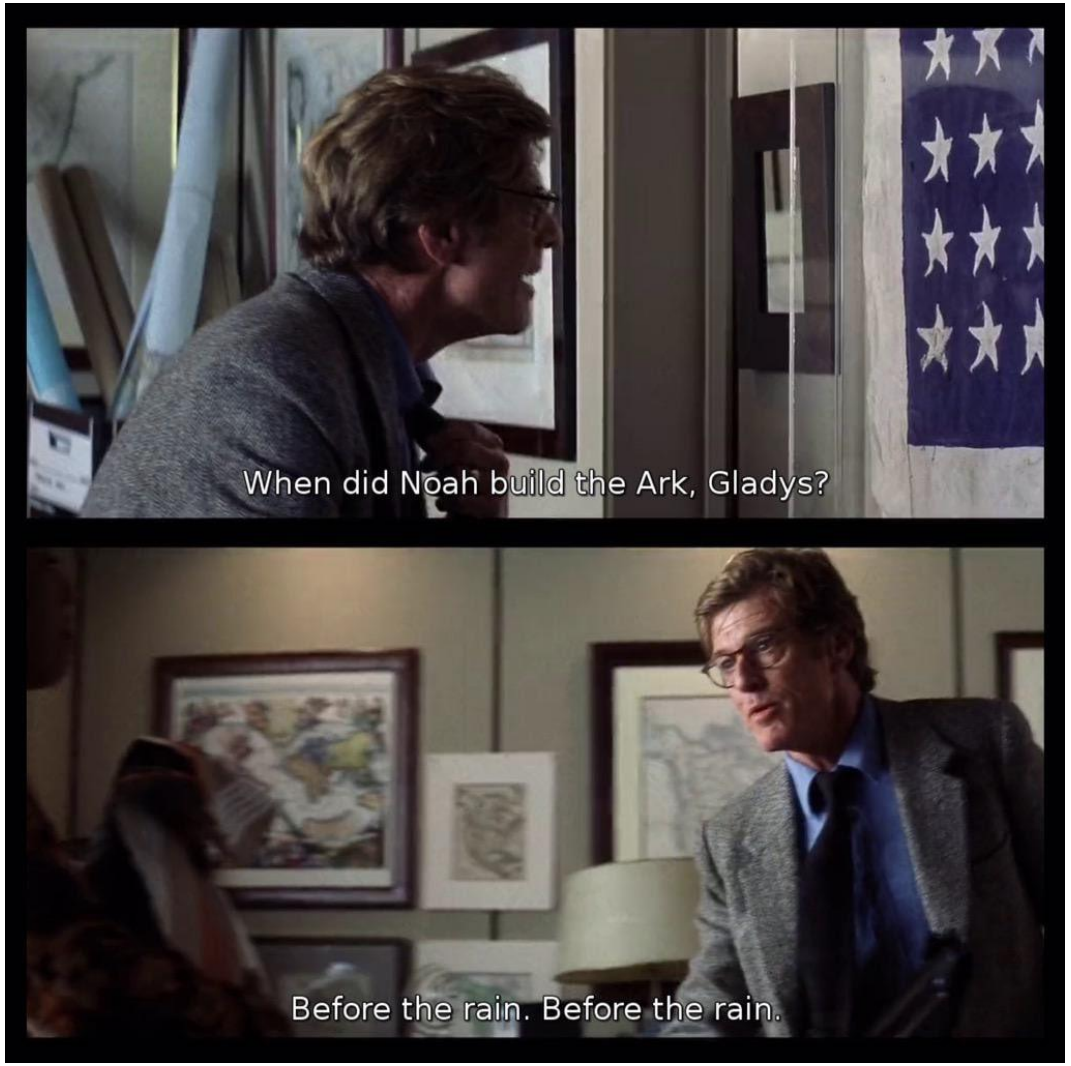
Question?
What determines the level of protection that is required?

Risk Assessment

Question?
When did Noah build the Arc

Answer?

Risk Assessment



Question?
When did Noah build the Arc

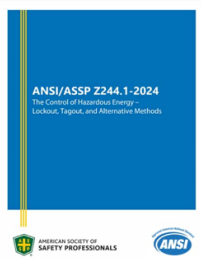
Answer?

OSHA vs ANSI

osha.gov

Home › By Standard Number › 1910.147 - The control of hazardous energy (lockout/tagout).

- **Part Number:** 1910
- **Part Number Title:** Occupational Safety and Health Standards
- **Subpart:** 1910 Subpart J
- **Subpart Title:** General Environmental Controls
- **Standard Number:** 1910.147
- **Title:** The control of hazardous energy (lockout/tagout).
- **Appendix:** A
- **GPO Source:** e-CFR



ANSI/ASSP Z244.1-2024

The Control Of Hazardous Energy – Lockout, Tagout, And Alternative Methods

This standard establishes requirements for machines, equipment, and processes in which the unexpected energization or start-up of the machines or equipment, release of stored energy, or the actions of persons could result in harm to personnel. The standard specifies the use of lockout, tagout or alternative methods to control hazardous energy associated with machines, equipment, or processes.The purpose of this standard is to establish requirements that protect personnel where harm can occur as a result of the unexpected release of hazardous energy.

According to OSHA interpretation letters, when it comes to a mechanical power press, "lock out tag out" (LOTO) **procedures should be applied during any servicing or maintenance activity that requires accessing hazardous energy points, like die changes, where the press needs to be partially energized for positioning, but the full lockout procedure is still required for most die-setting operations, with the exception of minor adjustments that can be done with alternative safety measures while the machine is running**.

Key points about LOTO on a mechanical power press:

Standard applies to servicing and maintenance:

OSHA's LOTO standard (1910.147) primarily applies to situations where a worker needs to perform maintenance or servicing on a machine, not during normal production operations.

Die-setting and lockout:

While changing dies on a mechanical power press often requires some manipulation with the press partially energized, the standard typically requires full lockout procedures for most die-setting tasks, with potential exceptions for minor adjustments that can be safely performed with alternative safeguards.

Minor servicing exceptions:

In some cases, minor adjustments or cleaning tasks performed during production may not require full LOTO if alternative protective measures are in place and the work is considered "minor servicing".

Testing and positioning:

OSHA allows for temporary removal of lockout devices to test or position a machine during maintenance, but only if employees are safely removed from the area or other protective measures are taken.

Important considerations:

Specific procedures:

Each employer must develop detailed LOTO procedures specific to their mechanical power presses, including identifying energy isolation points, how to de-energize the machine, and proper application of lockout devices.

History

Important considerations:

Specific procedures:

Each employer must develop detailed LOTO procedures specific to their mechanical power presses, including identifying energy isolation points, how to de-energize the machine, and proper application of lockout devices.

Employee training:

All employees who work on mechanical power presses must be adequately trained on the proper LOTO procedures.

Consult OSHA guidance:

If unsure about the specific LOTO requirements for a particular mechanical power press operation, consult OSHA's standard interpretations or contact your local OSHA office for clarification.

History

According to OSHA interpretation letters, when it comes to a mechanical power press, "lock out tag out" (LOTO) procedures should be applied during any servicing or maintenance activity that requires accessing hazardous energy points, like die changes, where the press needs to be partially energized for positioning, but the full lockout procedure is still required for most die-setting operations, with the exception of minor adjustments that can be done with alternative safety measures while the machine is running.

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Procedures

Posted Procedure

BRADY Lockout/Tagout Posted Procedure

ID#: 5879
Created: 7/6/2018
Revised: 7/6/2018

Facility: Brady Good Hope - Production
Description: Boiler #1
Location: Boiler Room

4 Lockout Points

Note: This machine is capable of generating extremely high temperatures. Allow it to return to room temperature before proceeding.Confined Space. Authorized personnel only. Permits are required before entering. Follow all Confined Space procedures.Piping systems can store energy hydraulically. Ensure pressures are isolated and/or have been relieved before proceeding.

MCC 3 Column 3 Bucket A | EAST VIEW | NORTH VIEW

Lockout Steps

Step #	Action	Info	Verification
1 Electrical E-1 480V	The E-1 Disconnect is located on the East side of the machine on the MCC panel Column 3 bucket A. . Turn Disconnect to the off position and lock out.	Use a Lock and hasp device.	Attempt to restart at control panel.
2 Gas G-1 Natural Gas	The G-1 Ball Valve is located on the East side of the machine. Turn Valve to the off position and lock out.	Use a Ball valve lockout device.	Verify pressure has bled off.
3 Water W-1 Hot Water Supply	The W-1 Butterfly Valve Lockout is located on the East side of the machine. Turn the valve to the closed position and lock out.	Use a Lock and hasp device.	Verify pressure has bled off.
4 Water W-2 Hot Water Return	The W-2 Butterfly Valve Lockout is located on the East side of the machine. Turn the valve to the closed position and lock out.	Use a Lock and hasp device.	Verify pressure has bled off.

Energy Isolation

Step-Action-Info-Verification

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Types Of Machines

Press Types
Drives

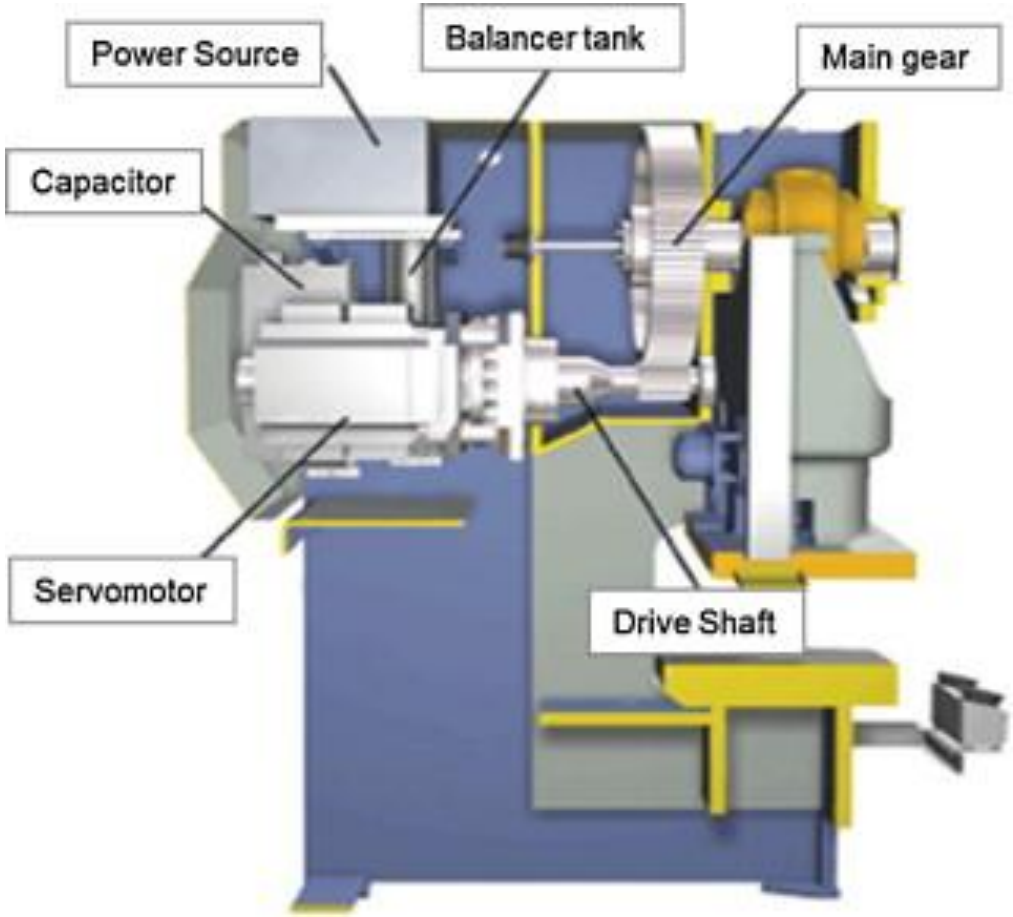
Hydraulic press

Servo Press

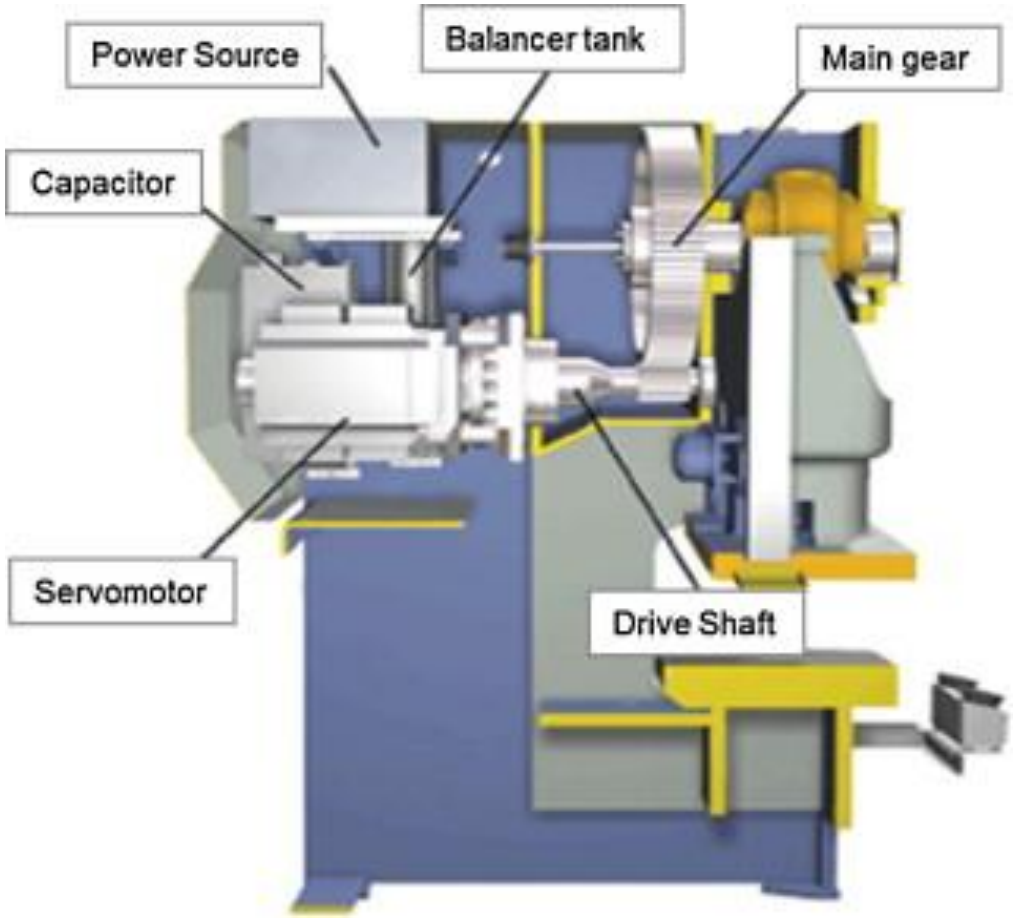
Conventional Press

Locking Out Servo

Loose Holding Torque From Servo Motor



Press Types
Servo Press



Servo Press

Safety

Motor provides the braking mechanism

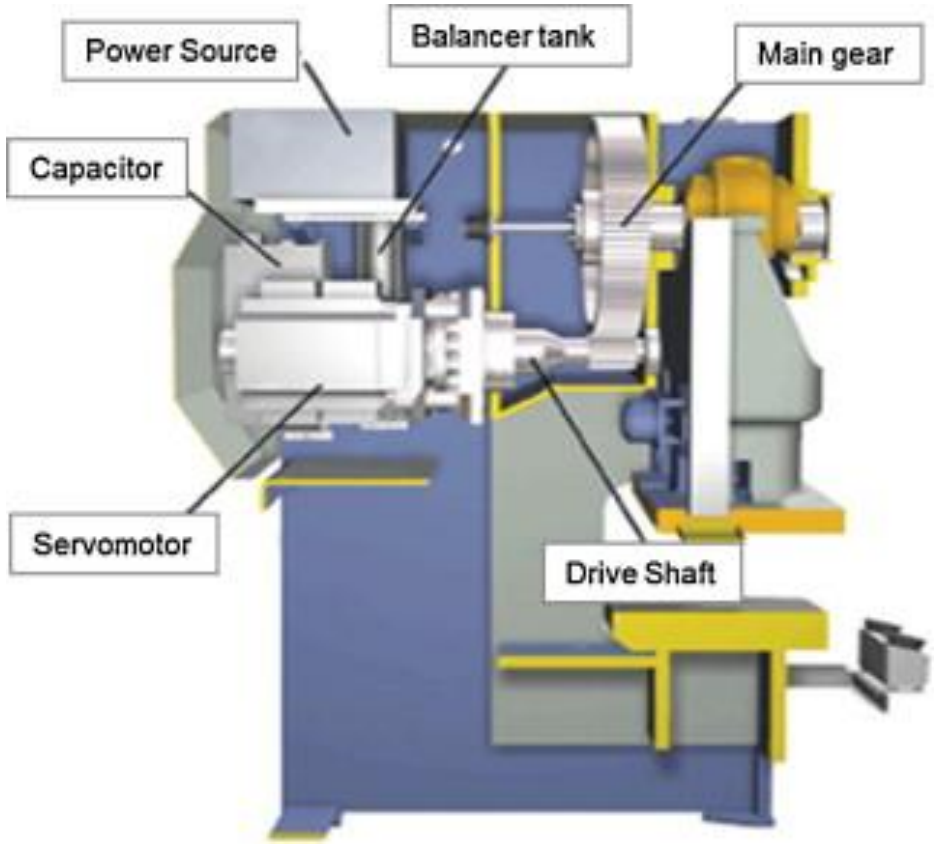
Not wear item, failure mode

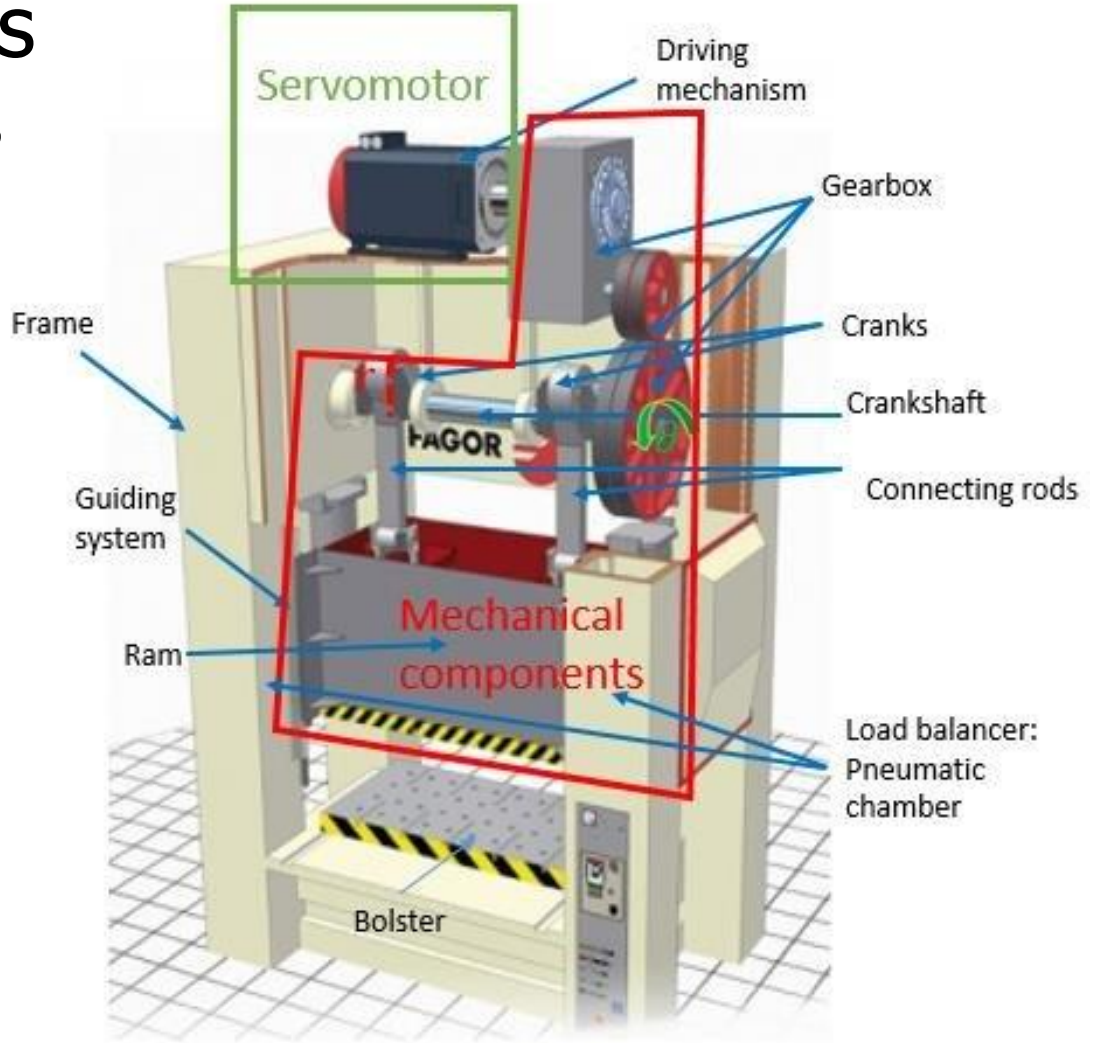
What if you have no power?

Secondary Brake or
Slide Lock

Servo motors stop and hold their position using a combination of closed-loop control, feedback mechanisms, and PWM (Pulse Width Modulation) techniques. They constantly adjust their power to maintain the desired position, even when external forces are applied.

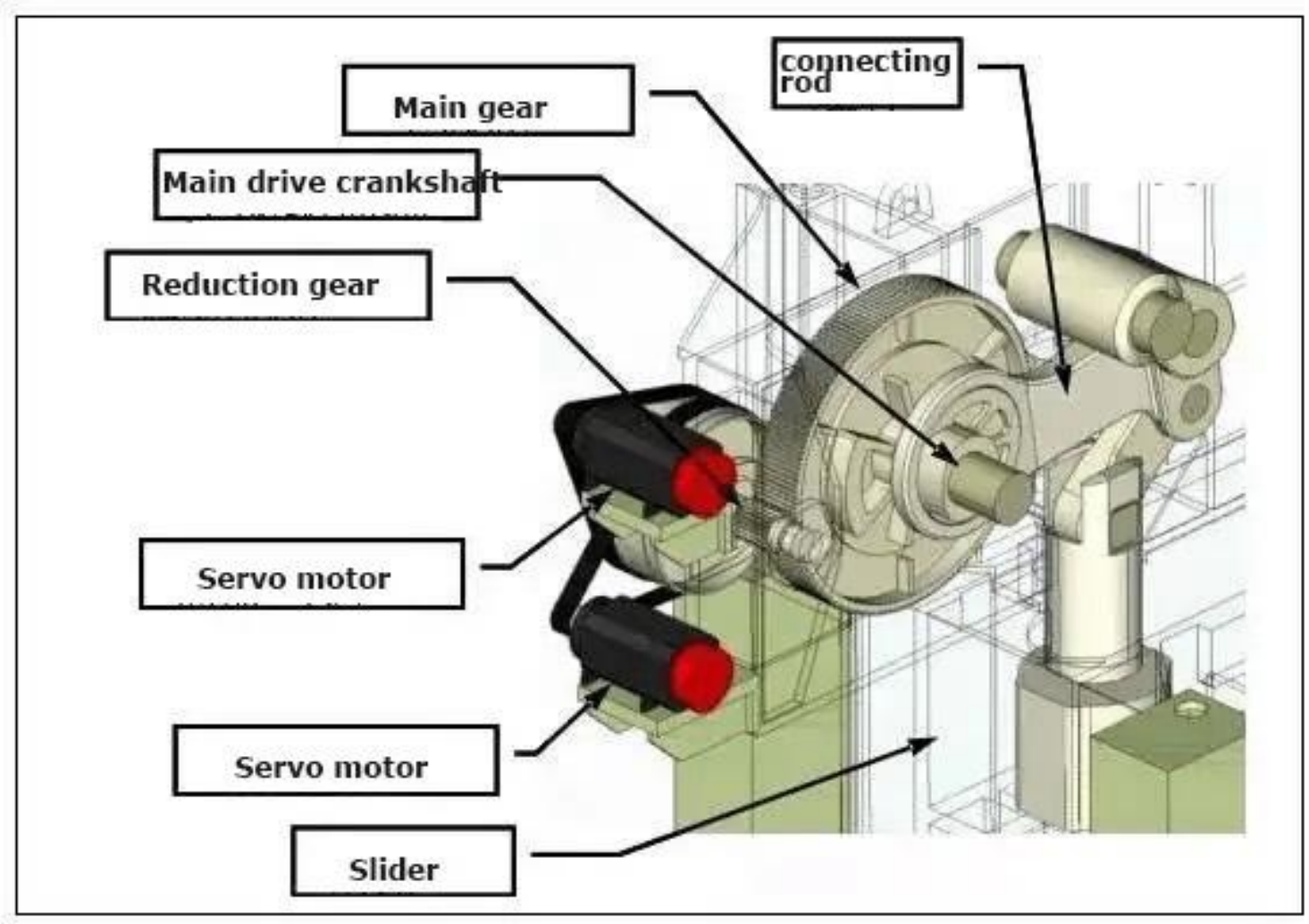
Press Types
Servo Press



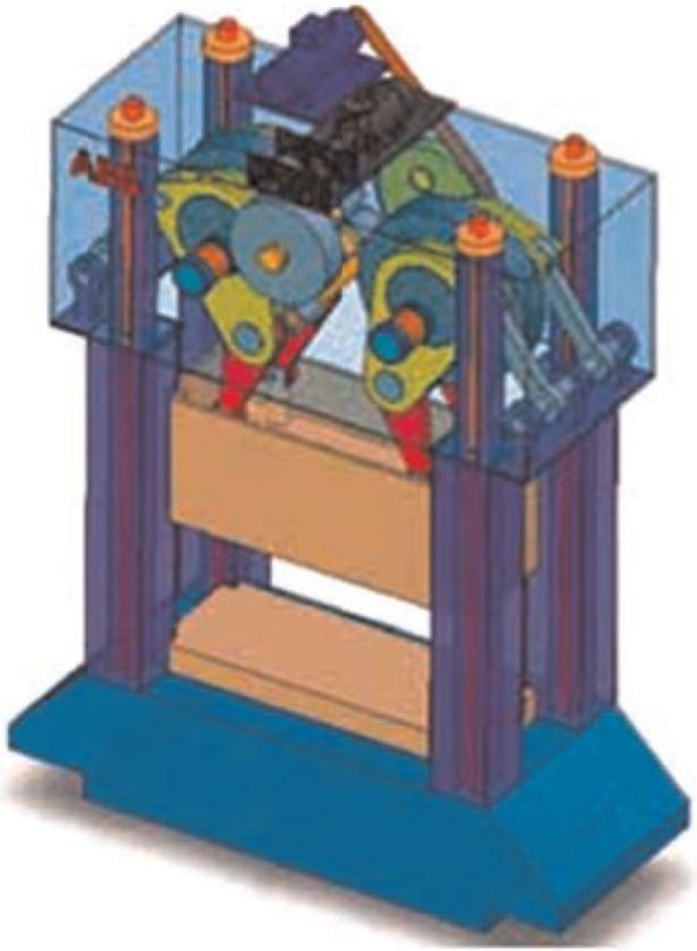


Servo Press

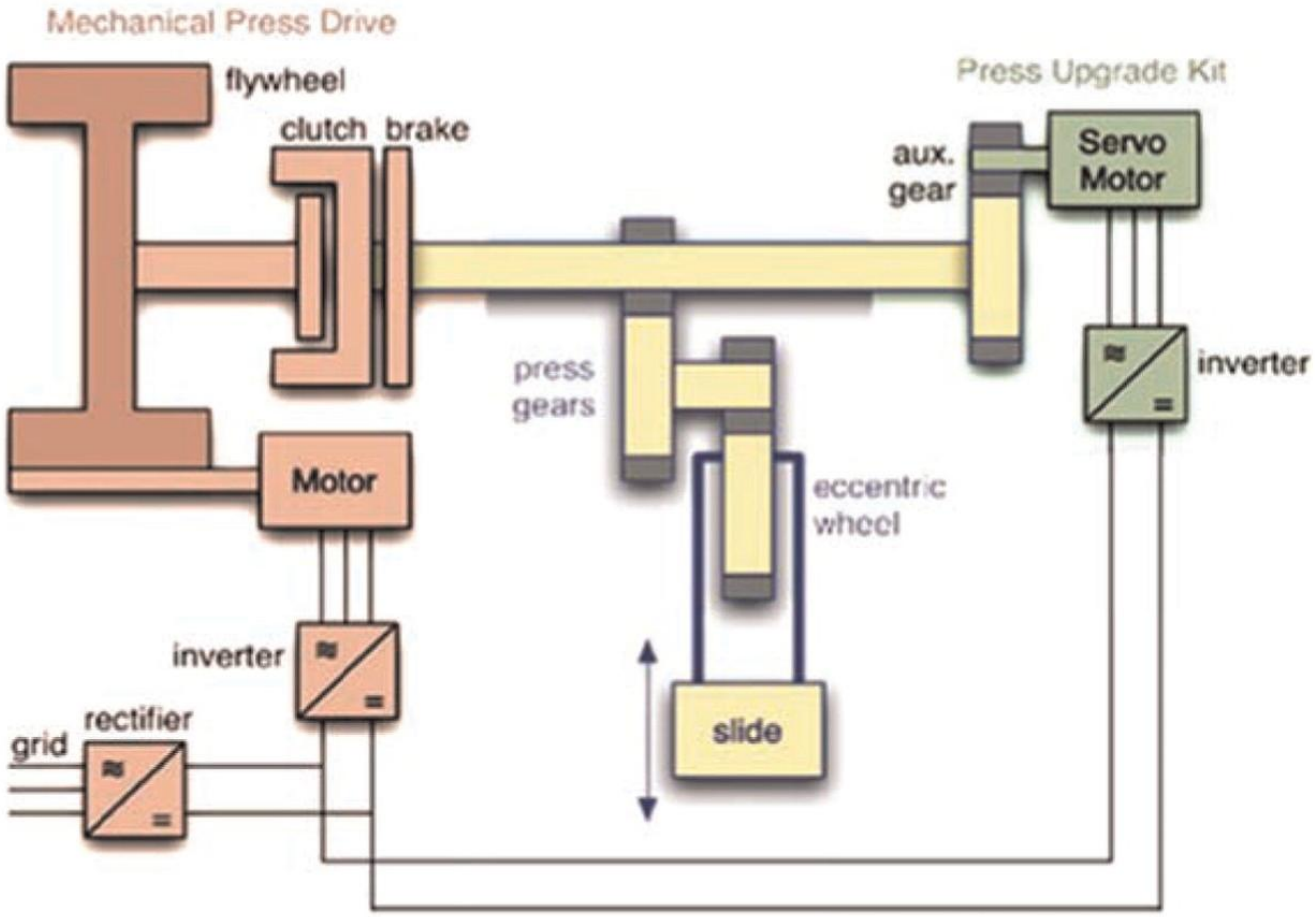
Press Types
Servo Press



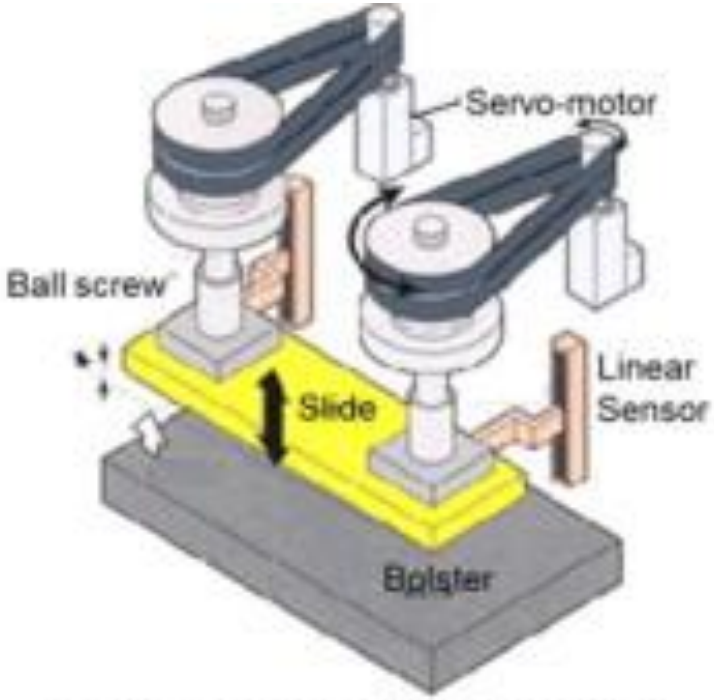
Press Types
Servo Press



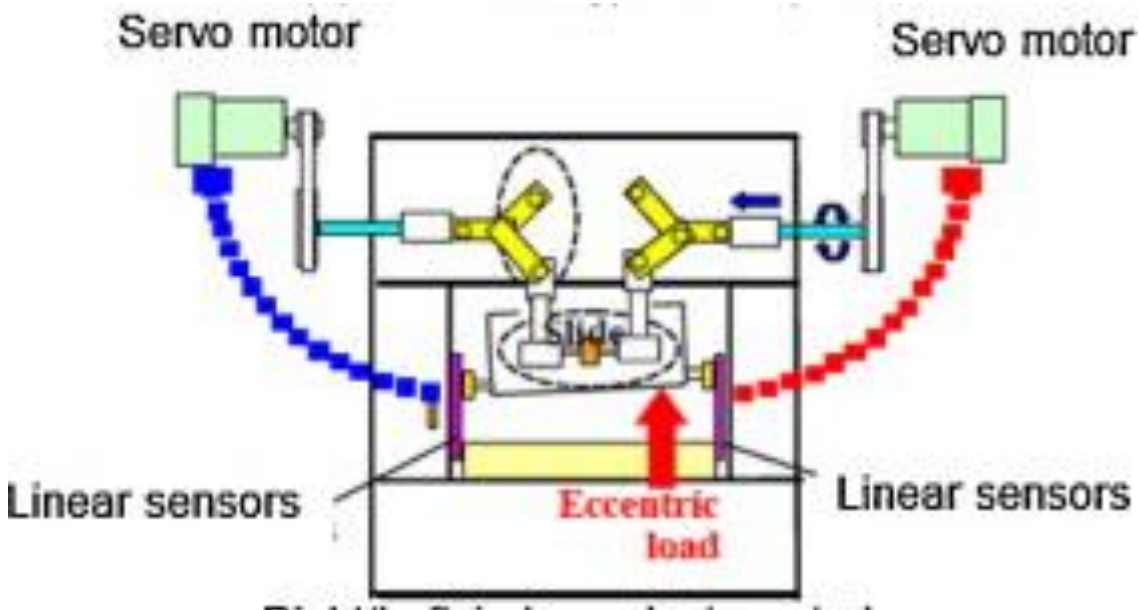
Servo Press



Press Types
Servo Press



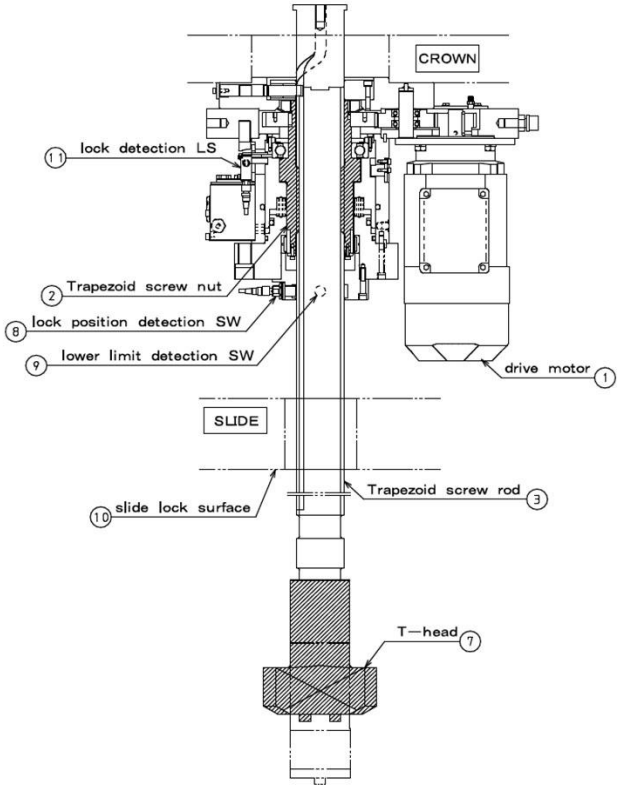
(a) Ball screw type servo press



(b) Ball screw and knucle-joint type servo press

Servo Press

Slide Lock



Locking Out Hydraulic

Loose Holding / Counterbalance Pressure,

Internal Leakage and Drift allow the Slide To Drift Down

Counterbalance Valve Failure

Press Types
Hydraulic Press

Hydraulic Press
Single Cylinder / Platten or 4 Post

Press Types
Hydraulic Press

Hydraulic Press

<u>Safety</u>

Hydraulic Pump Provides Drive

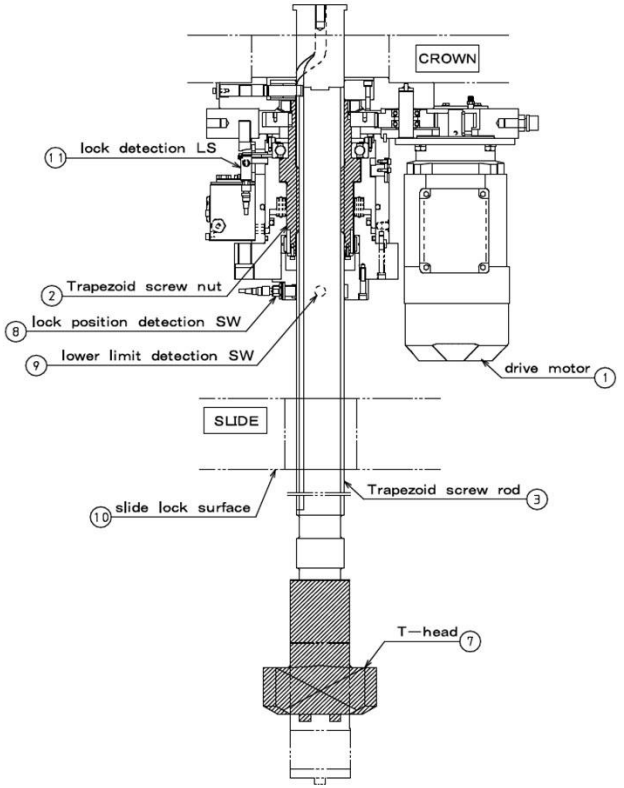
Not wear item, failure mode

What if you have no power?

Slide Lock

Blocked Up, must have power to move up off block

Slide Lock



Locking Out Conventional

Brake Failure

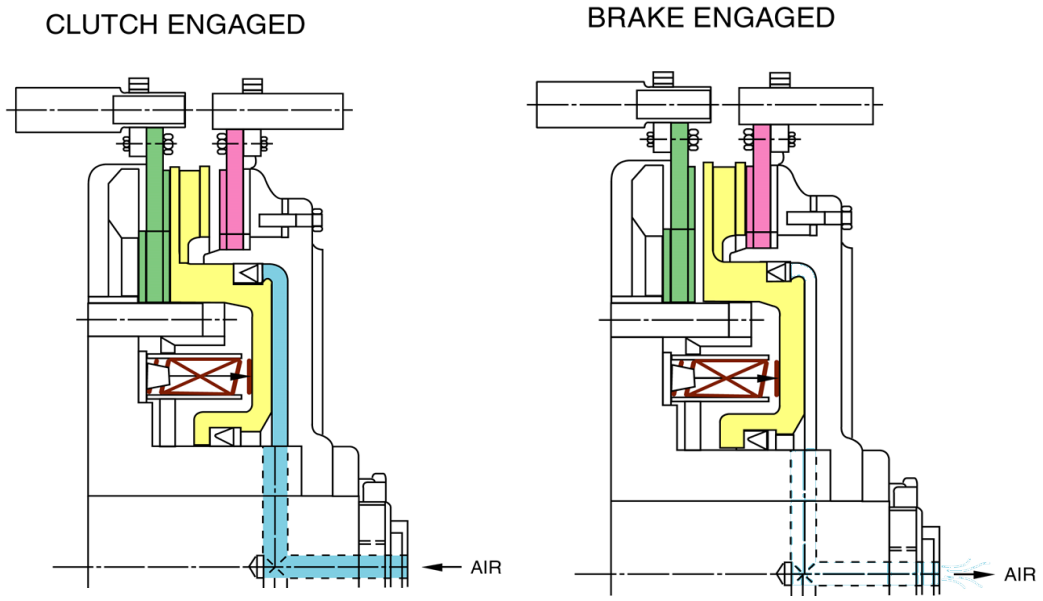
Connection Failure

Flywheel Locks Down

Press Types
Conventional Press

Conventional Press

Press Types
Conventional Press



Conventional Press

<u>Safety</u>

Flywheel Stores Energy

Is a wear item, stopping time changes

What if you have no power?

Brake Applied Flywheel Still Spins Down

Slide Lock Optional

Press Types
Conventional Press - Full Revolution

Full Revolution

Press Types
Conventional Press - Full Revolution

Full Revolution

Safety

Engagement Teeth
Drag Brake, Detent Brake Pullout Pin

Manual Engagement, Power Operated Option

Clicking When Not At The Top

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Safe Operation Production Mode

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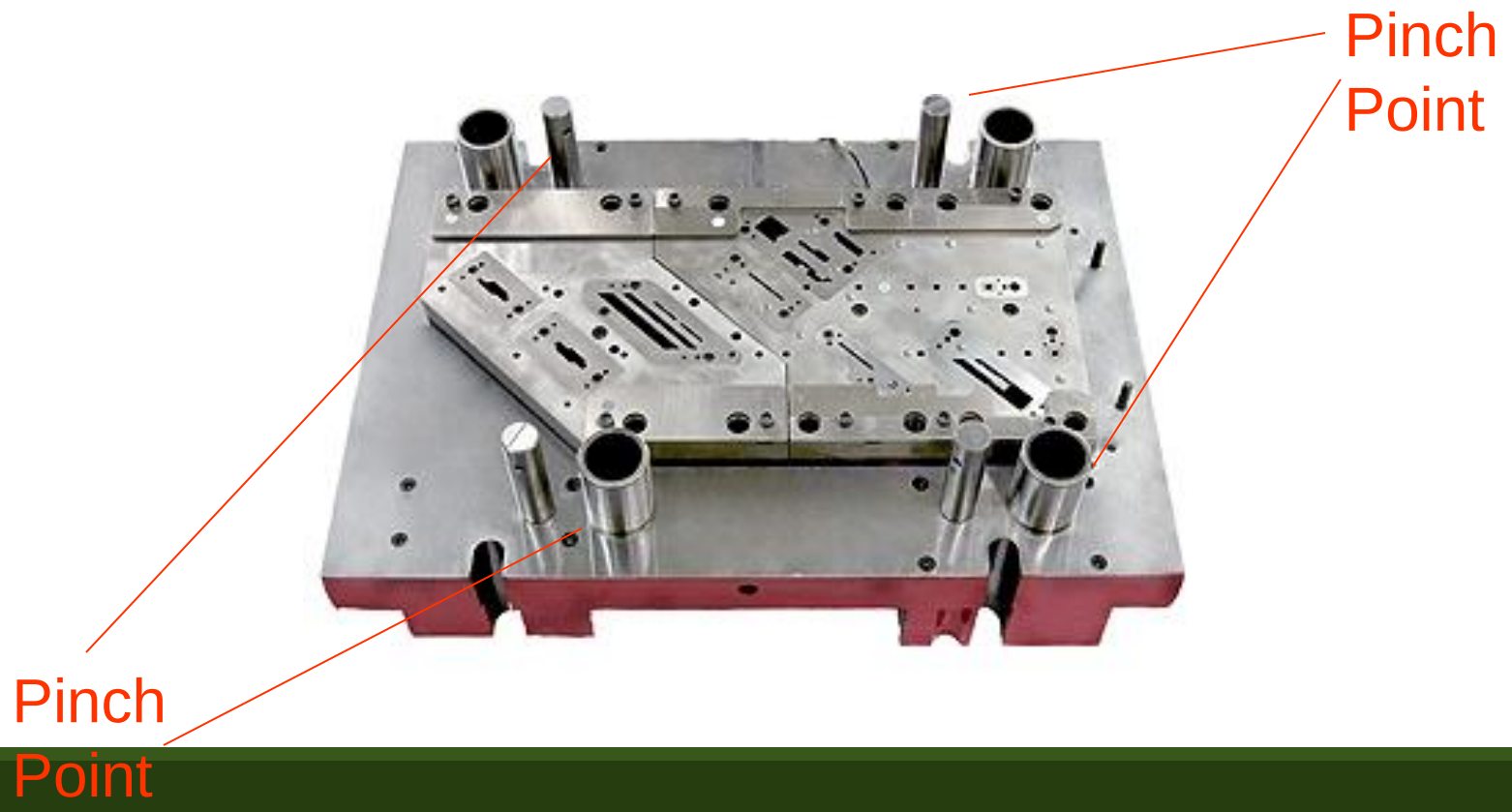
POINT OF OPERATION

- Guide Posts Can Be Pinch Points If The Separation Is Large Enough
- Stop Blocks



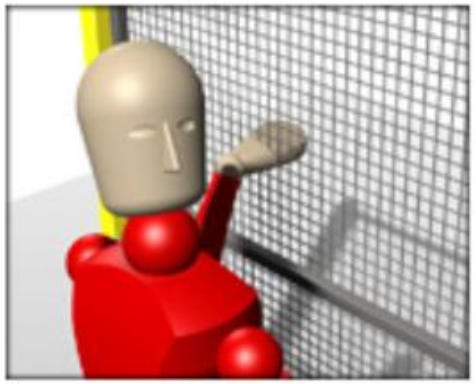
Fixed Guard
Full Revolution

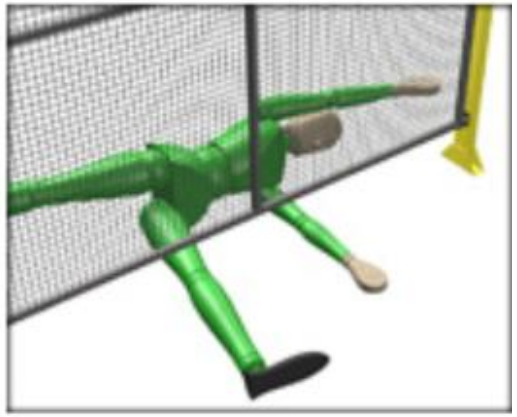
Fixed Guard
Service Removable

Gates
Type A B

Type A / B Gate
Opens in the Up Stroke
Opens at the Top Stroke

Guarding- OUTA



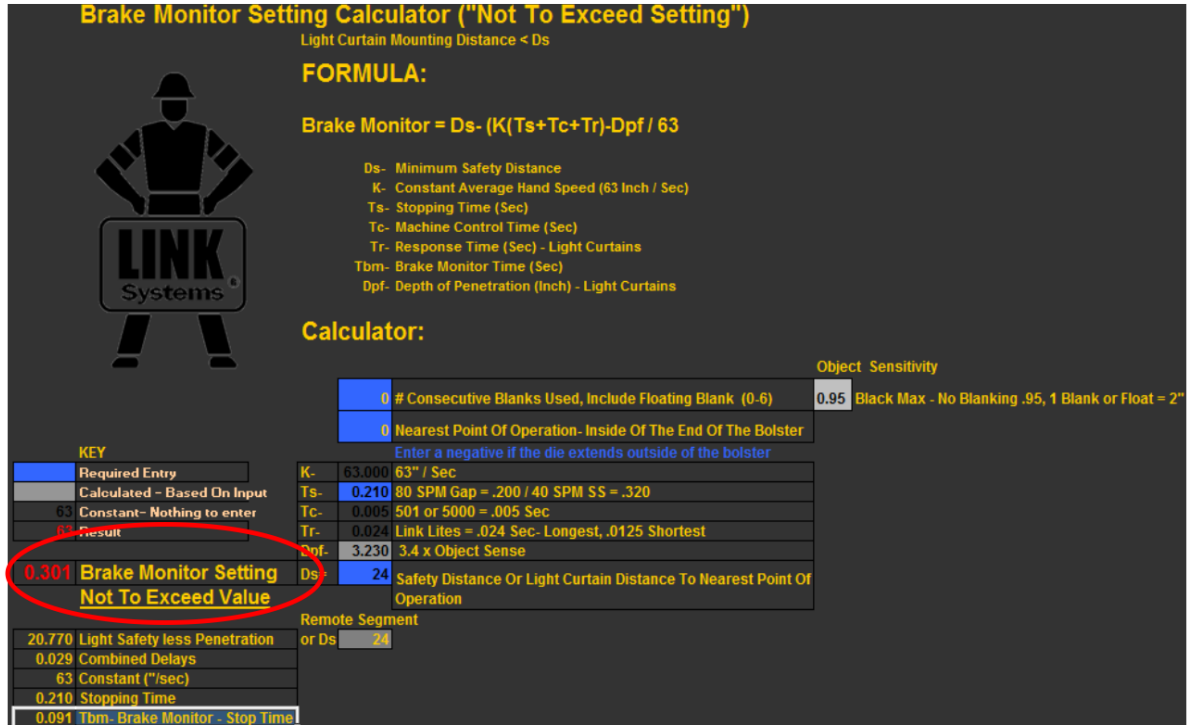


Stay “OUTA” the hazard
Over
Under
Through
Around

Safety

Safety Distance

Maximum Brake Monitor



OSHA Formula

Ds= K * Ts

Ds- Minimum Safety Distance
K- Constant Average Hand Speed (63 Inch / Sec)
Ts-Stopping Time (Sec)

ANSI Formula

Ds= K (Ts + Tc + Tr + Tbm) + Dpf

Ds- Minimum Safety Distance
K- Constant Average Hand Speed (63 Inch / Sec)
Ts-Stopping Time (Sec)
Tc-Machine Control Time (Sec)
Tr-Response Time (Sec) - Light Curtains
Tbm-Brake Monitor Setting Less Ts (Sec)
Dpf-Depth of Penetration (Inch) - Light Curtains

- **More Comprehensive Than OSHA**

16 mS =1”

In Both Formulas 16mS increase in stopping time will require 1” of added safety distance

Also a reduction of 16mS is an improvement of 1”

Distance	6	8	10	12	14	16	18
Max Ts	0.095	0.127	0.159	0.190	0.222	0.254	0.286
Distance	20	22	24	26	28	30	32
Max Ts	0.317	0.349	0.381	0.413	0.444	0.476	0.508

Light Curtain Protection

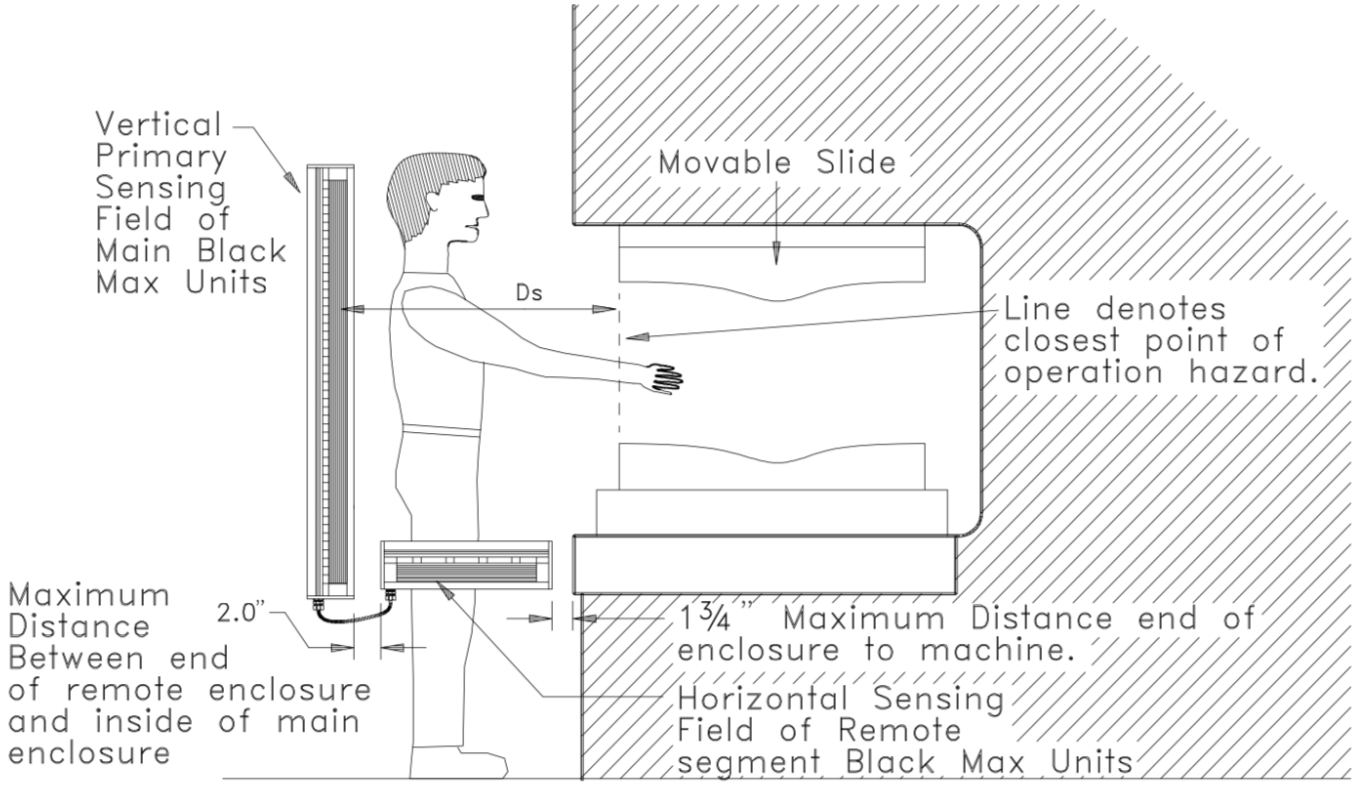


Figure 3.6: Horizontally mounted remote segment Black Max units to detect a person inside the main sensing field.

Light Curtains

Vertical Light Safety Distance Horizontal Or Remote Segment Prevents An Operator From Standing Between The Light And The Hazard

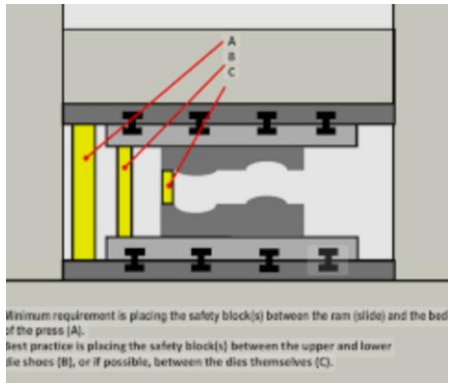
LOTO
Question?

-Integral to production, production mode, (SS, Cont,) making parts?
-Maintenance, Service, Adjustment

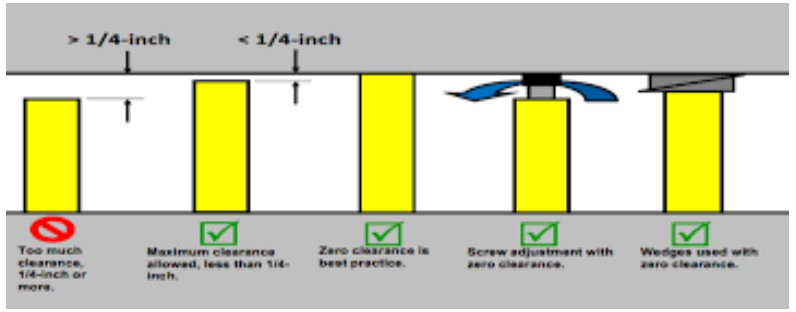
Lockout/Tagout is required when the unexpected energization or start up (or release of stored energy) of machines, equipment or prime movers could injure workers during cleaning, repairing, servicing, setting-up, adjusting and un-jamming.

Exposure Assessment

LOTO



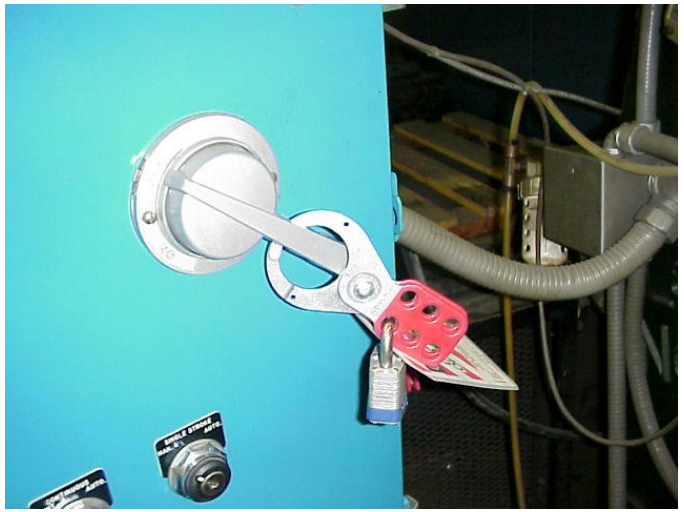
Minimum requirement is placing the safety block(s) between the ram (slide) and the bed of the press (A).
Best practice is placing the safety block(s) between the upper and lower die shoes (B), or if possible, between the dies themselves (C).

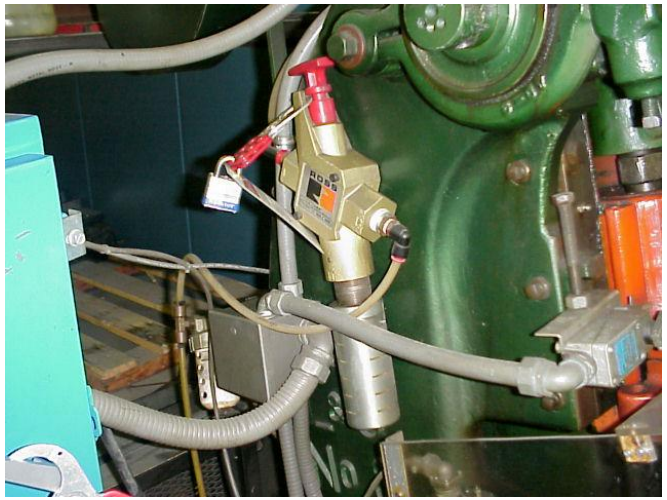


Die Block

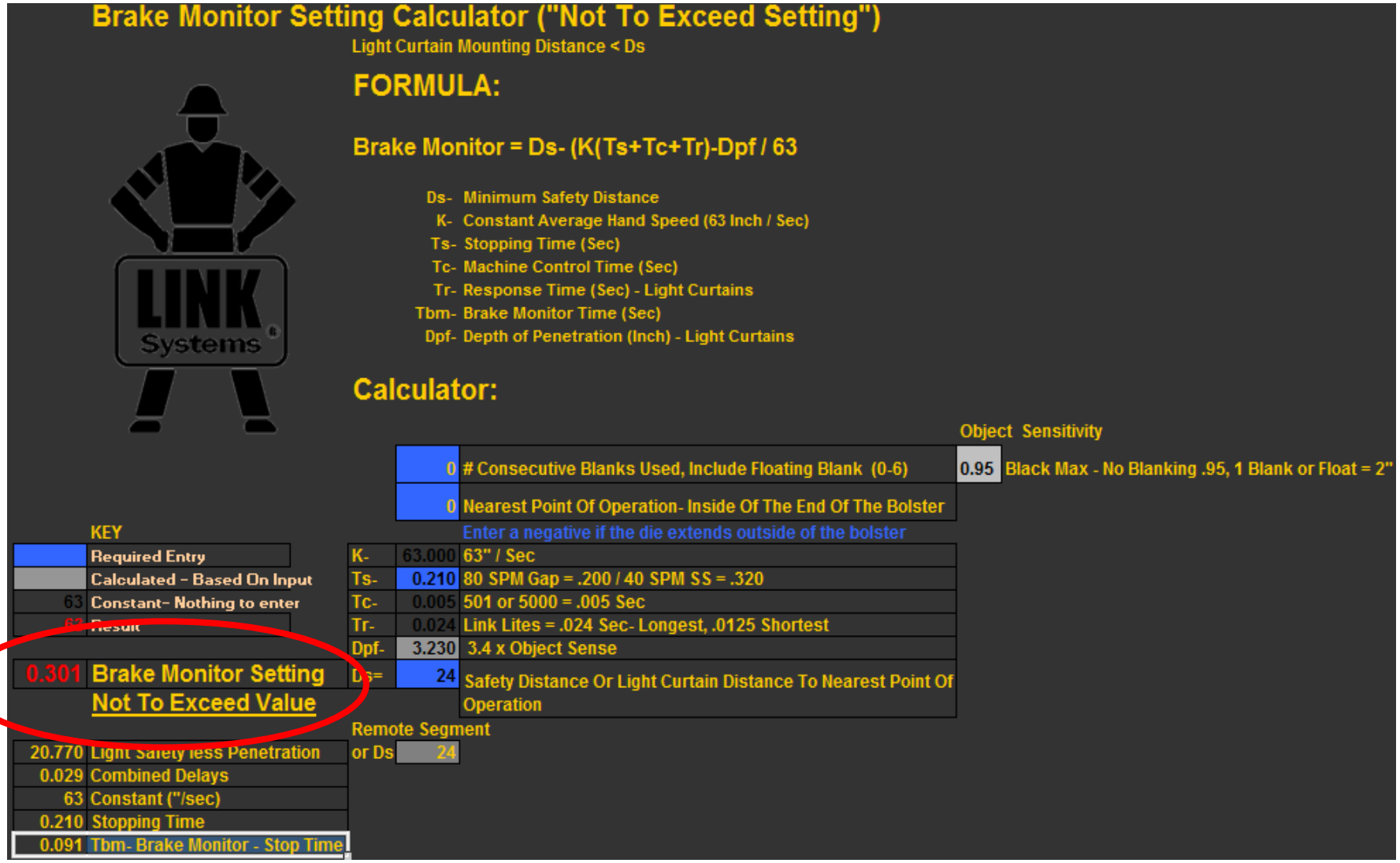
Energy Isolation

Lock Out Devices



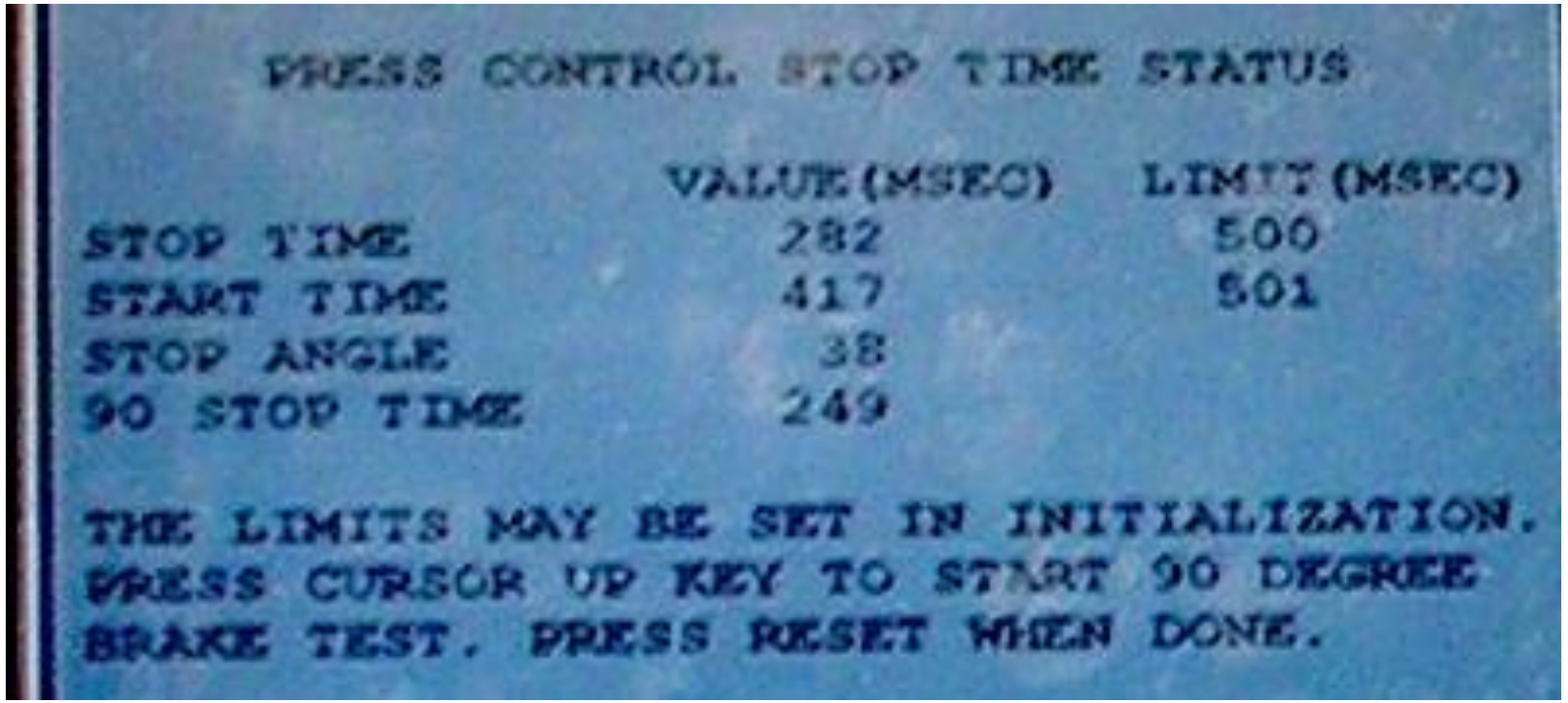


Maximum Brake Monitor

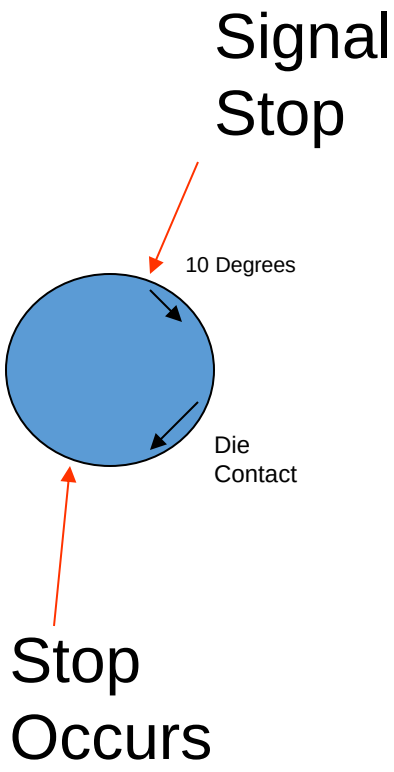


Clutch & Brake Monitor

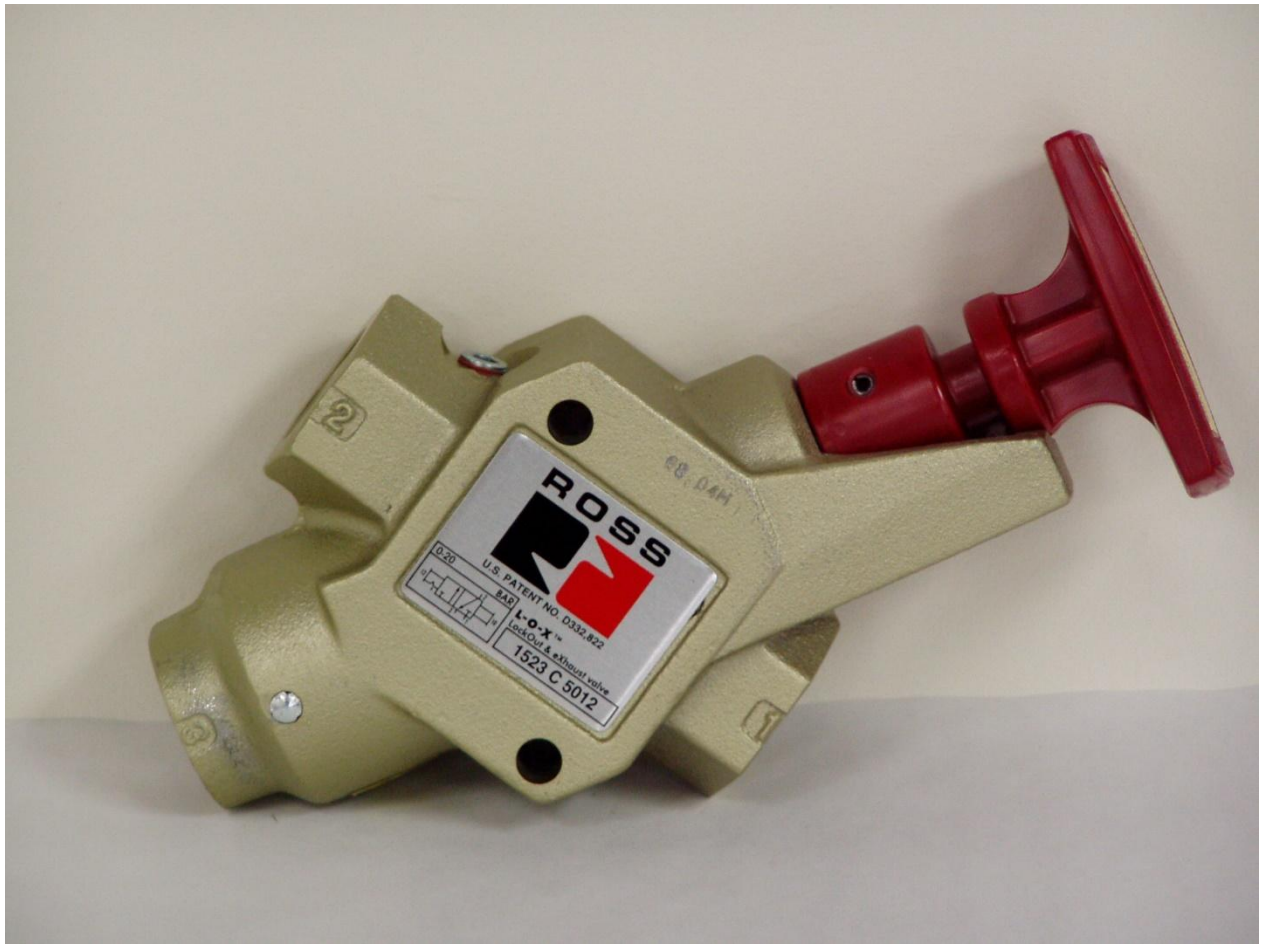
Brake Monitor Limits Set The Safety Distance



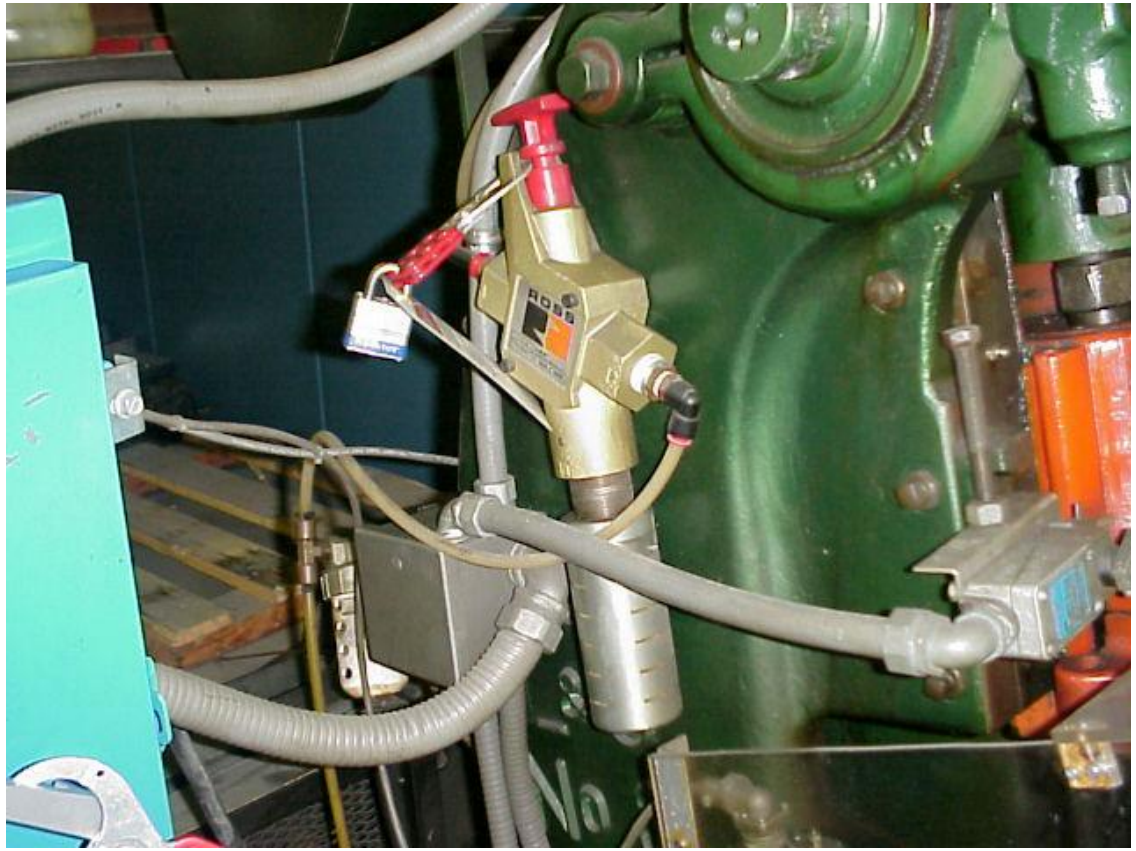
STOP SIGNALS



Danger Areas



LOTO
Counterbalance

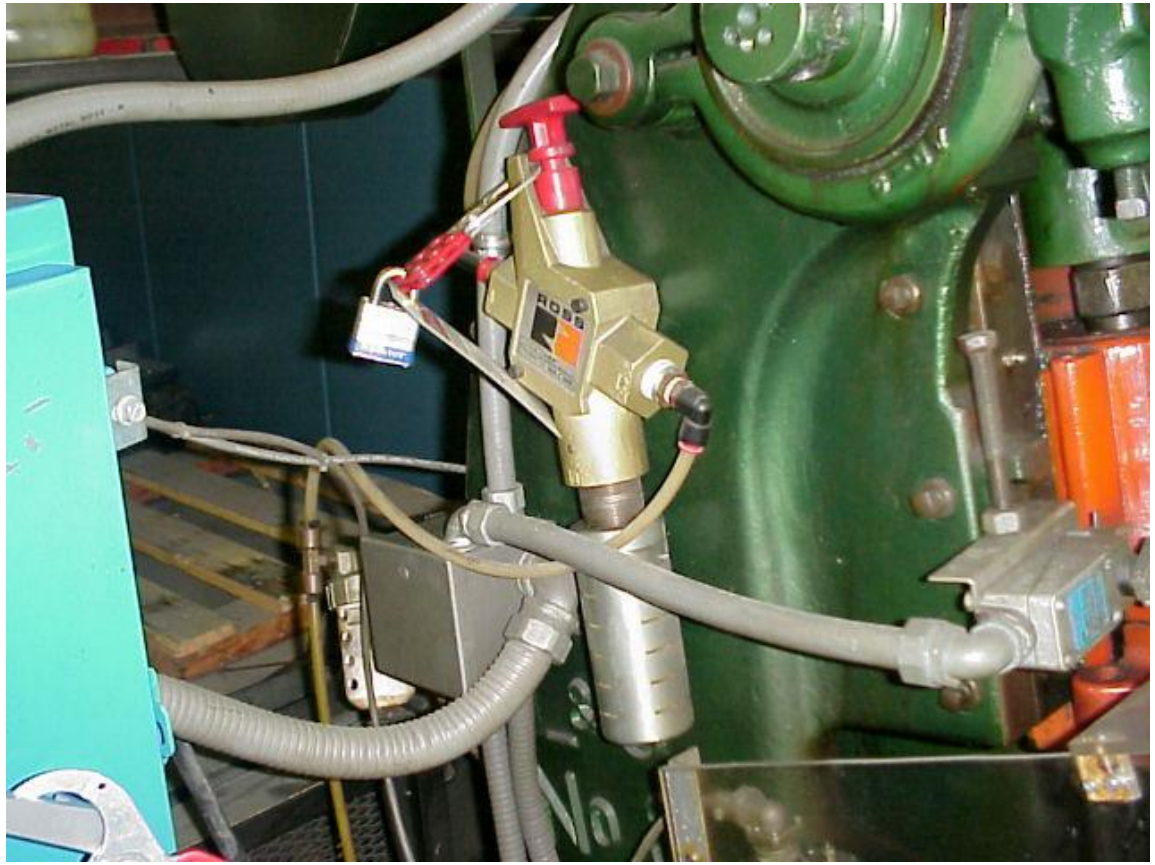


<u>Air Counterbalance</u>

Provides supportive energy that keeps the slide balanced and up

Don’t lock out unless you are working on the counterbalance

LOTO
Cushion



Air Cushion

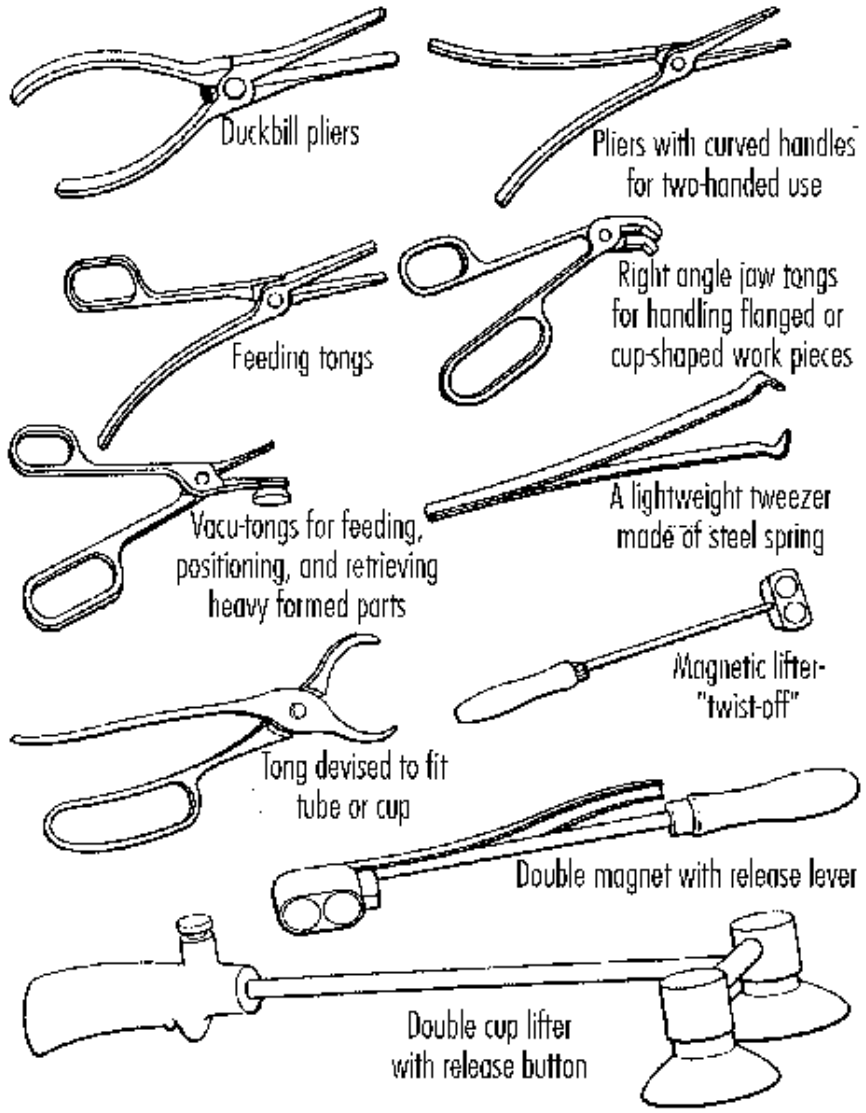
May need to be locked out also if the pins extend or press up through the die creating a secondary hazard

Tongs

Accessories

Soft material

Keeps hands out of dies



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Energy Isolation

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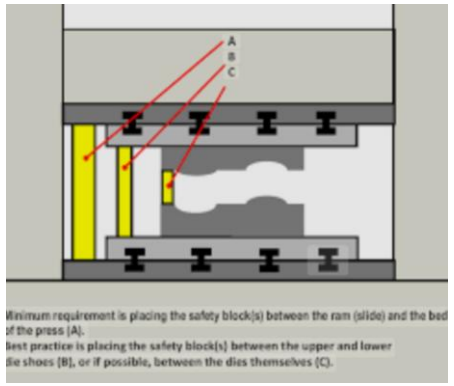
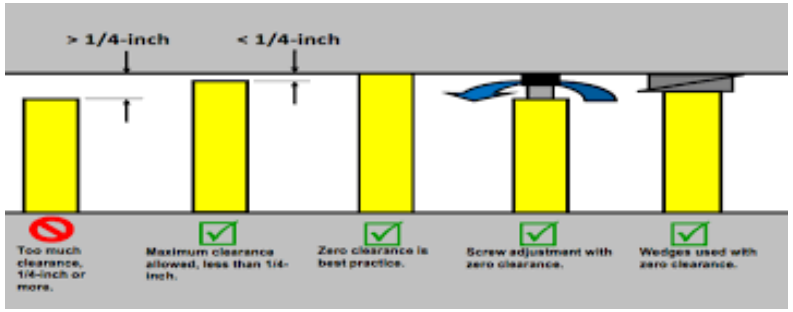
Exposure Assessment

LOTO



Minimum requirement is placing the safety block(s) between the ram (slide) and the bed of the press (A).
Best practice is placing the safety block(s) between the upper and lower die shoes (B), or if possible, between the dies themselves (C).



Die Block

Energy Isolation

Procedures

Posted Procedure

BRADY Lockout/Tagout Posted Procedure

ID#: 5879	Facility: Brady Good Hope - Production	Location: Boiler Room	
Created: 7/6/2018			
Revised: 7/6/2018	Description: Boiler #1		

4 Lockout Points

Note: This machine is capable of generating extremely high temperatures. Allow it to return to room temperature before proceeding.Confined Space. Authorized personnel only. Permits are required before entering. Follow all Confined Space procedures.Piping systems can store energy hydraulically. Ensure pressures are isolated and/or have been relieved before proceeding.

MCC 3 Column 3 Bucket A | EAST VIEW | NORTH VIEW

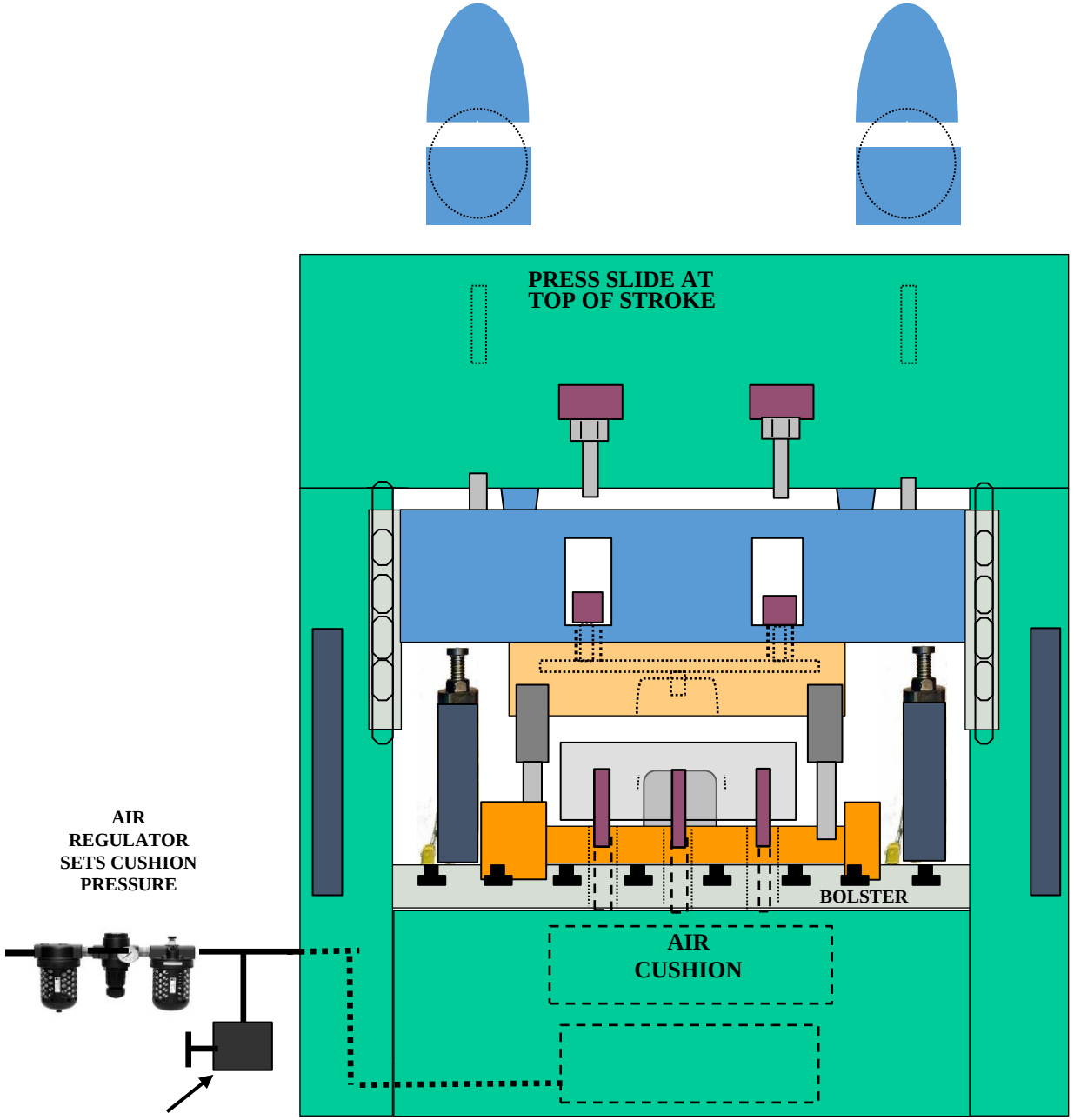
Lockout Steps

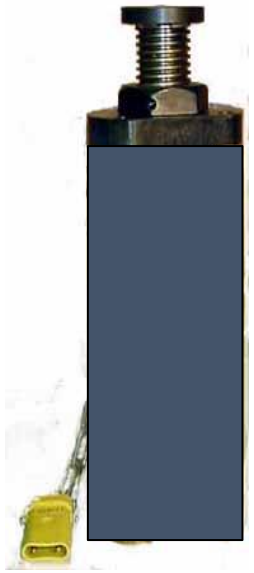
Step #	Action	Info	Verification
1 Electrical E-1 480V	The E-1 Disconnect is located on the East side of the machine on the MCC panel Column 3 bucket A. . Turn Disconnect to the off position and lock out.	Use a Lock and hasp device.	Attempt to restart at control panel.
2 Gas G-1 Natural Gas	The G-1 Ball Valve is located on the East side of the machine. Turn Valve to the off position and lock out.	Use a Ball valve lockout device.	Verify pressure has bled off.
3 Water W-1 Hot Water Supply	The W-1 Butterfly Valve Lockout is located on the East side of the machine. Turn the valve to the closed position and lock out.	Use a Lock and hasp device.	Verify pressure has bled off.
4 Water W-2 Hot Water Return	The W-2 Butterfly Valve Lockout is located on the East side of the machine. Turn the valve to the closed position and lock out.	Use a Lock and hasp device.	Verify pressure has bled off.

Energy Isolation

Step-Action-Info-Verification

SAFETY BLOCKS – A MISUNDERSTOOD CONCEPT





SAFETY BLOCKS – A MISUNDERSTOOD CONCEPT

OSHA 29 CFR 1910.217(d)(9) HAS THE TITLE "DIESETTING". SUBCLAUSE (iv) of (d)(9) ADDRESSES SAFETY BLOCKS.

"(iv) The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press."

SOURCE STANDARDS FOR OSHA 1910.217 STANDARDS WERE THE ANSI B11.1-1971 MECHANICAL POWER PRESS STANDARDS. LATER VERSIONS OF B11.1 HAVE CLARIFIED WHEN SAFETY BLOCKS HAVE TO BE USED BY REMOVING THE SAFETY BLOCK REQUIREMENT FROM THE DIE SETTING SUBCLAUSE AND PLACING IT UNDER A SEPARATE SUBCLAUSE ENTITLED "DIE ADJUSTMENT, CLEANING, OR REPAIR." THEY ALSO REQUIRED INTERLOCKING OF SAFETY BLOCKS WITH PRESS CONTROLS SO THAT, WHEN IN USE, THEY DEACTIVATE DRIVE MOTOR AND CLUTCH/BRAKE CIRCUITS.

ANSI B11.1-2001 STANDARDS RELATED TO SAFETY BLOCKS ARE AS FOLLOWS

9.2.6 Die adjustment, cleaning or repair "When it is necessary to place hands or other body parts into the point of operation for repair with the die(s) in the press or adjustment and cleaning which is not integral to the production process, means shall be provided to prevent the initiation of hazardous movements. To meet this requirement, the following procedures shall be followed:

1) The press drive motor shall be off and the clutch/brake control or trip control system shall be deactivated.
2) Safety blocks or other die/slide support means (e.g., slide locks, chain locks, locking pins) that restrict hazardous motion shall be designed constructed and installed to either:
a) Hold the full working force of the machine and tooling members when machine actuation can take place while the mechanism is in place; or
b)Be interlocked with the machine to prevent actuation of hazardous motion of the machine while in place in its protecting position and be designed and constructed to hold the maximum anticipated load (normally the static weight0 of the movable portion of the machine, its tooling, and attachments.
3)Electrical interlocking of manually installed safety block(s) or other die slide support means shall automatically de-energize the clutch and drive motor circuits when safety blocks are removed from their storage locations.
4) Manually installed safety blocks shall not be utilized until the flywheel has stopped.
5) Slide counterbalance systems shall not be used as a die/slide safety means.

Methods of Risk Reduction for Hazards Associated with Die Changes.

Energy Control.

Energy control methods reduce kinetic energy risks by removing electrical power from drive elements such as motors and control actuators to prevent unintended and unexpected (and therefore hazardous) motion of the press slide or other press components. Energy control can also address potential energy that is hazardous to an activity, such as eliminating fluid pressures or inserting props to block potential energy of objects from descending and causing crushing injuries.

Safeguarding. **The use of safeguarding devices that protect operators in production operations can be an important part of reducing risk for die setters. Some die setting activities, such as moving the slide of the press to different positions required for a die change, and shut height adjustment on presses with motorized shut height adjustment cannot be performed without energy available. For part revolution presses, properly applied light curtain presence sensing devices that detect die setters at all positions outside the press bed and prevent the stroking in the die closing portion of the stroke are to be preferred if active in all modes, including the Inch mode used by die setters.**

PRELIMINARY STEPS THAT MAY BE REQUIRED BEFORE DIE REMOVAL

- **FOR COIL FED PRESSES (ILLUSTRATION NEXT PAGE) SOME PRELIMINARY TASKS ARE:**
  - **POWER ON TASKS (MODE SELECTOR IN INCH):**
    1.TAILOUT OF END OF COIL. MANUALLY ADVANCE MATERIAL IN DIE AFTER END LEAVES FEED AND STROKE THE PRESS, REPETITIVELY IF REQUIRED, TO SHORTEN THE REMNANT OF MATERIAL. HAZARD -- CLOSING OF DIE POINT OF OPERATION UNDER POWER. RISK REDUCTION MUST BE BY SAFEGUARDING AND SAFE PROCEDURE – LIGHT CURTAINS, USE OF INCH BUTTONS, USE OF SAFE POSITION FOR MULTIPLE DIE SETTERS.
  - **ENERGY CONTROL TASKS (MODE SELECTOR IN OFF POSITION) SLIDE AT TOP OF STROKE:**
    1. USE TONGS, SHEARS AND OTHER TOOLS TO REMOVE REMAINING MATERIAL IN OPEN DIES. HAZARDS – POINT OF QPERATION AND SHATTERING OF TOOLS IN DIES IF PRESS STROKES. RISK REDUCTION BY ENERGY CONTROL TO PREVENT SLIDE MOVEMENT.

    2. REMOVE ANY PARTS AND SCRAP IN THE DIE (OSHA 1910.217(d)(1)(ii) REQUIRES ANY STUCK PARTS OR SCRAP TO BE REMOVED WITH THE USE OF TOOLS). HAZARDS – POINT OF QPERATION AND SHATTERING OF TOOLS (IF USED) IN DIES IF PRESS STROKES. RISK REDUCTION BY ENERGY CONTROL AND SAFEGUARDING SUCH AS LIGHT CURTIAINS TO PREVENT SLIDE MOVEMENT.

3. CLEAN DIES, IF REQUIRED AS PART OF REMOVAL PROCEDURE. ANSI B11.1-2001 9.2.6 REQUIRES THE USE OF A SAFETY BLOCK WHEN DIE CLEANING WHICH IS NOT INTEGRAL TO THE PRODUCTION PROCESS, AND WHICH INVOLVES THE USE OF HANDS OR OTHER BODY PARTS OCCURS IN THE PRESS. HAZARD - POINT OF OPERATION. RISK REDUCTION: ENERGY CONTROL AND SAFETY BLOCK. THE SAFETY BLOCK SHALL NOT BE INSTALLED IN THE PRESS BEFORE THE FLYWHEEL HAS STOPPED.

PRELIMINARY STEPS THAT MAY BE REQUIRED BEFORE DIE REMOVAL

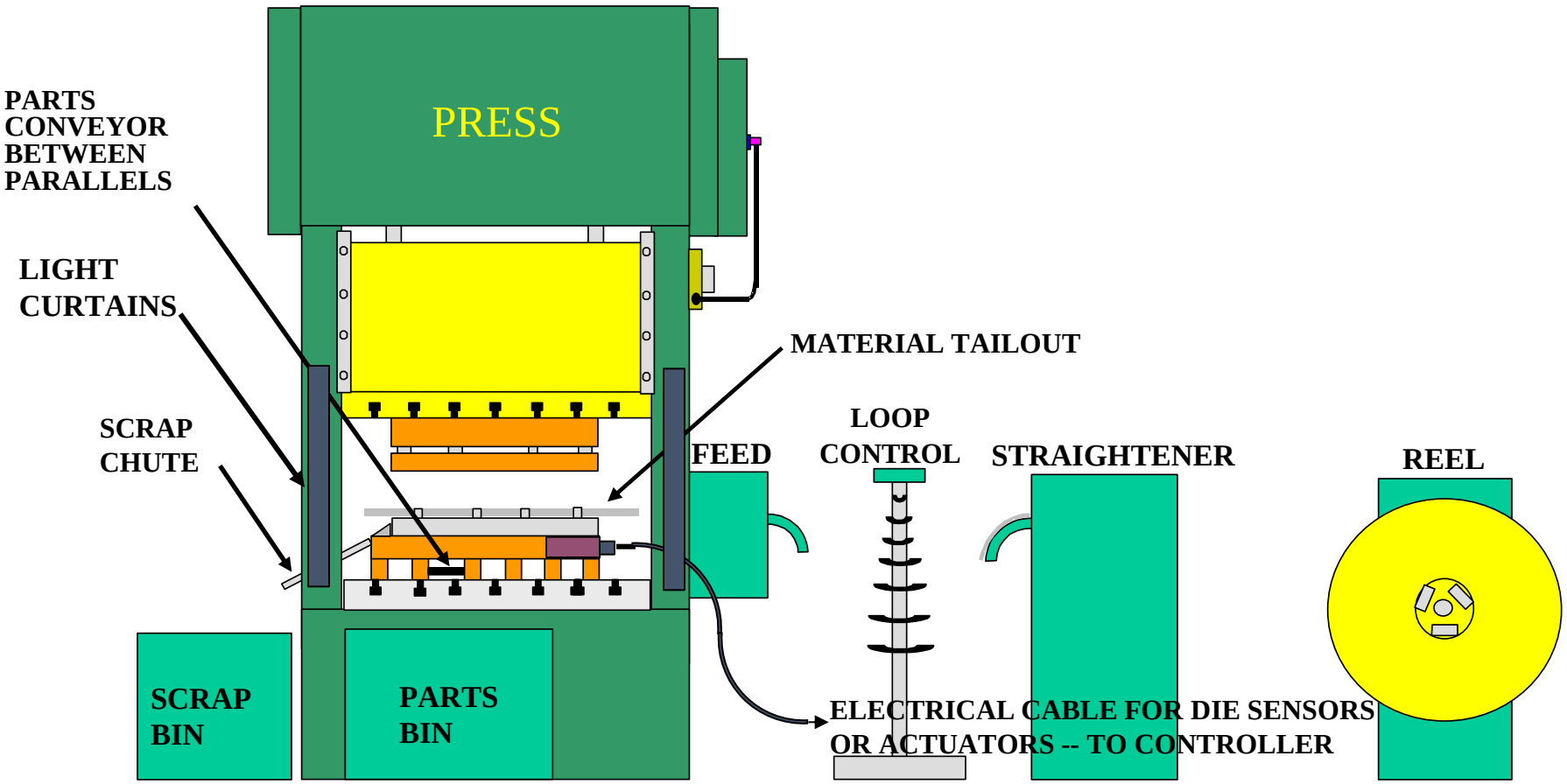
- **FOR MANUALLY FED PRESSES SOME PRELIMINARY TASKS MAY BE:**
  - **ENERGY CONTROL TASKS (MODE SELECTOR IN OFF POSITION) SLIDE AT TOP OF STROKE:**

1. REMOVE ANY PARTS AND SCRAP IN THE DIE (OSHA 1910.217(d)(1)(ii) REQUIRES ANY STUCK PARTS OR SCRAP TO BE REMOVED WITH THE USE OF TOOLS). HAZARDS – POINT OF QPERATION AND SHATTERING OF TOOLS (IF USED) IN DIES IF PRESS STROKES. RISK REDUCTION BY ENERGY CONTROL TO PREVENT SLIDE MOVEMENT.

2. CLEAN DIES, IF REQUIRED AS PART OF REMOVAL PROCEDURE. ANSI B11.1-2001 9.2.6 REQUIRES THE USE OF A SAFETY BLOCK WHEN DIE CLEANING WHICH IS NOT INTEGRAL TO THE PRODUCTION PROCESS, AND WHICH INVOLVES THE USE OF HANDS OR OTHER BODY PARTS OCCURS IN THE PRESS. HAZARD - POINT OF OPERATION. RISK REDUCTION: ENERGY CONTROL AND SAFETY BLOCK. THE SAFETY BLOCK SHALL NOT BE INSTALLED IN THE PRESS BEFORE THE FLYWHEEL HAS STOPPED.

REMOVAL OF DIES

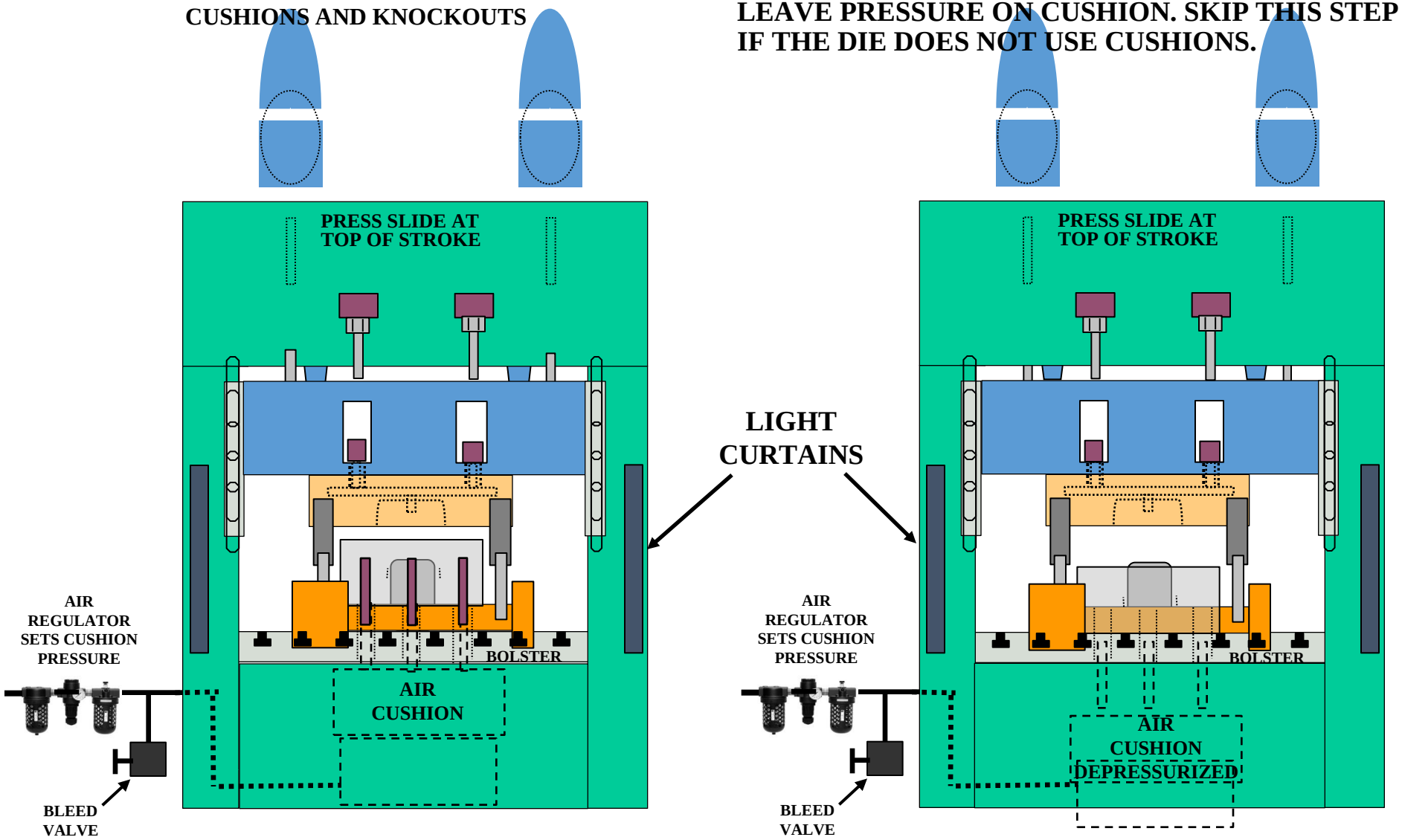
COIL FED CONTINUOUS OPERATIONS



REMOVAL OF DIES

PRESS FINISHED WITH JOB. READY FOR DIES TO BE REMOVED. DIES USING CUSHIONS AND KNOCKOUTS ARE ILLUSTRATED. FOR DIES THAT DON'T USE CUSHIONS OR KNOCKOUTS, OMIT DIE CHANGE PROCEDURES ASSOCIATED WITH CUSHIONS AND KNOCKOUTS

FOR DIES USING CUSHIONS, DEPRESSURIZE THE CUSHION AND LOWER TO ITS HOME POSITION. USE LOCKOUT VALVE TO BLOCK CUSHION PRESSURE SOURCE. EXCEPTION. IF DIE PINS ARE SO SHORT THEY WILL FALL BELOW BOLSTER, LEAVE PRESSURE ON CUSHION. SKIP THIS STEP IF THE DIE DOES NOT USE CUSHIONS.

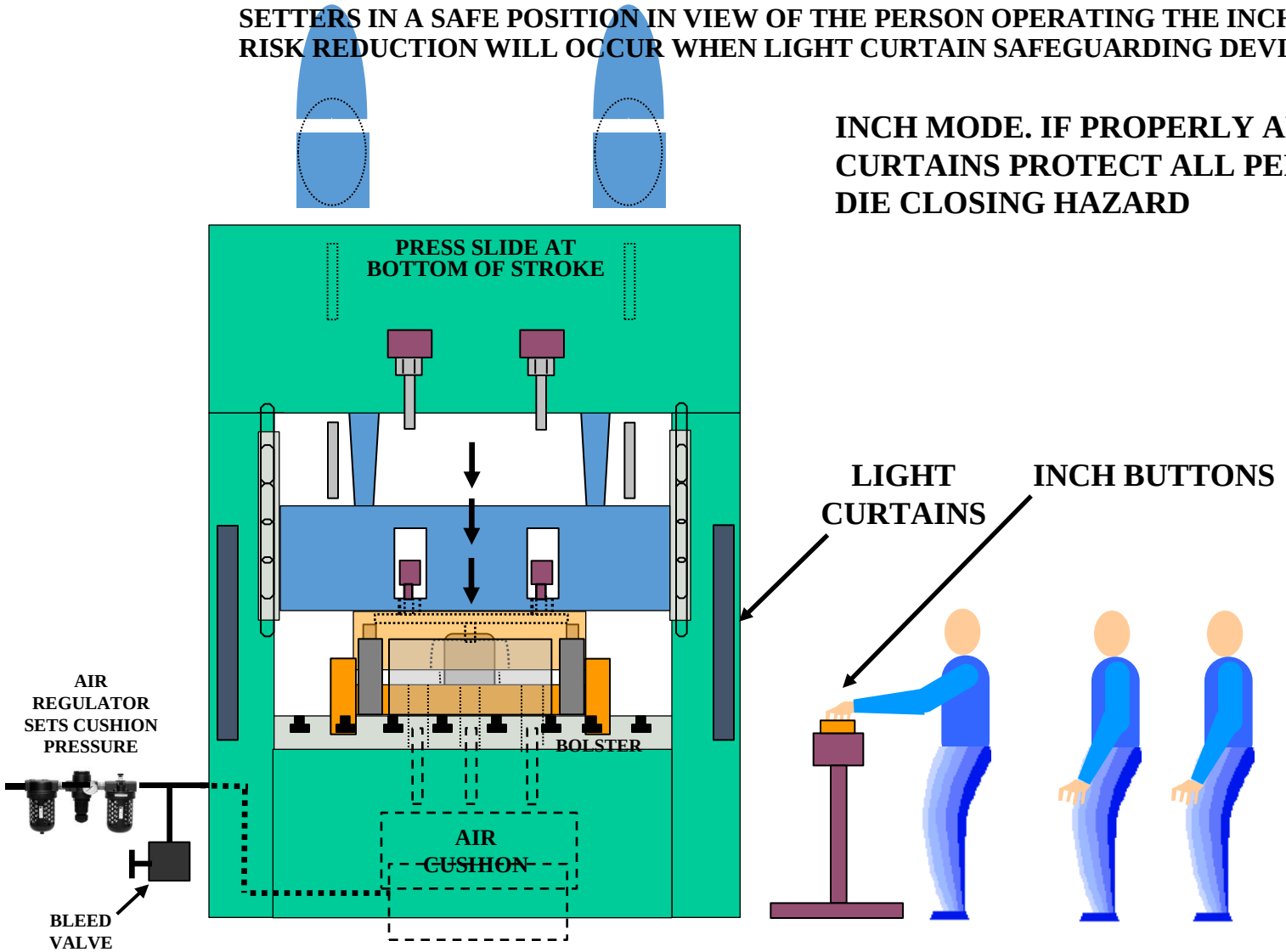


REMOVAL OF DIES

POWER ON TASK: TURN THE MODE SELECTOR TO THE “INCH” POSITION AND THE DRIVE MOTOR ON. USING THE INCH OPERATOR CONTROLS, INCH THE PRESS SLIDE DOWNWARD TILL THE UPPER DIE RESTS ON THE LOWER DIE.

HAZARD: POINT OF OPERATION HAZARD AS THE DIES CLOSE UNDER POWER.

RISK REDUCTION: OPERATOR CONTROLS FOR INCH AND PROCEDURES THAT PLACE MULTIPLE DIE SETTERS IN A SAFE POSITION IN VIEW OF THE PERSON OPERATING THE INCH CONTROLS. GREATER RISK REDUCTION WILL OCCUR WHEN LIGHT CURTAIN SAFEGUARDING DEVICES ARE USED IN THE INCH MODE. IF PROPERLY APPLIED, THE LIGHT CURTAINS PROTECT ALL PERSONNEL FROM THE DIE CLOSING HAZARD

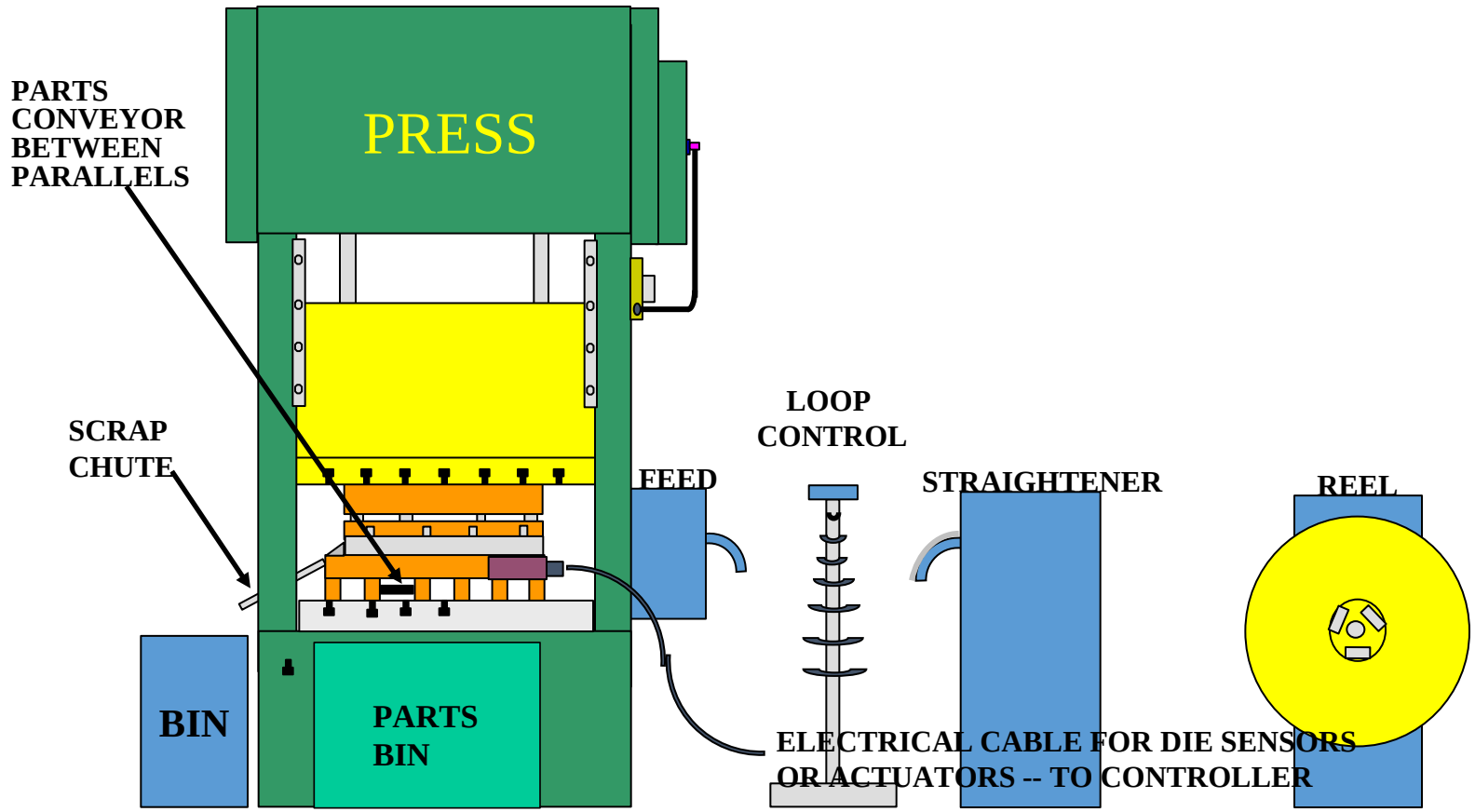


REMOVAL OF DIES

POWER OFF TASK: TURN THE MODE SELECTOR TO OFF AFTER INCHING THE PRESS SLIDE TO NEAR BOTTOM WITH DIES CLOSED. MANY AUTOMATIC PRESS OPERATIONS HAVE CHUTES, BINS, CONVEYORS, AIR BLOWOFFS, DIE SENSORS WITH CABLES, ETC. ASSOCIATED WITH THE PRODUCTION OPERATION. THESE SHOULD BE MOVED OR DISCONNECTED BEFORE DIE REMOVAL BEGINS. IT IS PREFERABLE TO REMOVE SUCH ITEMS WITH THE DIES CLOSED. THIS STEP WILL NOT BE NECESSARY FOR MANY (BUT NOT ALL) MANUALLY FED DIES.

HAZARDS: NONE ASSOCIATED WITH THE PRESS. POSSIBLE HAZARDS RELATED TO HANDLING EQUIPMENT REMOVING PARTS AND SCRAP BINS.

RISK REDUCTION: ENERGY CONTROL AND SAFEGUARDING CANNOT BE USED. DEVELOPMENT AND TRAINING OF SAFE PROCEDURES CAN REDUCE RISK.

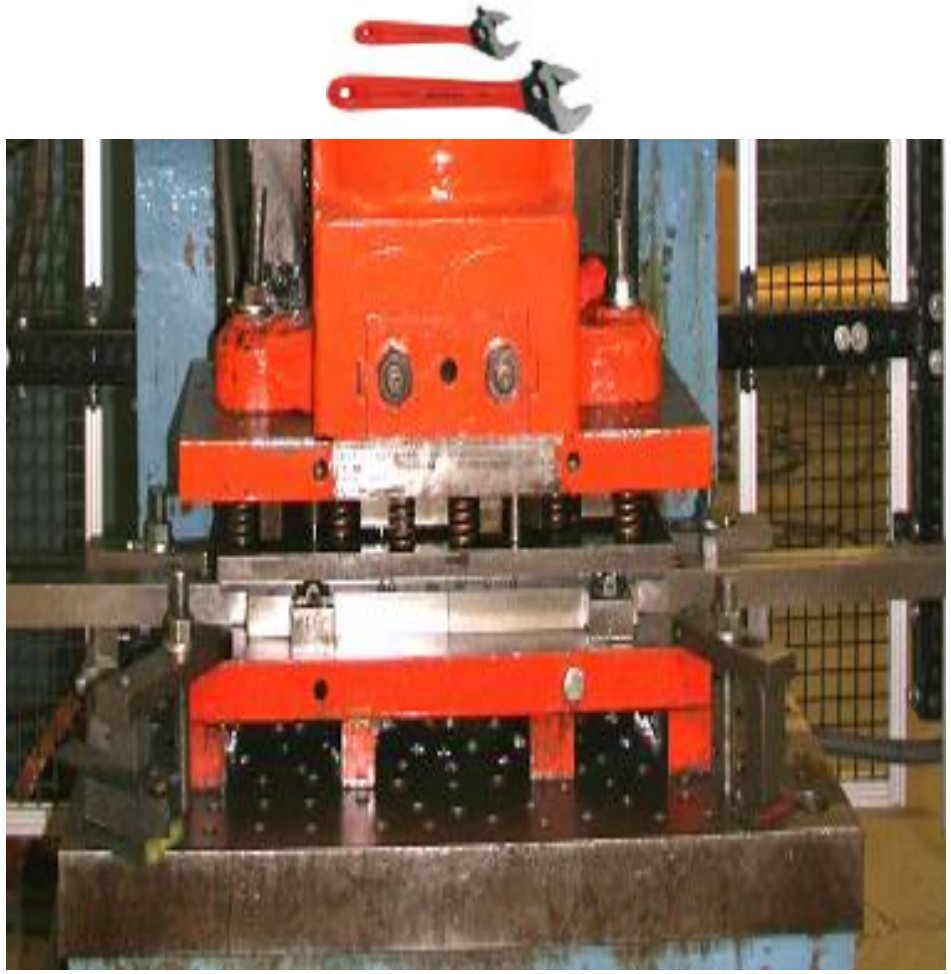


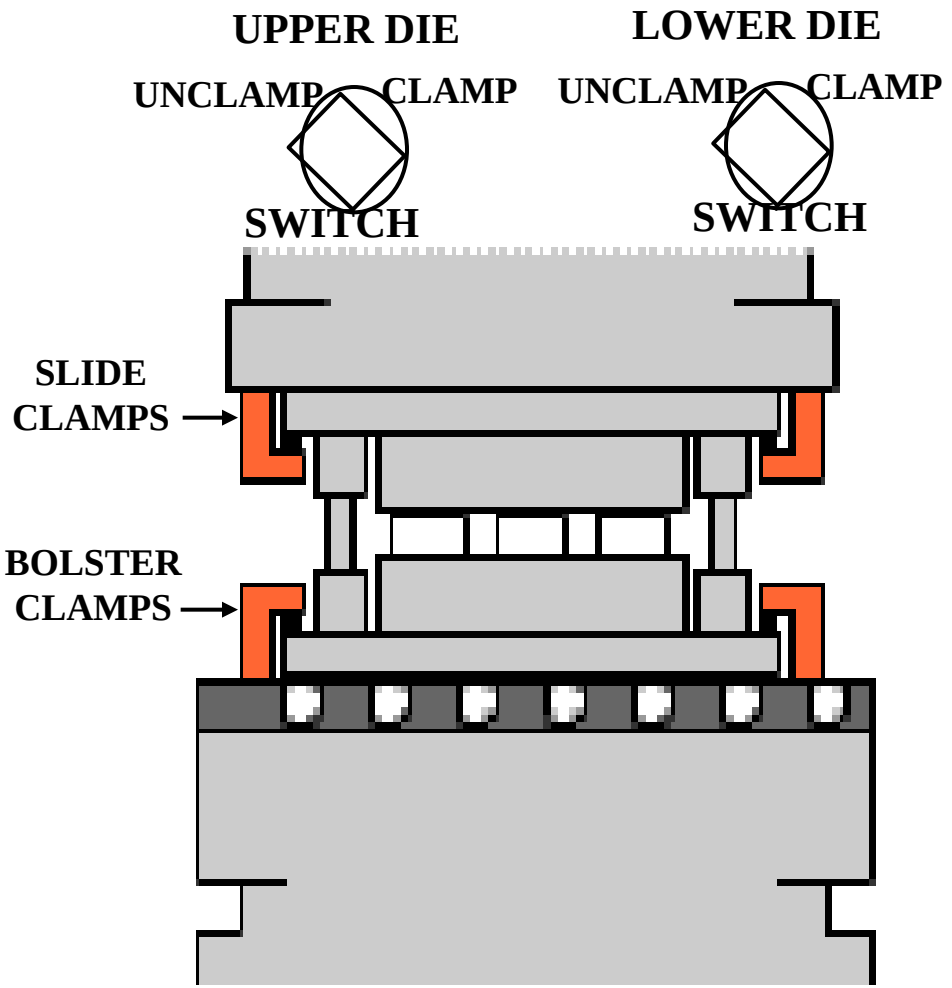
REMOVAL OF DIES

POWER OFF TASK: MODE SELECTOR IN OFF POSITION. AFTER REMOVING ANY CHUTES, CONVEYORS, AIR LINES, ELECTRICAL CABLES,ETC., REMOVE ALL REMOVE THE UPPER AND LOWER DIE FASTENERS WHILE DIES ARE CLOSED.

HAZARD: IF PRESS IS STROKED UPWARD AFTER SOME FASTENERS ARE RELEASED AND SOME ARE STILL ATTACHED, THE UPPER DIE MAY TRAVEL UPWARD WITH THE SLIDE AND FALL BACK ONTO LOWER DIE OR OUT OF PRESS AS INADEQUATE FASTENERS FAIL.

RISK REDUCTION: ENERGY CONTROL. MODE SELECTOR MUST REMAIN OFF UNTIL DIES ARE DETACHED. SEE PROCEDURE ON NEXT PAGE.



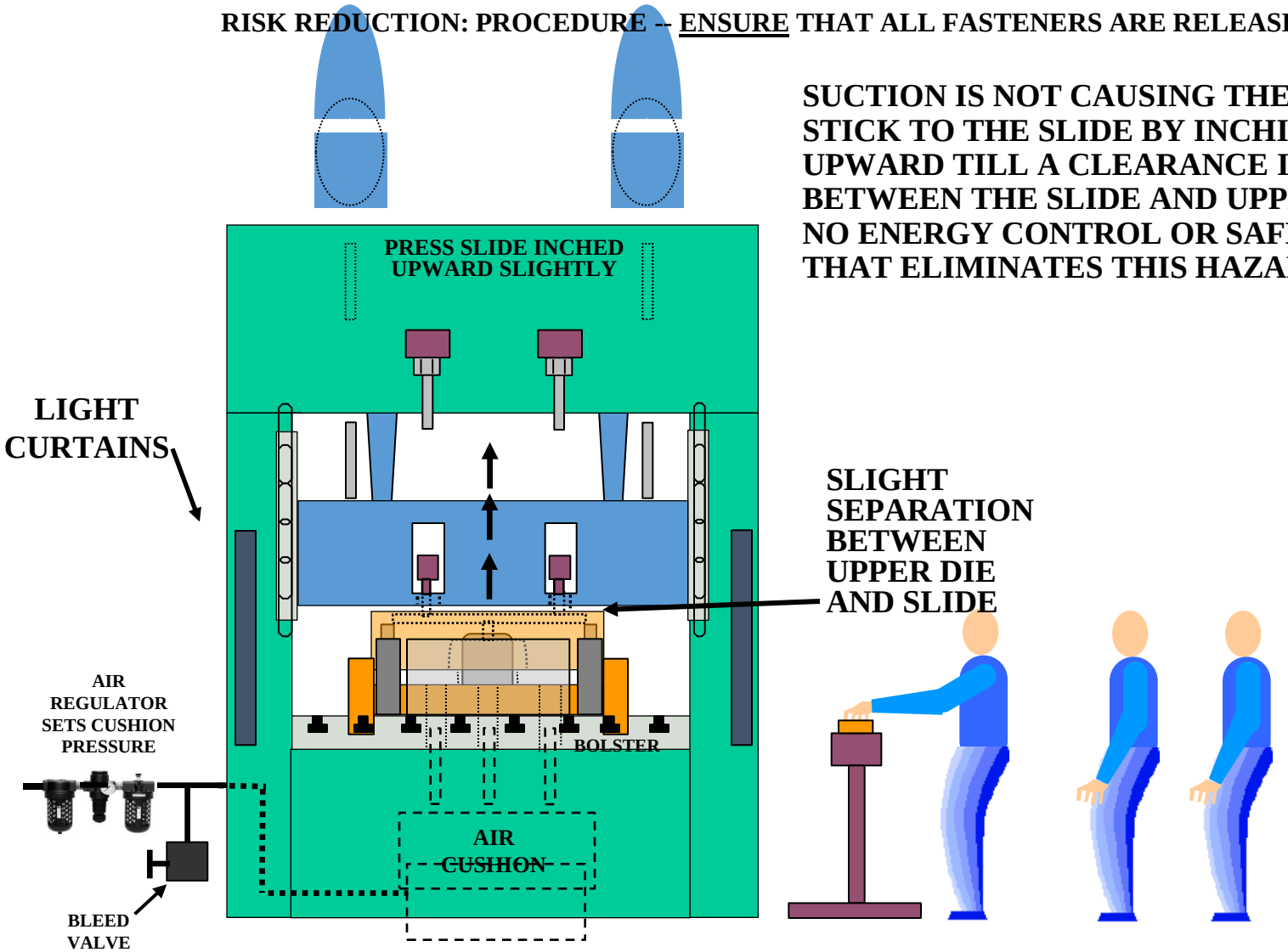


REMOVAL OF DIES

POWER ON TASK: AFTER DIE FASTENERS ARE REMOVED, TURN MODE SELECTOR SWITCH TO INCH AND START PRESS DRIVE MOTOR. INCH THE PRESS SLIDE UP SLIGHTLY TILL A SLIGHT SEPARATION APPEARS BETWEEN UPPER DIE AND SLIDE.

HAZARD: IF SLIDE IS QUICKLY TAKEN ALL THE WAY BACK TO TOP, THE UPPER DIE MAY GO PART OF THE WAY UP AND FALL FROM THE SLIDE ONTO THE LOWER DIE IF SOME, BUT NOT ALL, FASTENERS ARE RELEASED OR IF OIL SUCTION CAUSES THE UPPER DIE TO STICK TO THE SLIDE.

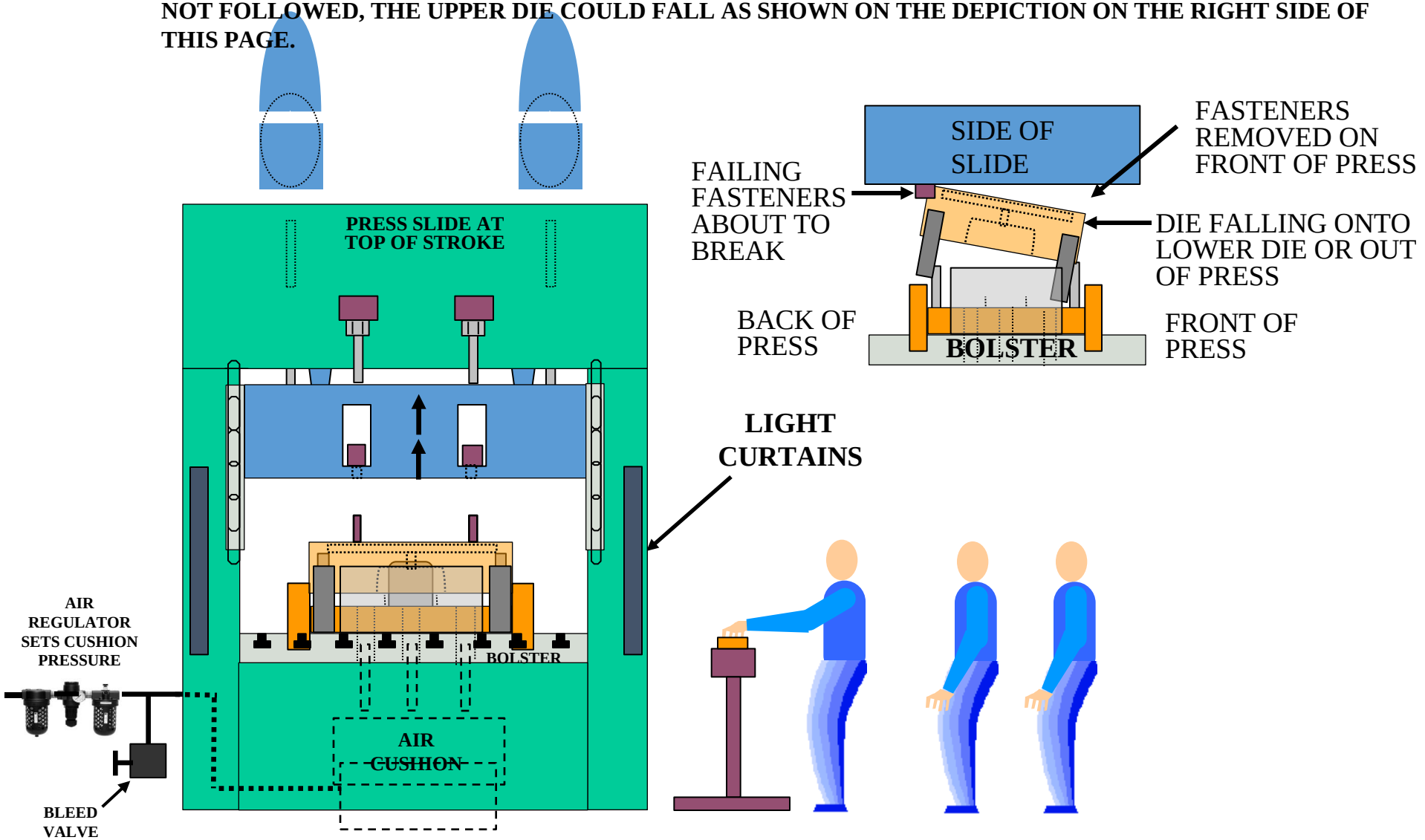
RISK REDUCTION: PROCEDURE -- ENSURE THAT ALL FASTENERS ARE RELEASED AND THAT OIL SUCTION IS NOT CAUSING THE UPPER DIE TO STICK TO THE SLIDE BY INCHING SLOWLY UPWARD TILL A CLEARANCE IS OBSERVED BETWEEN THE SLIDE AND UPPER DIE. THERE IS NO ENERGY CONTROL OR SAFEGUARDING THAT ELIMINATES THIS HAZARD.



REMOVAL OF DIES

POWER ON TASK: SELECTOR SWITCH REMAINS IN INCH MODE. AFTER SEPARATION OD UPPER DIE FROM SLIDE IS OBSERVED (LAST PAGE), USE INCH CONTROLS TO RETURN SLIDE ALL THE WAY TO TOP OF STROKE.

HAZARD: THERE IS NO HAZARD IF THE PROCEDURES ON THE PRECEDING PAGE ARE FOLLOWED TO ENSURE THAT THE UPPER DIE IS FREE OF THE SLIDE. IF THE PROCEDURE ON THE PRECEDING PAGE IS NOT FOLLOWED, THE UPPER DIE COULD FALL AS SHOWN ON THE DEPICTION ON THE RIGHT SIDE OF THIS PAGE.

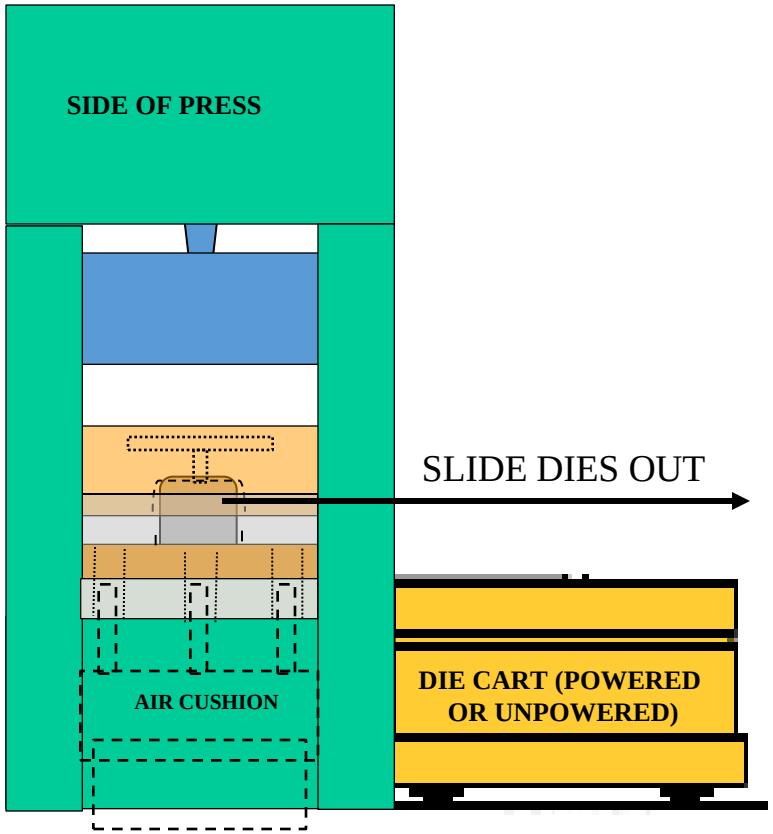


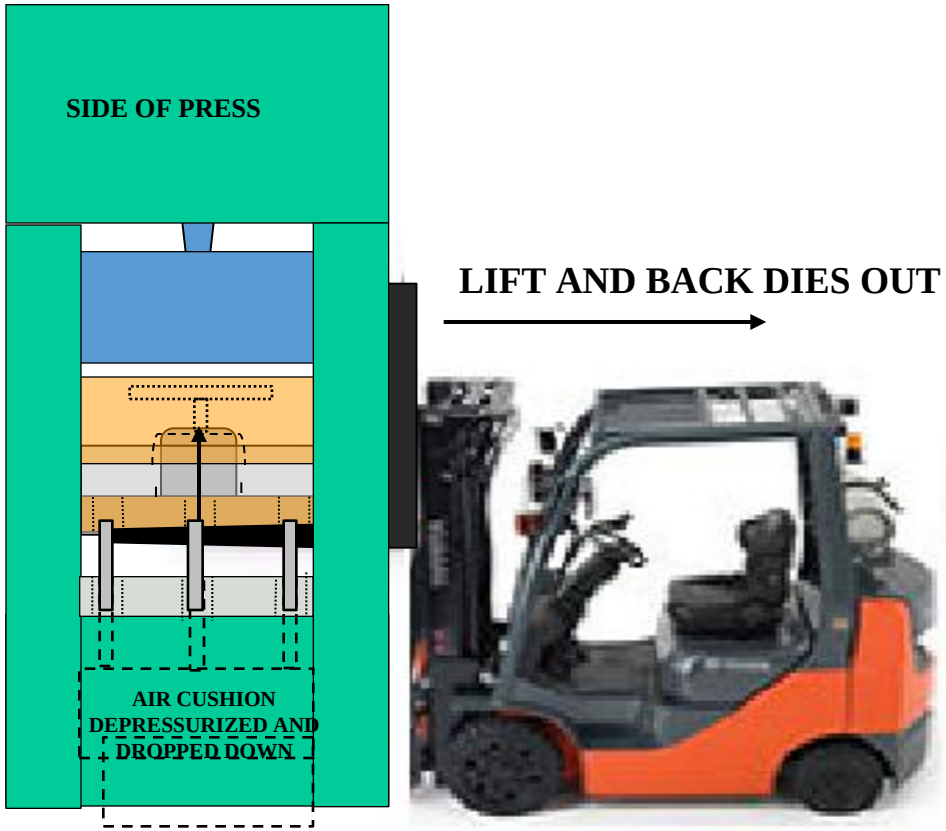
REMOVAL OF DIES

PRESS POWER OFF TASK: TURN THE MODE SELECTOR SWITCH TO OFF POSITION. USE HANDLING EQUIPMENT SUCH AS CRANES, FORKLIFTS, OR DIE CARTS TO REMOVE DIES FROM THE PRESS.

HAZARDS: STROKING OF THE PRESS COULD INJURE PERSONNEL EXPOSED TO PINCH POINTS BETWEEN THE SLIDE AND UPPER DIE OR THE LOWER DIE AND BOLSTER. ALSO COULD CREATE SHRAPNEL FROM BROKEN DIE PARTS. CRUSHING HAZARDS FROM DIES FALLING FROM HANDLING EQUIPMENT OR FROM MOVEMENT OF FORKLIFTS OR POWERED DIE CARTS OR DIES HANGING FROM CRANES.

RISK REDUCTION: SAFEGUARDING SUCH AS LIGHT CURTAINS AND ENERGY CONTROL FOR STROKING OF PRESS. ENERGY CONTROL FOR DIE CUSHIONS. THERE ARE NO SAFEGUARDING METHODS OR ENERGY CONTROL METHODS TO PROTECT PERSONNEL FROM DIE HANDLING HAZARDS. OSHA AND ANSI REQUIRE DIES TO BE DESIGNED FOR EASE OF HANDLING DURING INSTALLATION AND REMOVAL FROM THE PRESS. DESIGN OF HANDLING EQUIPMENT PATHWAYS AND HUMAN PATHWAYS CAN REDUCE RISK. TRAIN HANDLING EQUIPMENT OPERATORS IN PROCEDURES TO ENHANCE SAFETY. TRAIN ALL PERSONNEL TO NEVER GET IN THE PATHWAY OF HANDLING EQUIPMENT OR UNDER TRANSPORTED DIES.



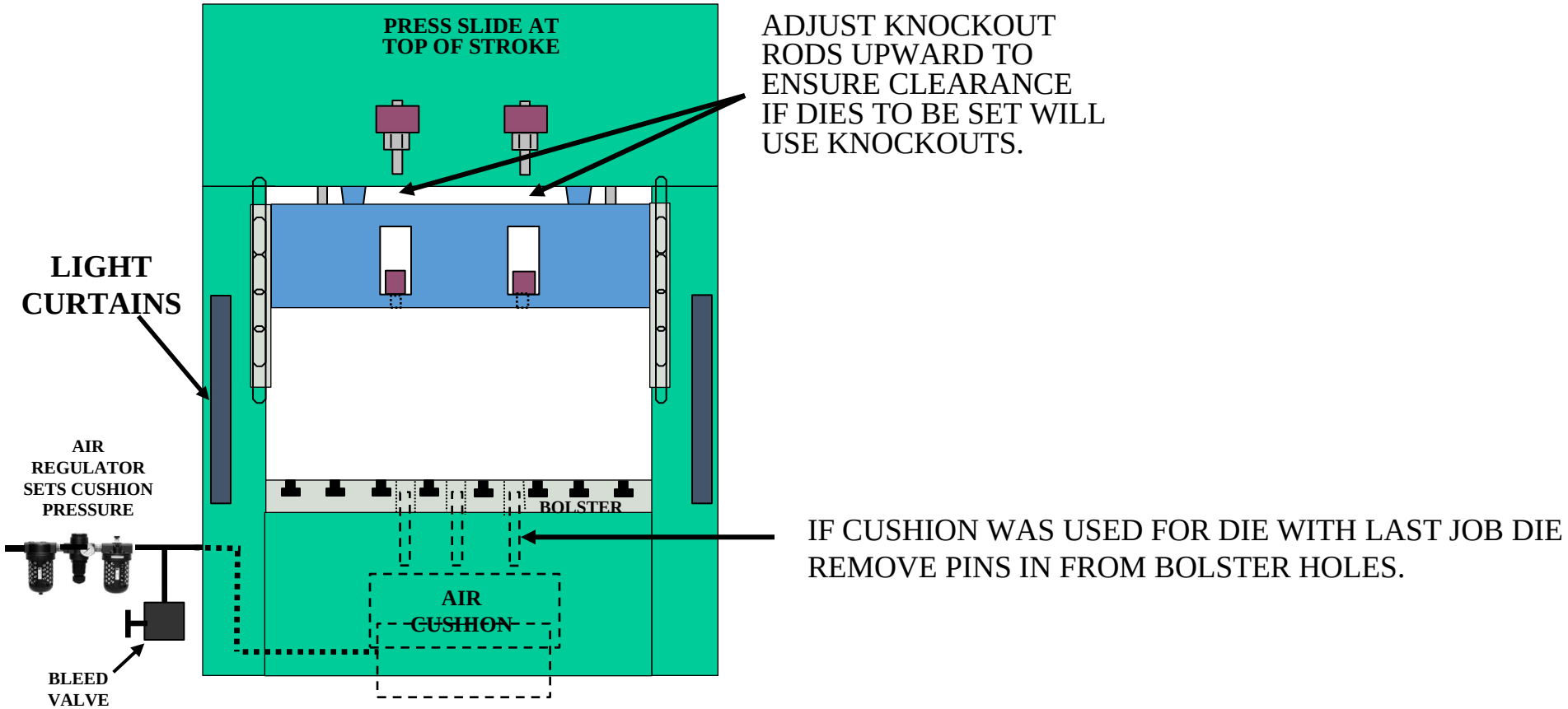


DIE INSTALLATION

POWER OFF TASKS: REMOVE DIE PINS IF CUSHION WAS USED WITH DIE USE DFOR LAST JOB. IF NECESSARY, PRESSURIZE DIE CUSHION TO REMOVE DIE PINS THEN DEPRESSURIZE AND LOCK OUT DIE CUSHIONS. IF PREVIOUS DIES USED KNOCKOUTS, ADJUST KNOCKOUT RODS UP TO ENSURE CLEARANCE.

HAZARDS: NONE AT THIS TIME, BUT FAILURE TO PERFORM THESE ACTIVITIES CAN LEAD TO SAFETY ISSUES IN LATER DIE SETTING STEPS. FOR EXAMPLE, IF A NEW DIE IS INSTALLED THAT DOEN'T USE A CUSHION AND THE CUSHION IS MISTAKENLY PRESSURIZED AT A LATER TIME, THE DIE SET MAY BE ELEVATED AND FALL ONTO THE BOLSTER AND OUT OF THE PRESS. IF A NEW DIE IS INSTALLED IN THE PRESS AND THE OLD KNOCKOUT ADJUSTMENT IS NOT ADJUSTED UPWARD TO ENSURE KNOCKOUT CLEARANCE FOR THE NEW DIE, DAMAGED DIES AND SHATERRED KNOCKOUT PARTS MAY RESULT.

RISK REDUCTION: PROCEDURE -- REMOVE PINS WHEN DIE CUSHION NOT USED. ENSURE KNOCKOUT CLEARANCE.



DIE INSTALLATION

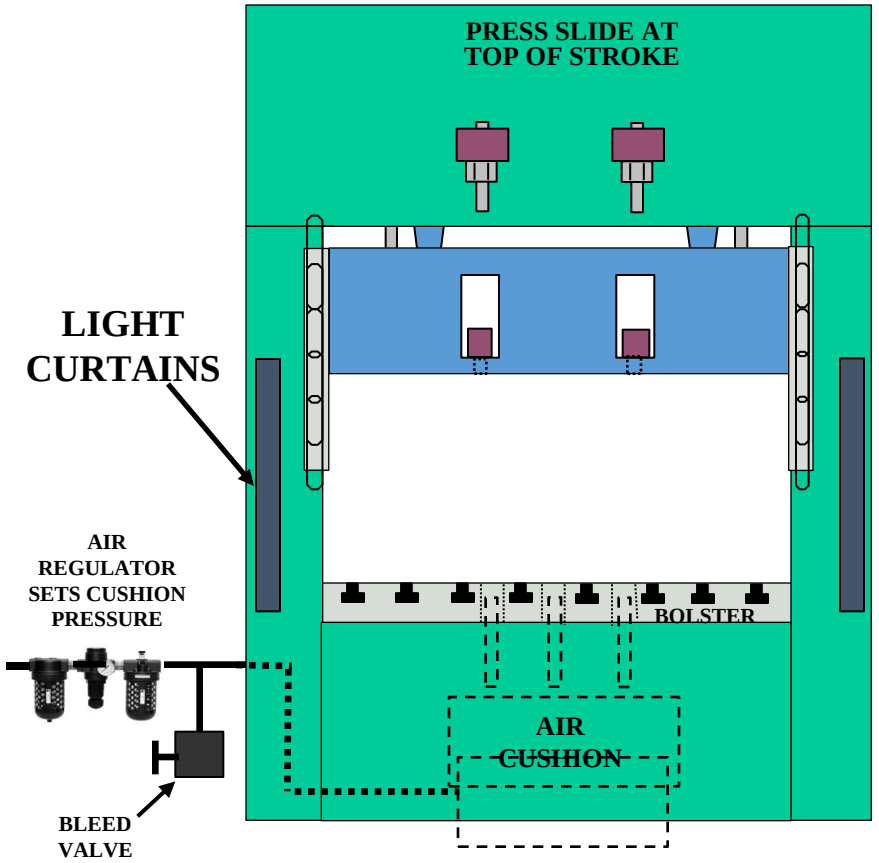
TASK: ADJUST APPROXIMATE SHUT HEIGHT OF PRESS FOR DIES BEFORE DIES ARE INSTALLED.

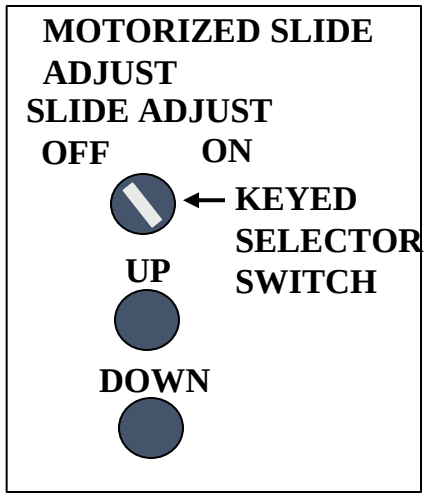
POWER OFF TASK: TURN THE MODE SELECTOR SWITCH TO OFF POSITION. FOR SMALL PRESSES WITH SHUT HEIGHT MANUALLY ADJUSTABLE BY TOOLS. ADJUST SHUT HEIGHT TO BE THAT REQUIRED FOR THE DIE PLUS ABOUT 1/4 INCH.

POWER ON TASK: FOR PRESSES WITH MOTORIZED SHUT HEIGHT ADJUST POWER MUST BE ON. TURN THE SLIDE ADJUST OFF/ON SWITCH TO ON AND USE THE UP/DOWN PUSHBUTTONS TO ADJUST THE APPROXIMATE SHUT HEIGHT TO TAHT REQUIRED FOR DIES PLUS ABOUT 1/4 INCH.

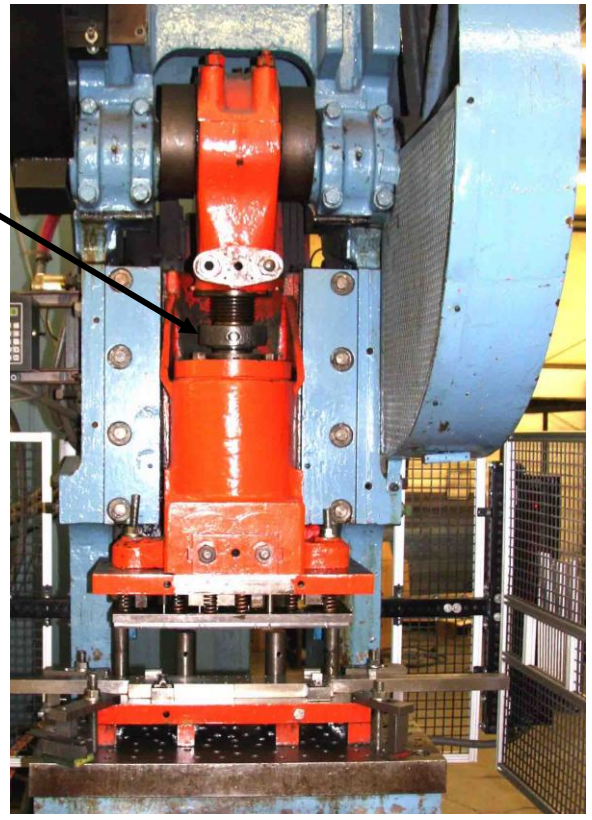
HAZARDS: RISK OF INJURY TO DIE SETTER MANUALLY ADJUSTING SHUT HEIGHT WITH TOOL ON ADJUSTING SCREW IF PRESS STROKES. NONE FOR MOTORIZED SHUT HEIGHT ADJUST.

RISK REDUCTION: ELECTRICAL ENERGY CONTROL FOR MANUAL SLIDE ADJUST. MODE SELECTOR SWITCH OFF.





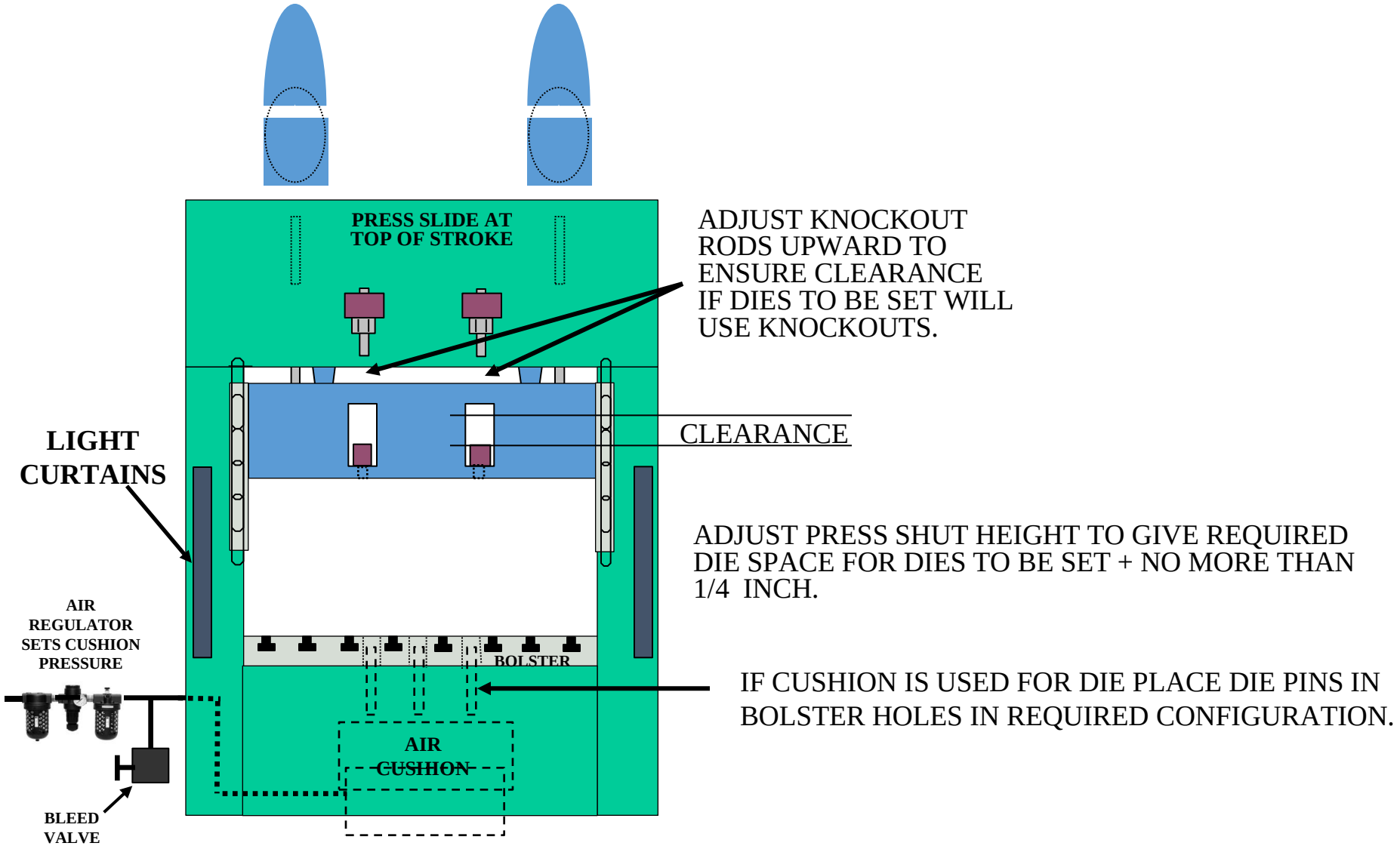
MANUAL SLIDE ADJUST MECHANISM



DIE INSTALLATION

POWER OFF TASKS: MODE SELECTOR TURNED TO OFF POSITION. IF NECESSARY, CLEAN THE BOLSTER. IF NEW DIES WILL USE DIE CUSHIONS CONFIGURE DIE PINS FOR NEW DIE.

HAZARDS: NONE AT THIS POINT IN DIE SETTING AS LONG AS POWER IS REMOVED BY MODE SELECTOR IN OFF AND KEY OUT OF MODE SELECTOR.

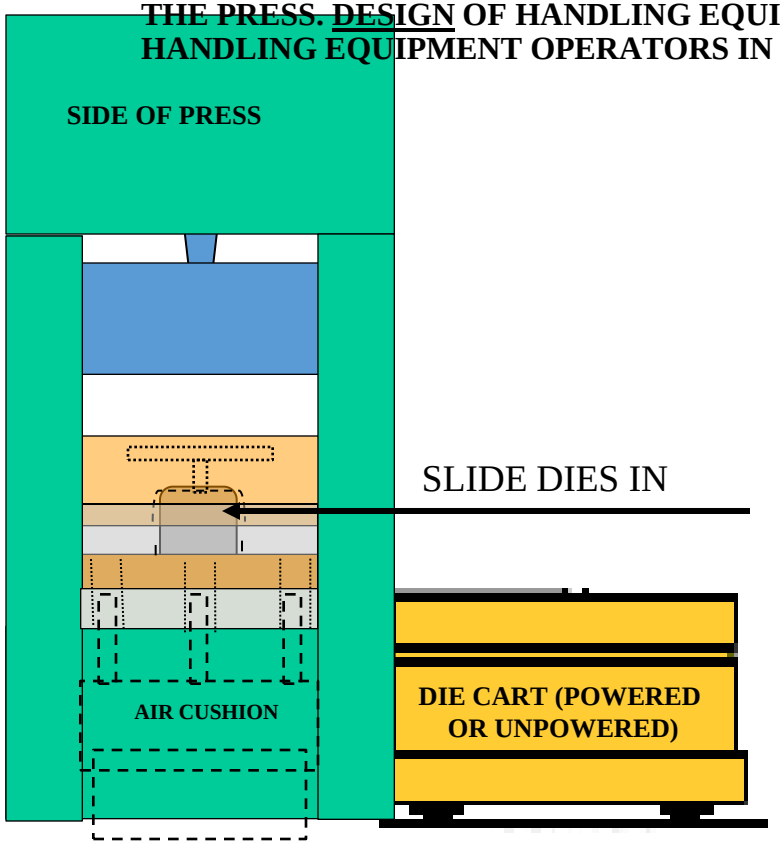


DIE INSTALLATION

PRESS POWER OFF TASK: LEAVE THE MODE SELECTOR SWITCH IN OFF POSITION. LEAVE DIE CUSHIONS DEPRESSURIZED AND LOCKED OUT. USE HANDLING EQUIPMENT SUCH AS CRANES, FORKLIFTS, OR DIE CARTS TO PLACE DIE SET ON THE PRESS BOLSTER.

HAZARDS: STROKING OF THE PRESS COULD INJURE PERSONNEL EXPOSED TO PINCH POINTS BETWEEN THE SLIDE AND UPPER DIE OR THE LOWER DIE AND BOLSTER. ALSO COULD CREATE SHRAPNEL FROM BROKEN DIE PARTS. IF CUSHION PINS EXTEND ABOVE BOLSTER, DIES MUST NE CAREFULLY AND SLOWLY POSITIONED AND LOWERED ONTO PINS TO AVOID MISSING HOLES IN LOWER DIE, CAUSING DIE TO TILT AND SLIDE OUT OF PRESS. CRUSHING HAZARDS FROM DIES FALLING FROM HANDLING EQUIPMENT OR FROM MOVEMENT OF FORKLIFTS OR POWERED DIE CARTS OR DIES HANGING FROM CRANES.

RISK REDUCTION: SAFEGUARDING SUCH AS LIGHT CURTAINS AND ENERGY CONTROL FOR STROKING OF PRESS. ENERGY CONTROL FOR DIE CUSHIONS. THERE ARE NO SAFEGUARDING METHODS OR ENERGY CONTROL METHODS TO PROTECT PERSONNEL FROM DIE HANDLING HAZARDS. OSHA AND ANSI REQUIRE DIES TO BE DESIGNED FOR EASE OF HANDLING DURING INSTALLATION AND REMOVAL FROM THE PRESS. DESIGN OF HANDLING EQUIPMENT AND HUMAN PATHWAYS CAN REDUCE RISK. TRAIN HANDLING EQUIPMENT OPERATORS IN PROCEDURES TO



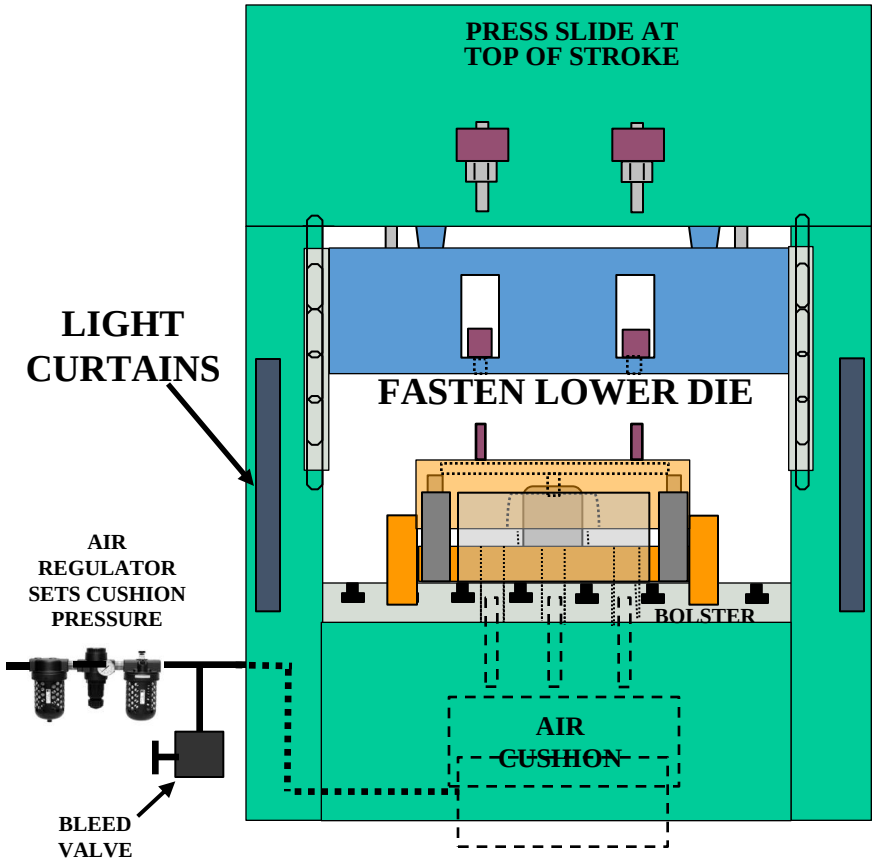
ENHANCE SAFETY. TRAIN ALL PERSONNEL TO NEVER GET IN THE PATHWAY OF HANDLING EQUIPMENT OR OR UNDER TRANSPORTED DIES.

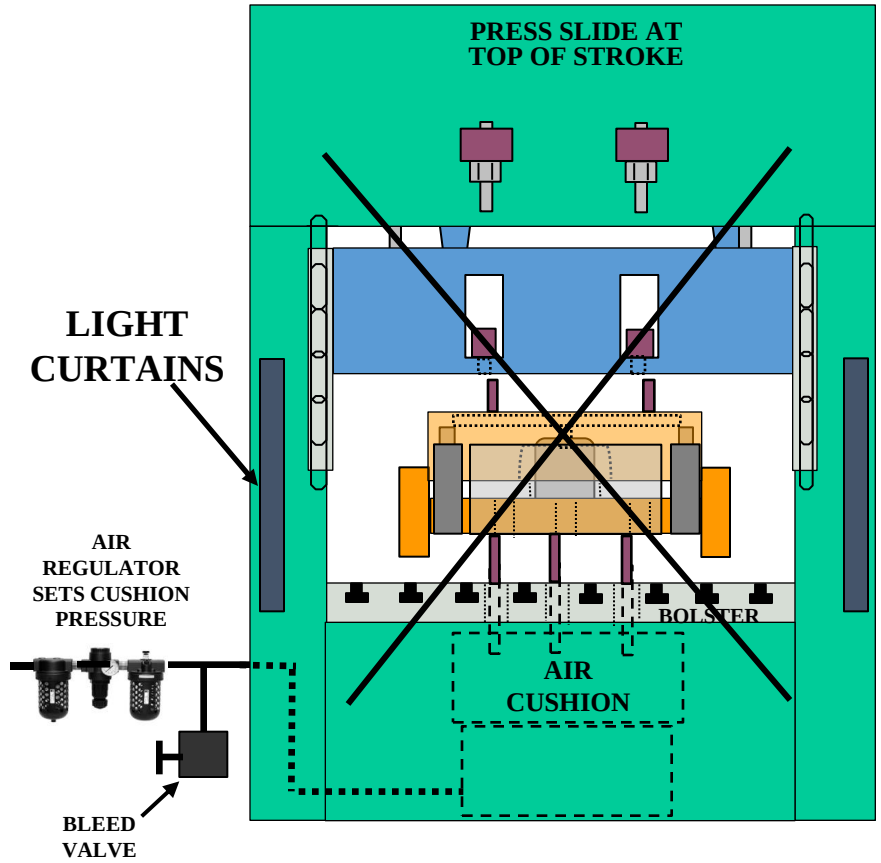
DIE INSTALLATION

PRESS POWER OFF TASK: LEAVE THE MODE SELECTOR SWITCH IN OFF POSITION. INITIALLY, LEAVE DIE CUSHIONS DEPRESSURIZED AND LOCKED OUT. IF DIE CUSHIONS WILL BE USED, FASTEN LOWER DIES SECURELY TO BOLSTER AT THIS TIME. IF DIE CUSHIONS AREN'T USED SKIP ALL ACTIVITIES RELATED TO CUSHION AND FASTEN BOTH LOWER AND UPPER AFTER THE SLIDE HAS BEEN LOWERED TO TOUCH THE UPPER DIE AS SHOWN LATER.

HAZARDS: STROKING OF THE PRESS COULD INJURE PERSONNEL EXPOSED TO PINCH POINTS BETWEEN THE SLIDE AND UPPER DIE. WHEN DIE CUSHIONS ARE USED WITH DIE PINS THAT ARE BELOW TOP OF BOLSTER WITH CUSHION DEPRESSURIZED, IF THE DIE CUSHION IS PRESSURIZED WITH LOWER DIES NOT FASTENED TO BOLSTER AND LOWER DIE HOLES AND DIE PINS ARE MISALIGNED, THE WHOLE DIE SET WILL BE ELEVATED AND MAY FALL ONTO BOLSTER OR OUT OF PRESS.

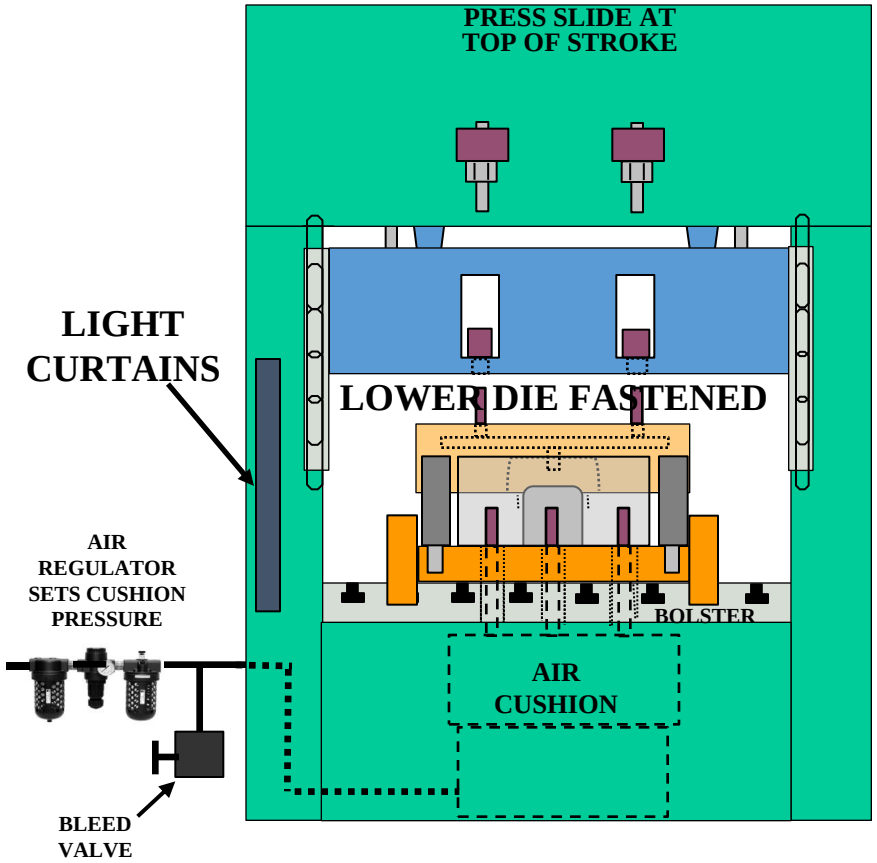
RISK REDUCTION: SAFEGUARDING SUCH AS LIGHT CURTAINS AND ENERGY CONTROL FOR STROKING OF PRESS. ENERGY CONTROL OF DIE CUSHIONS UNTIL LOWER DIES ARE SECURELY FASTENED.





DIE INSTALLATION

POWER OFF TASK: LEAVE THE MODE SELECTOR SWITCH IN OFF POSITION. INITIALLY, LEAVE DIE CUSHIONS DEPRESSURIZED AND LOCKED OUT. UNLOCK THE DIE CUSHION LOCKOUT VALVE AND SLOWLY INCREASE CUSHION PRESSURE TO OBSERVE THE LOWER DIE PRESSURE PADS AND UPPER DIE LIFT AS SHOWN IN THE FIGURE BELOW. ALSO OBSERVE THAT ALL DIE PINS EXTEND UPWARD, IF DIE DESIGN SO ALLOWS. IF DIE IS MISALIGNED WITH PINS, THE UPPER DIE WILL NOT BE LIFTED. DEPRESSURIZE AND LOCK OUT CUSHION, ALIGN DIE AND REPEAT PROCESS.



HAZARDS: STROKING OF THE PRESS COULD INJURE PERSONNEL EXPOSED TO PINCH POINTS BETWEEN THE SLIDE AND UPPER DIE. IF UPPER DIE HOLES ARE MISALIGNED WITH DIE PINS, IF LOWER DIE IS UNFASTENED AFTER PRESSURE IS ON CUSHION, DIES COULD BE LIFTED AND FALL ONTO BOLSTER OR OUT OF PRESS.

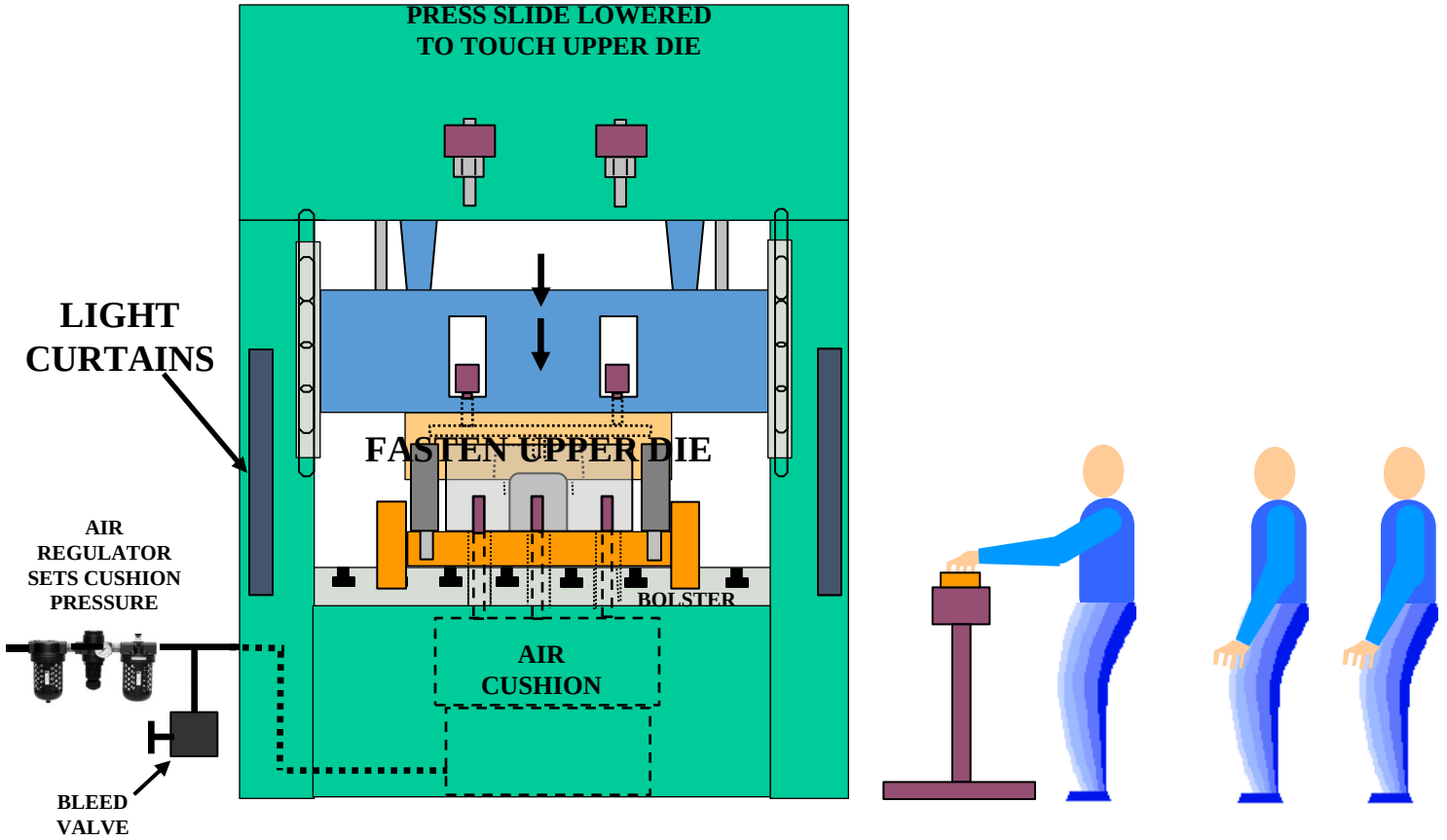
RISK REDUCTION: SAFEGUARDING SUCH AS LIGHT CURTAINS AND ENERGY CONTROL FOR STROKING OF PRESS. ENERGY CONTROL OF DIE CUSHIONS WITH CUSHION PRESSURE LOCKED OUT UNTIL LOWER DIES ARE SECURELY FASTENED.

DIE INSTALLATION

POWER ON TASK: TURN SELECTOR SWITCH TO INCH. START PRESS DRIVE MOTOR. INCH THE PRESS SLIDE DOWN UNTIL THE SLIDE TOUCHED THE UPPER DIE. IF SLIDE DOESN'T TOUCH UPPER DIE WITH SLIDE AT BOTTOM DEAD CENTER, USE SHUT HEIGHT ADJUST TO LOWER SLIDE TO TOUCH UPPER DIE.

HAZARD: PINCH POINT BETWEEN SLIDE AND UPPER DIE AS SLIDE IS DRIVEN DOWN UNDER POWER.

RISK REDUCTION:OPERATOR CONTROLS FOR INCH AND PROCEDURES THAT PLACE MULTIPLE DIE SETTERS IN A SAFE POSITION IN VIEW OF THE PERSON OPERATING THE INCH CONTROLS. GREATER RISK REDUCTION WILL OCCUR WHEN LIGHT CURTAIN SAFEGUARDING DEVICES ARE USED IN THE INCH MODE. IF PROPERLY APPLIED, THE LIGHT CURTAINS PROTECT ALL PERSONNEL FROM THE DIE CLOSING HAZARD.



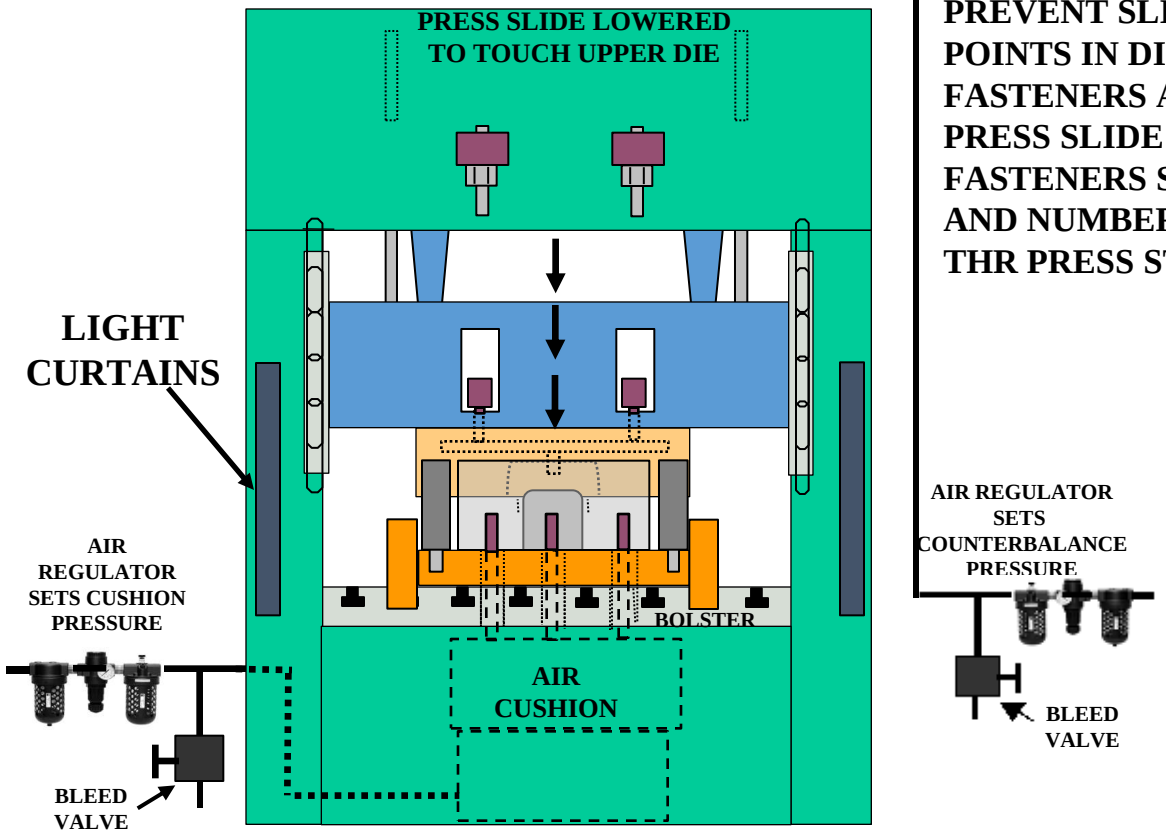
DIE INSTALLATION

POWER OFF TASKS: TURN MODE SELECTOR SWITCH TO <u>OFF</u> POSITION. FASTEN BOTH UPPER AND LOWER DIES IN THIS POSITION IF DIES DON'T USE CUSHIONS. LOWER DIES SHOULD ALREADY BE FASTENED IN PREVIOUS STEP IF DIES USE CUSHION. AFTER DIES ARE FASTENED, ADJUST COUNTERBALANCE PRESSURE FOR NEW UPPER DIE WEIGHT IF PRESS HAS A COUNTERBALANCE.

HAZARDS: DOWNWARD SLIDE MOVEMENT UNDER POWER THAT CREATES PINCH POINTS IN DIES IF SLIDE IS NOT ALL THE WAY TO BOTTOM DEAD CENTER. DIE SETTERS USE INADEQUATE FASTENERS OR INCOMPLETE FASTENING OF UPPER DIE WHICH CAUSES DIES TO FALL FROM SLIDE ONTO BED OR OUT OF PRESS WHEN SLIDE IS MOVED TOWARD TOP IN NEXT STEP.

RISK REDUCTION: <u>ENERGY CONTROL</u>-MODE SELECTOR MUST REMAIN OFF UNTIL DIES ARE ATTACHED TO

PREVENT SLIDE MOVEMENT THAT CREATES PINCH POINTS IN DIE. <u>PROCEDURE</u> -- <u>ENSURE</u> THAT ALL FASTENERS ARE IN PLACE AND TIGHT BEFORE THE PRESS SLIDE IS STROKED BACK TO TOP. <u>DESIGN</u> – FASTENERS SHOULD BE SUFFICIENT IN STRENGTH AND NUMBER TO PREVENT UPPER DIE FALLING AS THR PRESS STROKES.



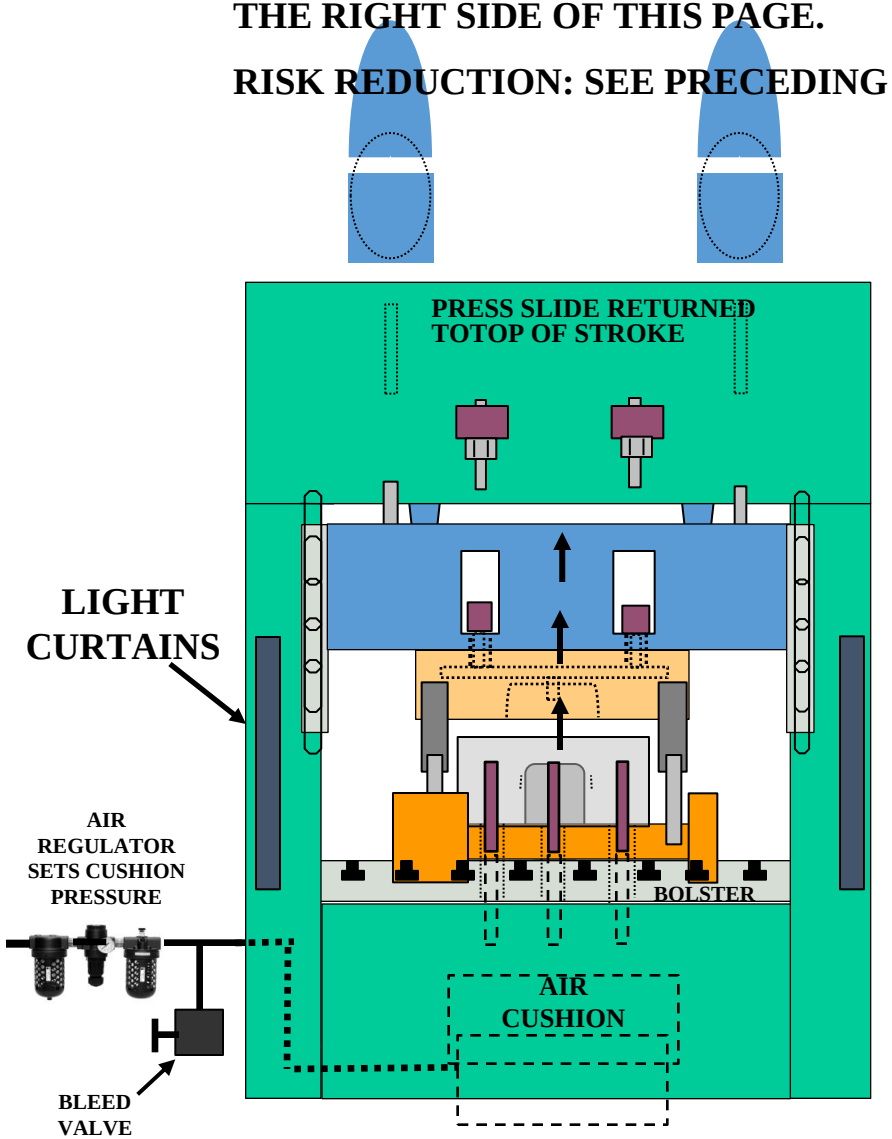
IF THE PRESS HAS AN AIR COUNTERBANCEADJUST THE PRESSURE FOR THE UPPER DIE WEIGHT AFTER THE UPPER DIE IS ATTACHED.

DIE INSTALLATION

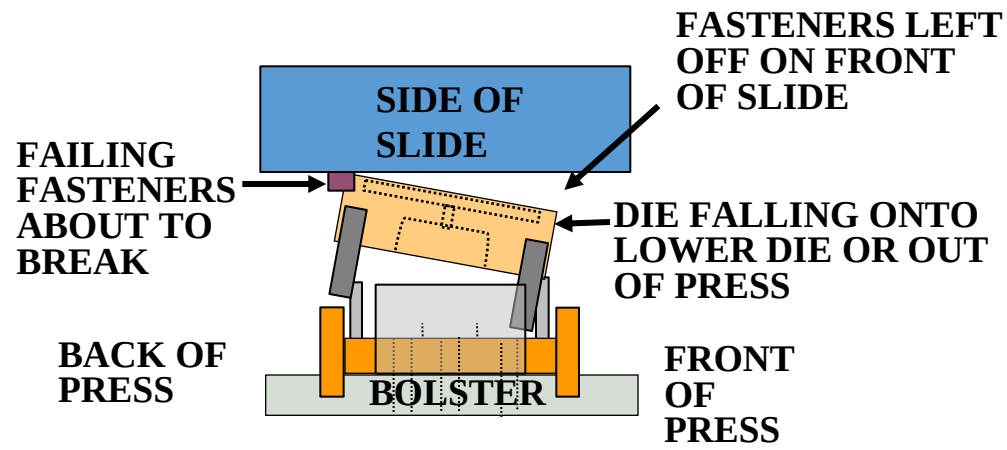
POWER ON TASK: TURN SELECTOR SWITCH IN INCH MODE AND START DRIVE MOTOR. USE INCH CONTROLS TO RETURN SLIDE ALL THE WAY TO TOP OF STROKE.

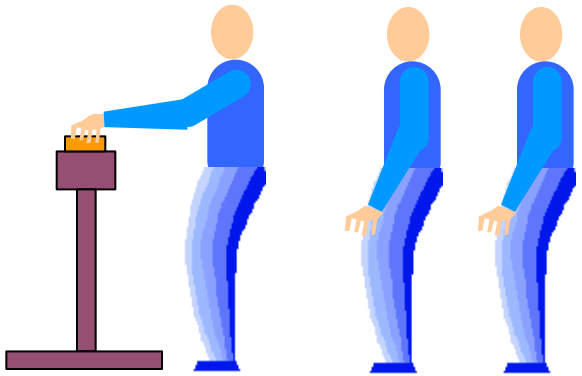
HAZARD: THERE IS NO HAZARD IF DIE FASTENERS ARE OF ADEQUATE DESIGN AND ALL ARE IN PLACE. IF NOT, THE UPPER DIE COULD FALL AS SHOWN ON THE DEPICTION ON THE RIGHT SIDE OF THIS PAGE.

RISK REDUCTION: SEE PRECEDING PAGE.



SIDE VIEW OF PRESS





DIE INSTALLATION (SKIP THESE STEPS IF KNOCKOUTS OR CUSHIONS NOT USED)

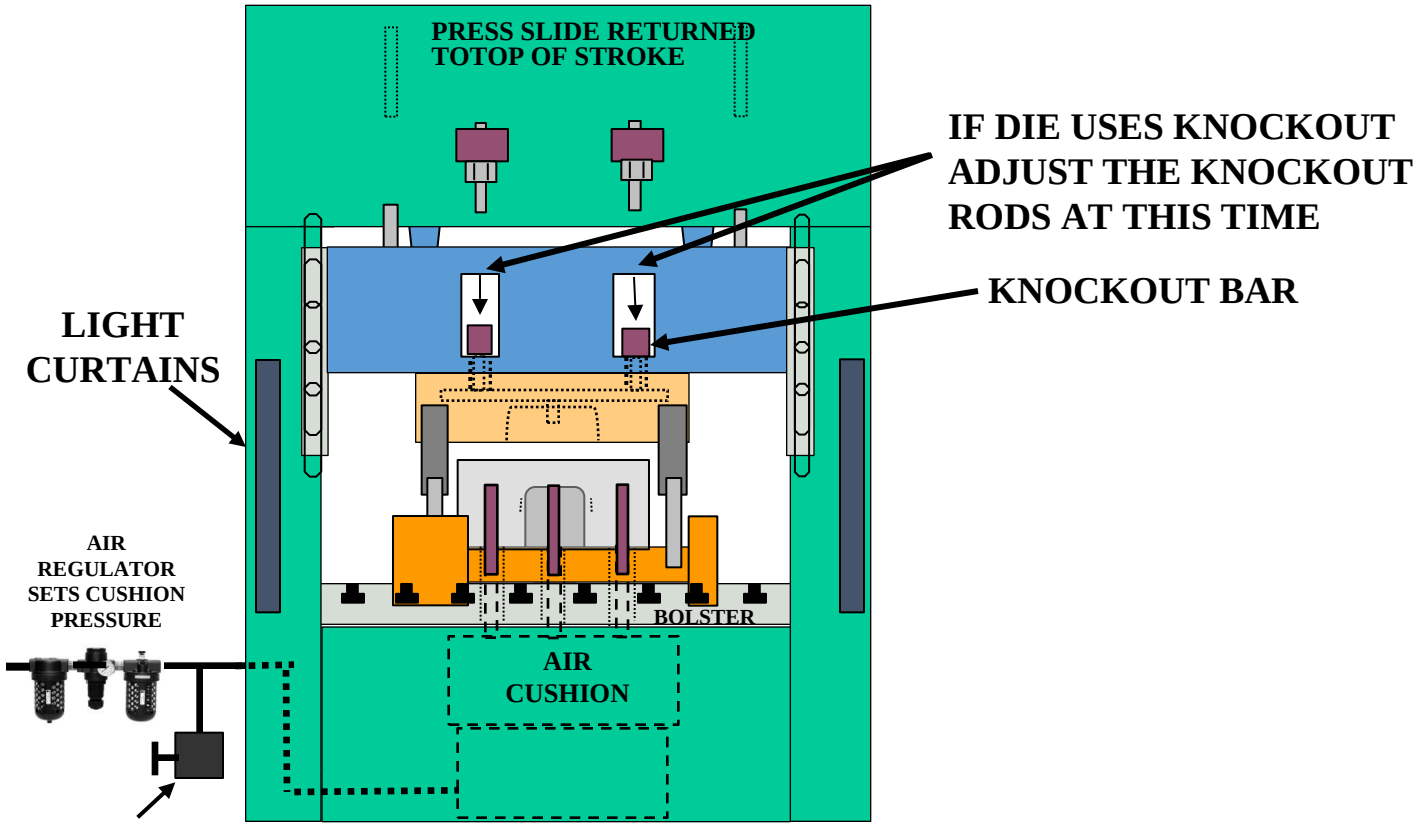
POWER OFF TASK: (DIES WITH KNOCKOUTS ONLY): MAKE CERTAIN PRESS SLIDE IS AT TOP POSITION. TURN SELECTOR SWITCH TO OFF POSITION. ADJUST KNOCKOUT RODS FOR PROPER PART KNOCKOUT.

HAZARD: SLIDE MOVEMENT WHILE KNOCKOUT BARS ARE BEING ADJUSTED COULD PRESENT A FALL HAZARD OR A PINCH POINT HAZARD BETWEEN KNOCKOUT RODS AND BARS

RISK REDUCTION: ENERGY CONTROL -- MODE SELECTOR IN OFF POSITION.

TASK POWER ON OR OFF: IF AIR CUSHION IS USED, SET DIE CUSHION PRESSURE TO STATED VALUE. THIS PRESSURE MAY HAVE TO BE REFINED FOR MATERIAL VARIATION AS TRIAL STROKES ARE MADE.

HAZARD: NONE FOR ADJUSTING CUSHION PRESSURE.

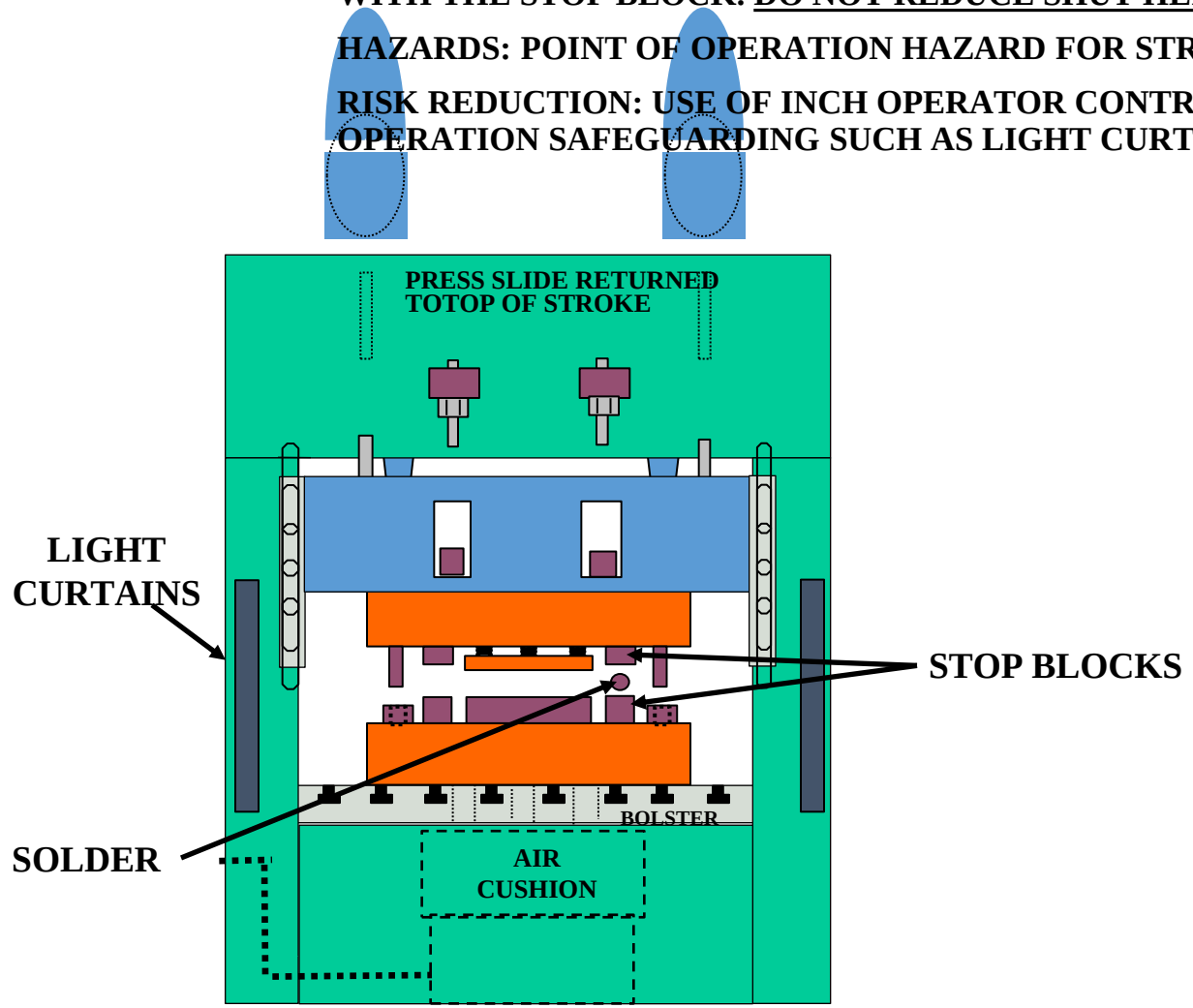


DIE INSTALLATION

POWER ON TASK: PRECISE SHUT HEIGHT ADJUSTMENT. SELECTOR SWITCH TO INCH MODE. DRIVE MOTOR ON. USE TOOLS, MOTORIZED SHUT HEIGHT ADJUST, OR AUTOMATIC SHUT HEIGHT ADJUST FROM CONTROL MEMORY, DEPENDING ON PRESS, TO ADJUST SHUT HEIGHT. FOR DIES THAT HAVE STOP BLOCKS AND MANUAL SHUT HEIGHT ADJUST, USE SOLDER, GREASED PAPER, ETC. BETWEEN STOP BLOCKS. INCH THE PRESS THROUGH COMPLETE STROKES AND SLOWLY REDUCE SHUT HEIGHT UNTIL THE SOLDER IS MASHED TO A SPECIFIED THICKNESS OR PAPER INDICATES CONTACT WITH THE STOP BLOCK. DO NOT REDUCE SHUT HEIGHT FURTHER.

HAZARDS: POINT OF OPERATION HAZARD FOR STROKING OF PRESS.

RISK REDUCTION: USE OF INCH OPERATOR CONTROLS AND SAFE POSITION. POINT OF OPERATION SAFEGUARDING SUCH AS LIGHT CURTAINS.



SUBSEQUENT STEPS THAT MAY BE REQUIRED AFTER DIE INSTALLATION

- **FOR COIL FED PRESSES (SEE ILLUSTRATION NEXT PAGE) SOME SUBSEQUENT TASKS MAY BE:**
  - **POWER ON TASKS. MODE SELECTOR IN INCH, DRIVE MOTOR ON:**

1. **THREADING MATERIAL THROUGH FEED ELEMENTS AND INTO THE DIE. PAY MATERIAL OFF COIL ON REEL OR CRADLE AND THREAD THROUGH STRAIGHTENER AND FEED ELEMENTS. FOR SERVO ROLL FEEDS, USE THE MANUAL JOG MODE TO INSERT MATERIAL IN DIES. FOR PROGRESSIVE DIES, JOG THE MATERIAL INTO THE FIRST STATION AND THEN MAKE A COMPLETE STROKE OF THE PRESS. THEN JOG MATERIAL INTO EACH SUCCESSIVE DIE STATION AND MAKE A COMPLETE STROKE EACH TIME THE MATERIAL IS JOGGED INTO A NEW DIE STATION UNTIL THE MATERIAL IS COMPLETELY THREADED THROUGHT THE DIE.**

HAZARD -- CLOSING OF DIE POINT OF OPERATION UNDER POWER.

RISK REDUCTION MUST BE BY SAFEGUARDING AND SAFE PROCEDURE – LIGHT CURTAINS, USE OF INCH OR JOG BUTTONS, USE OF SAFE POSITION FOR MULTIPLE DIE SETTERS.

2. **MANY AUTOMATIC PRESS OPERATIONS HAVE CHUTES, BINS, CONVEYORS, AIR BLOWOFFS, DIE SENSORS WITH CABLES, ETC. ASSOCIATED WITH THE PRODUCTION OPERATION. THESE SHOULD BE PUT IN PLACE OR CONNECTED BEFORE PRODUCTION BEGINS. THIS STEP WILL NOT BE NECESSARY FOR MANY (BUT NOT ALL) MANUALLY FED DIES.**

HAZARDS: MOVEMENT OF HANDLING EQUIPMENT FOR PARTS AND SCRAP BINS

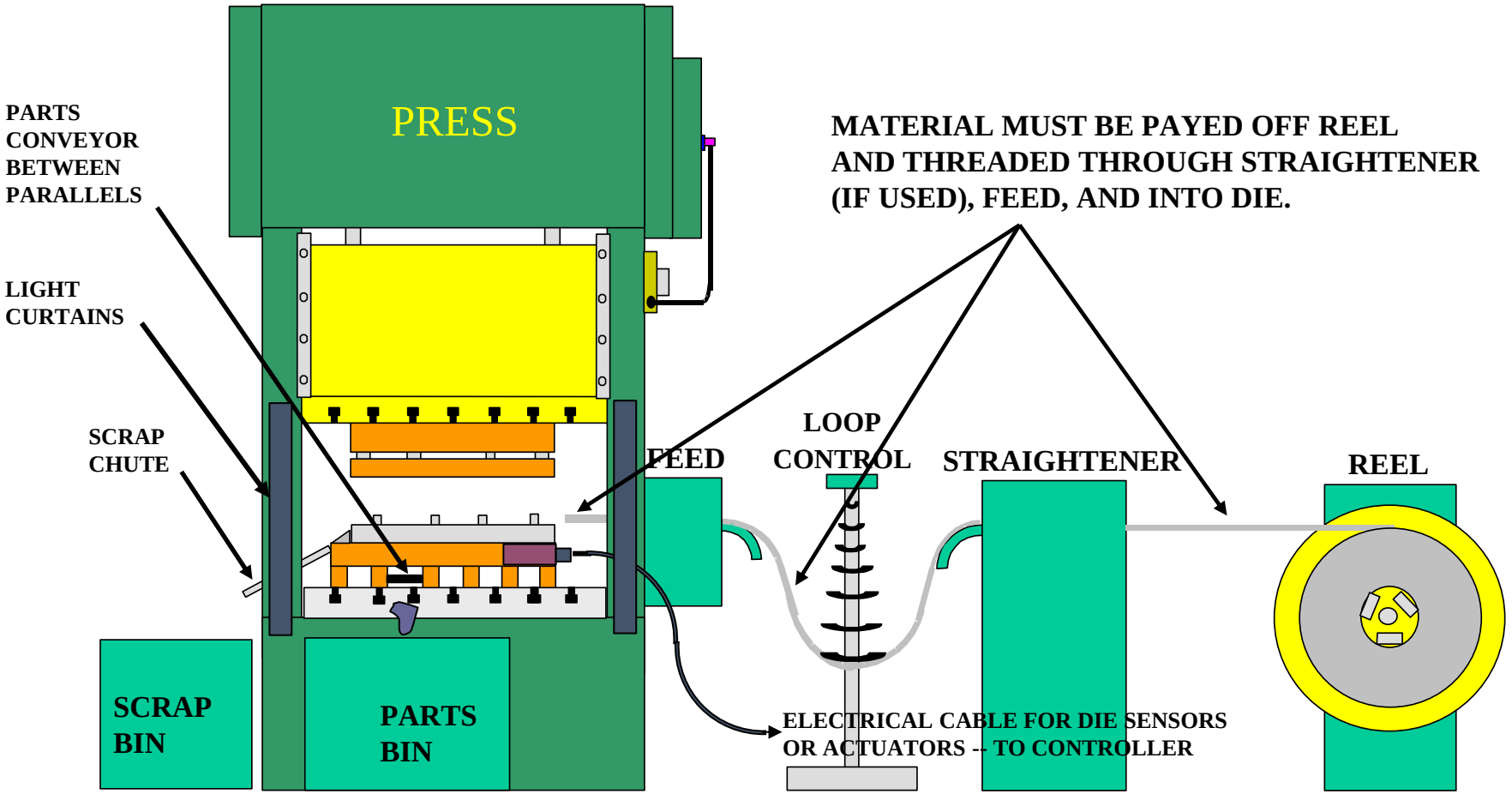
RISK REDUCTION: DEVELOPMENT OF PROCEDURES AND TRAINING FOR HANDLING EQUIPMENT. FOR ACTIVITIES SUCH AS PLACEMENT OF CHUTES OR CONVEYORS, IF PERSONNEL ARE SAFEGUARDING PROTECTS THESE ACTIVITIES, THEY MAYN BE ACCOMPLISHED WITHOUT ENERGY CONTROL.

- **MANUALLY FED AND AUTOMATIC BLANK FED PRESSES ALSO WILL OFTEN HAVE THE ITEMS RELATED TO NUMBER 2 ABOVE.**

SUBSEQUENT STEPS THAT MAY BE REQUIRED AFTER DIE INSTALLATION

SEE TASKS, HAZARDS AND RISK REDUCTION ON PREVIOUS PAGE.

COIL FED CONTINUOUS OPERATIONS



DIE CHANGE FOR PRESSES WITH ROLLING BOLSTERS

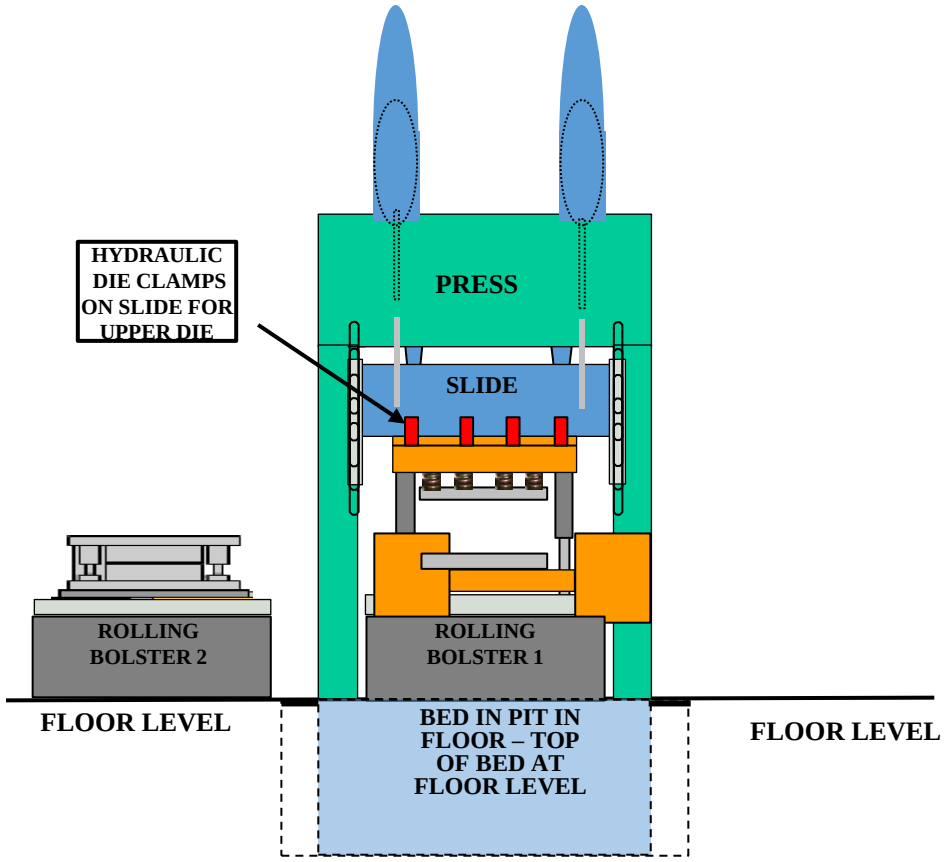


FIGURE 1. LAST JOB FINISHED. PRESS AT TOP OF STROKE

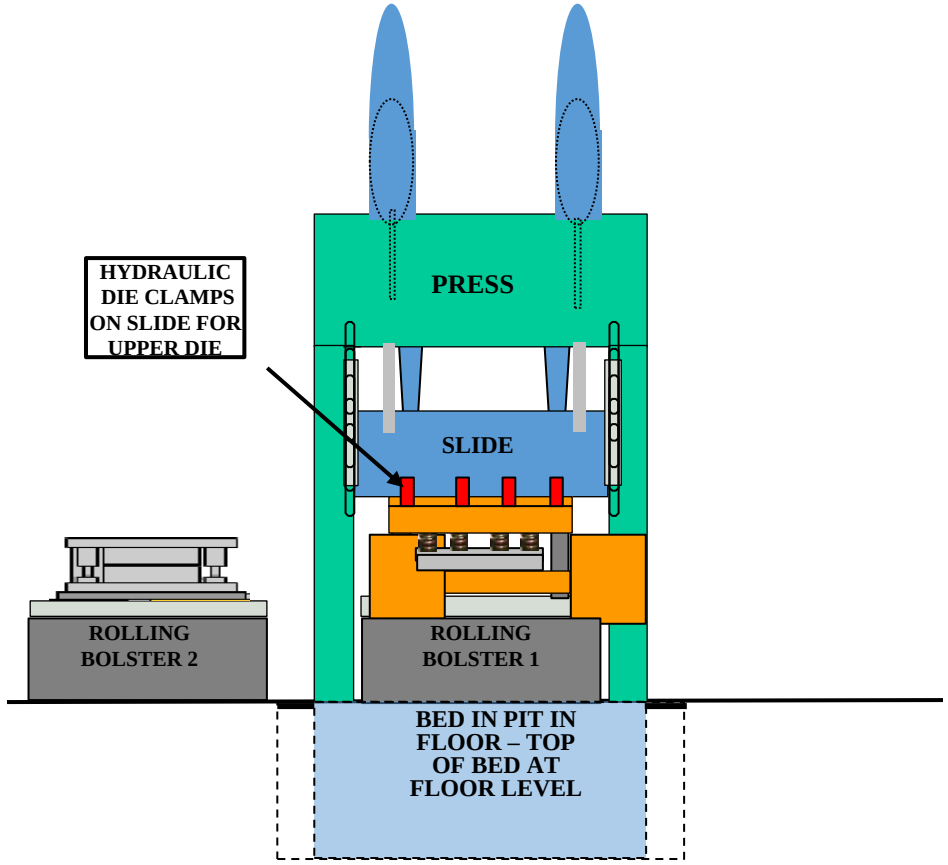


FIGURE 2. SLIDE HAS BEEN INCHED TO NEAR BOTTOM OF STROKE. UNCLAMP HYDRAULIC DIE CLAMPS ON SLIDE FROM UPPER DIE IN THIS POSITION.

DIE CHANGE FOR PRESSES WITH ROLLING BOLSTERS

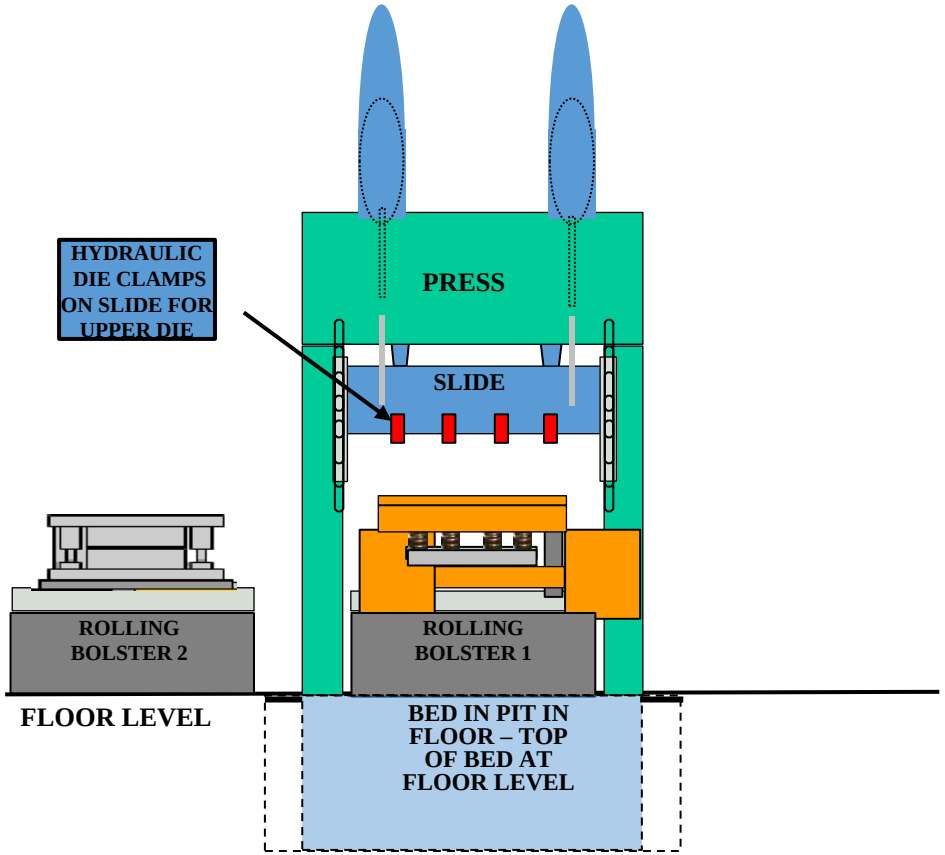


FIGURE 3. SLIDE INCHED BACK TO TOP OF STROKE TO GIVE CLEARANCE FOR BOLSTERS TO RAISE UP ON ROLLERS. THE SHUT HEIGHT OF THE PRESS IS ADJUSTED FOR THE DIES ON ROLLING BOLSTER 2 AT THIS POINT.

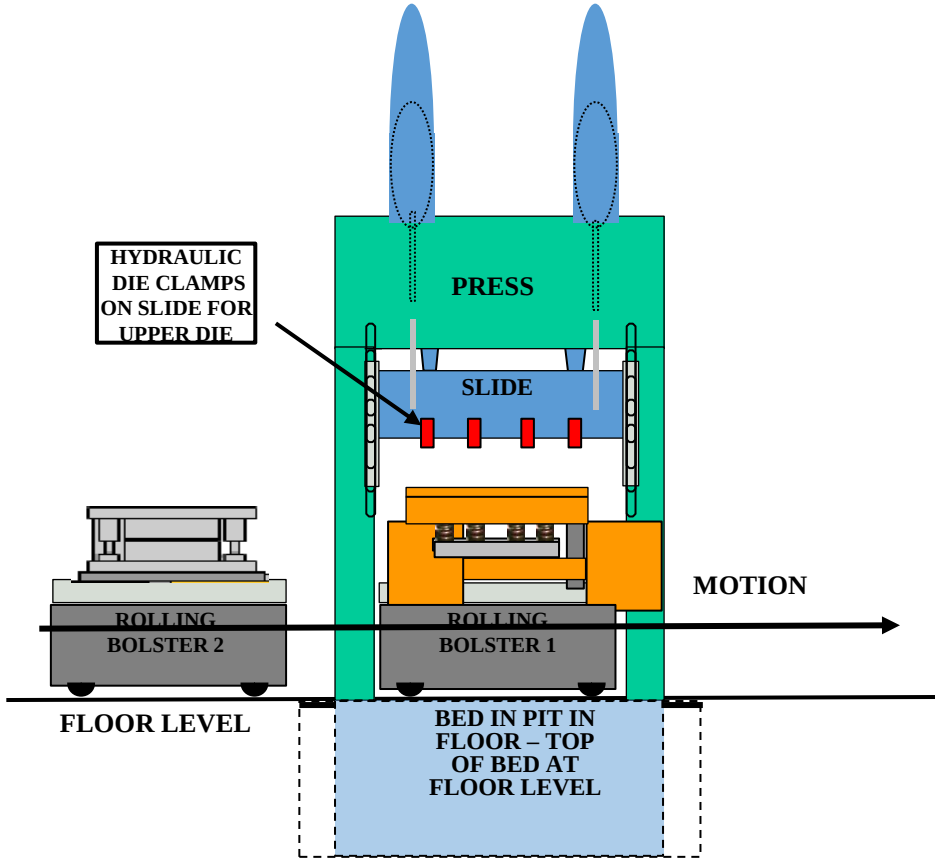


FIGURE 4. BOTH ROLLING BOLSTERS RAISE UP ON ROLLERS AND ROLL TO RIGHT.

DIE CHANGE FOR PRESSES WITH ROLLING BOLSTERS

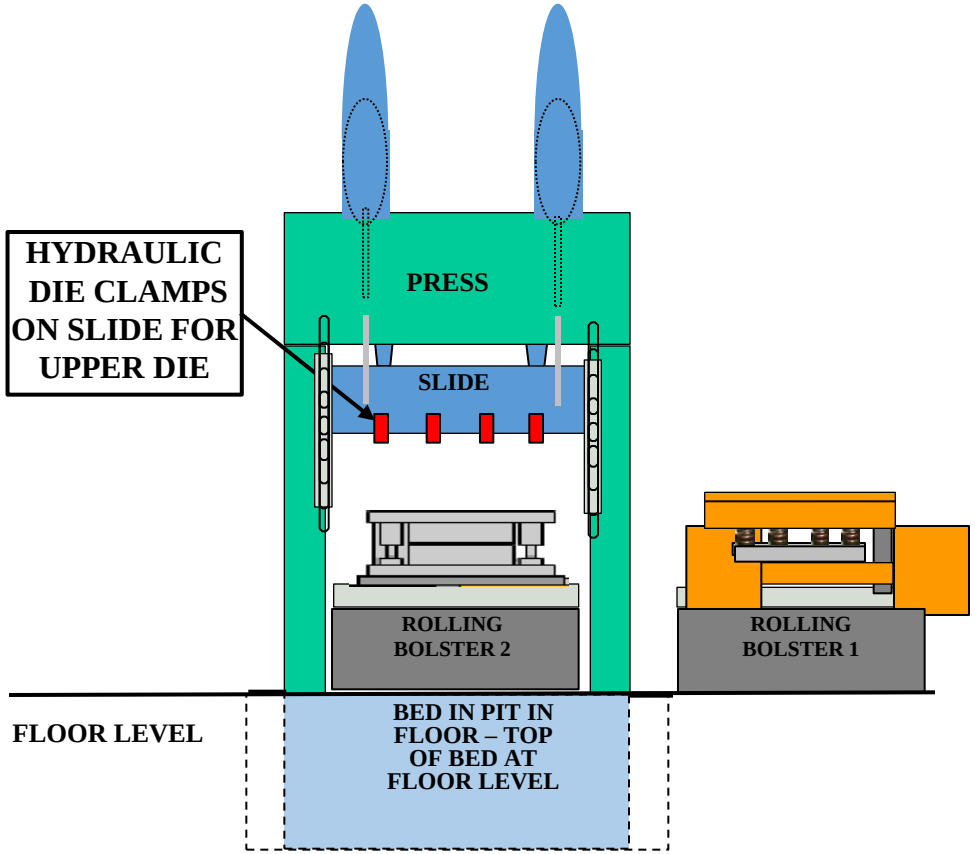


FIGURE 14. ROLLING BOLSTER 1 HAS ROLLED OUT TO ITS PARKING POSITION AND RETRACTED ITS ROLLERS. ROLLING BOLSTER 2 HAS ROLLED INTO THE PRESS BED, RETRACTED ITS ROLLERS AND LOCKED ITSELF IN POSITION ON PRESS BED.

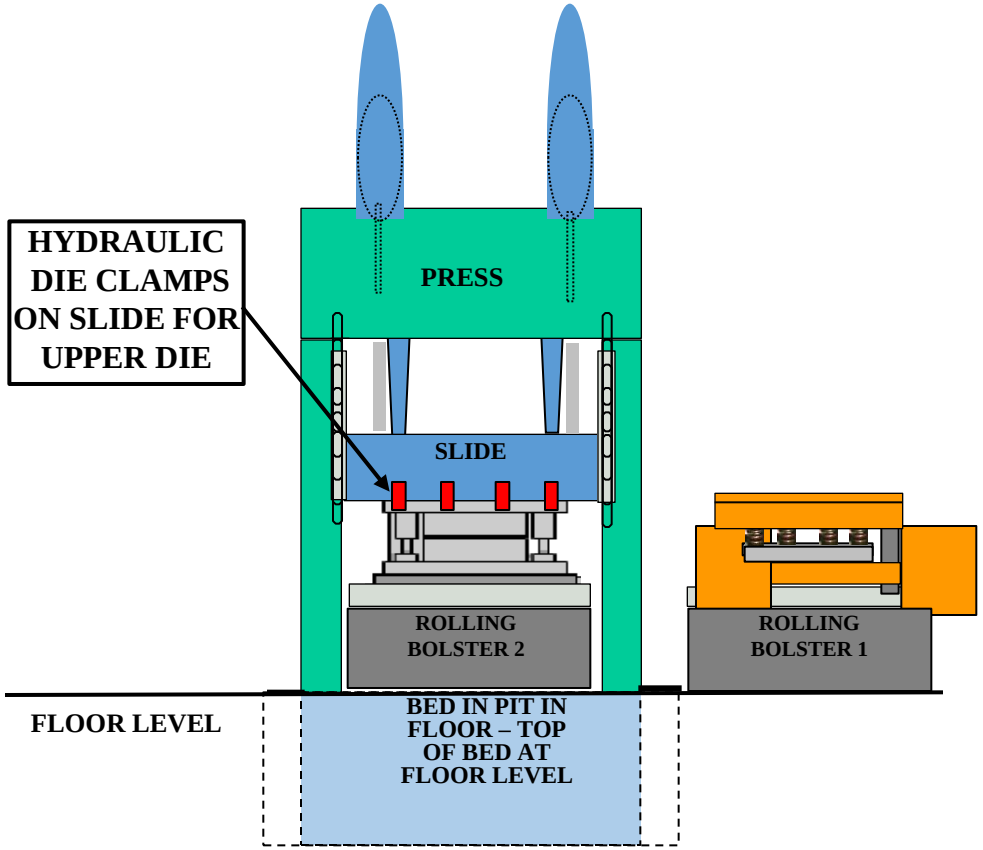


FIGURE 15. SLIDE IS INCHED BACK TO NEAR BOTTOM AND THE DIE SETTER USES HYDRAULIC DIE CLAMPS ON THE SLIDE TO CLAMP THE UPPER DIES TO THE SLIDE.

DIE CHANGE FOR PRESSES WITH ROLLING BOLSTERS

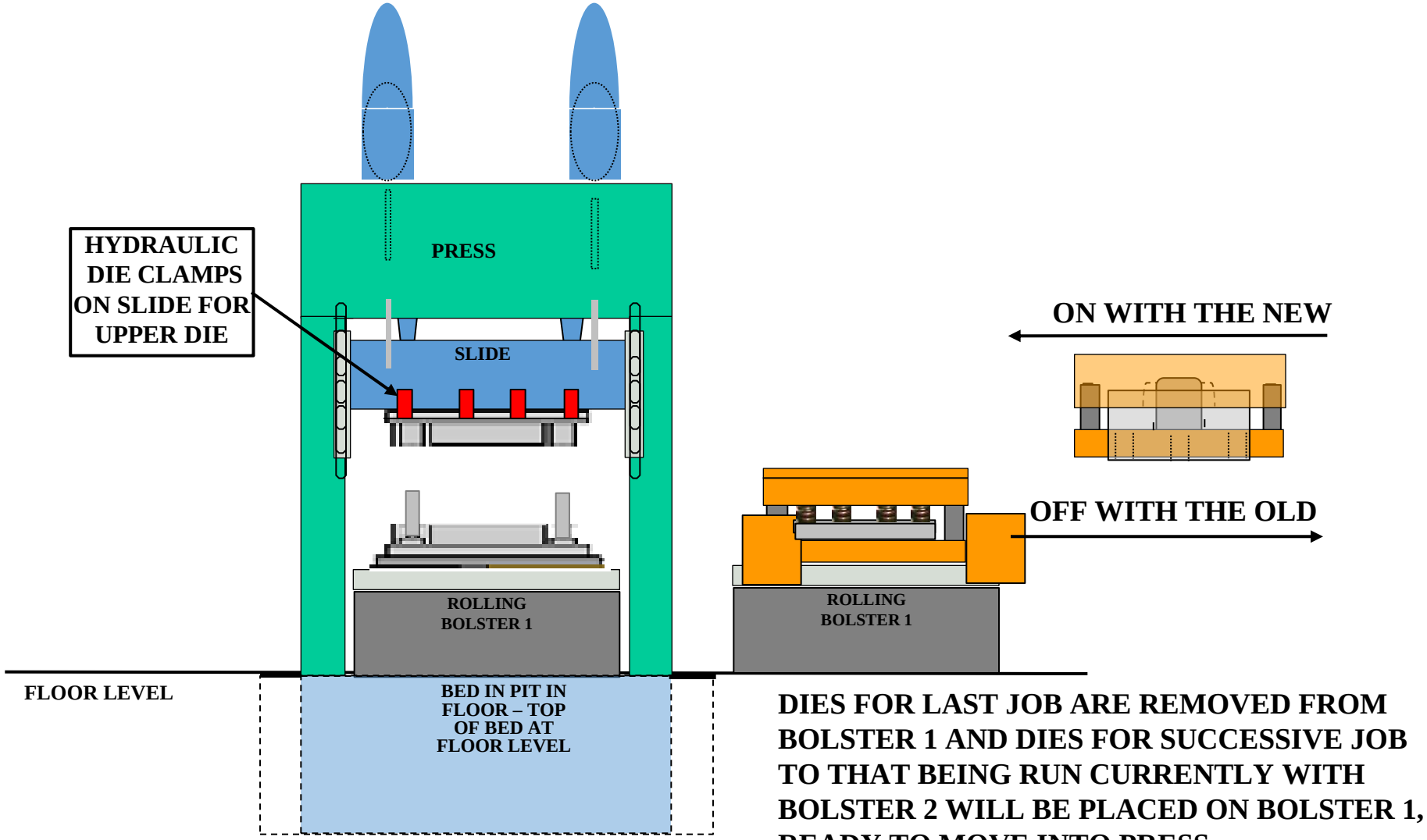


FIGURE 16. THE SLIDE IS INCHED BACK TO TOP, THE PRODUCTION MODE IS SELECTED AND THE DIE SETUP FOR NEW JOB IS COMPLETE.

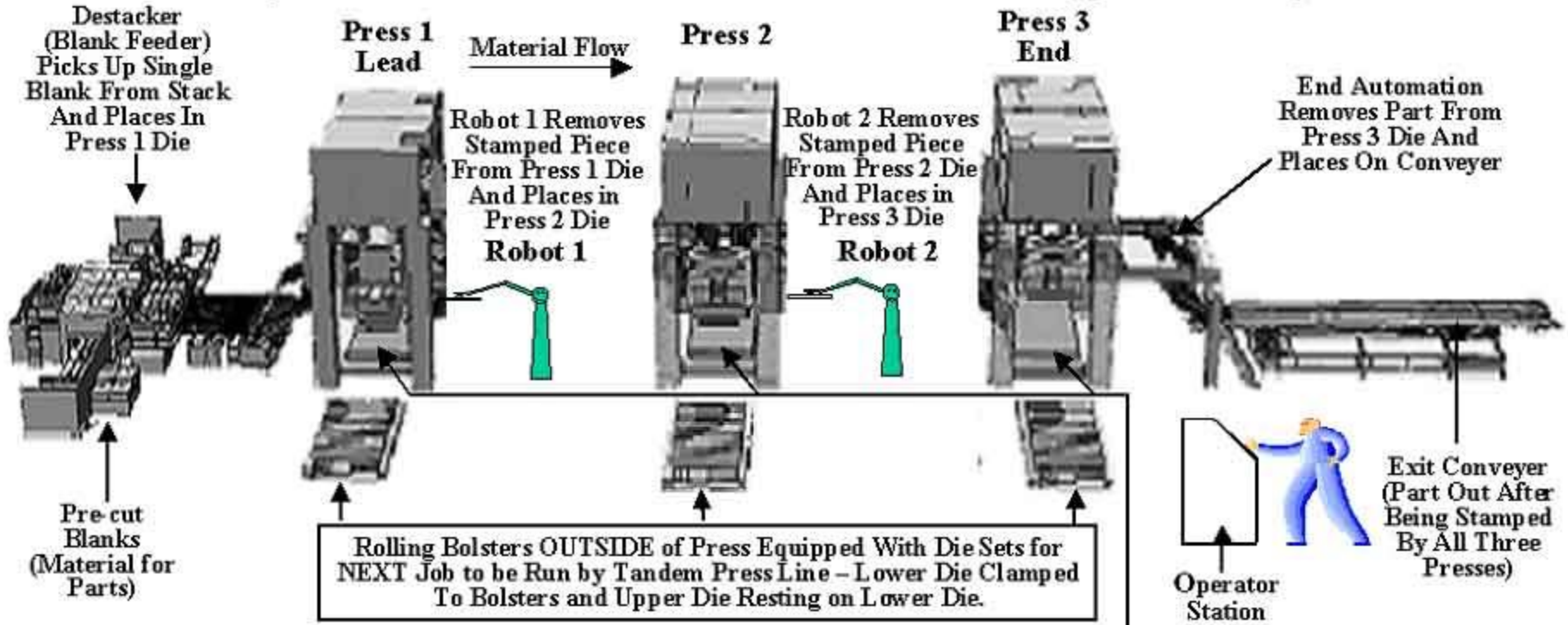
DIES FOR LAST JOB ARE REMOVED FROM BOLSTER 1 AND DIES FOR SUCCESSIVE JOB TO THAT BEING RUN CURRENTLY WITH BOLSTER 2 WILL BE PLACED ON BOLSTER 1, READY TO MOVE INTO PRESS.

THE NEXT FEW PAGES ULLUSTRATE TANDEM AND TRANSFER PRESSES DESIGNED AND EQUIPPED FOR AUTOMATIC DIE CHANGE (ADC).

With automatic die change, intelligent controllers communicate with each other through serial communication cables. Rolling bolsters are used with each press. When a part run is complete, the operator for the single or multiple press production system, enters the job i.d. for the next job in the master controller for the production system and all parameters to set up each press and each piece of feeding automation are sent to their individual controllers. The operator activates the die change sequence and the entire sequence proceeds automatically without further operator action until complete and ready to begin production with the new dies. Power must remain on at all times and this precludes lockout during ADC.

AUTOMATIC DIE CHANGE (ADC) SEQUENCE FOR 3 TANDEM PRESSES WITH ROLLING BOLSTERS

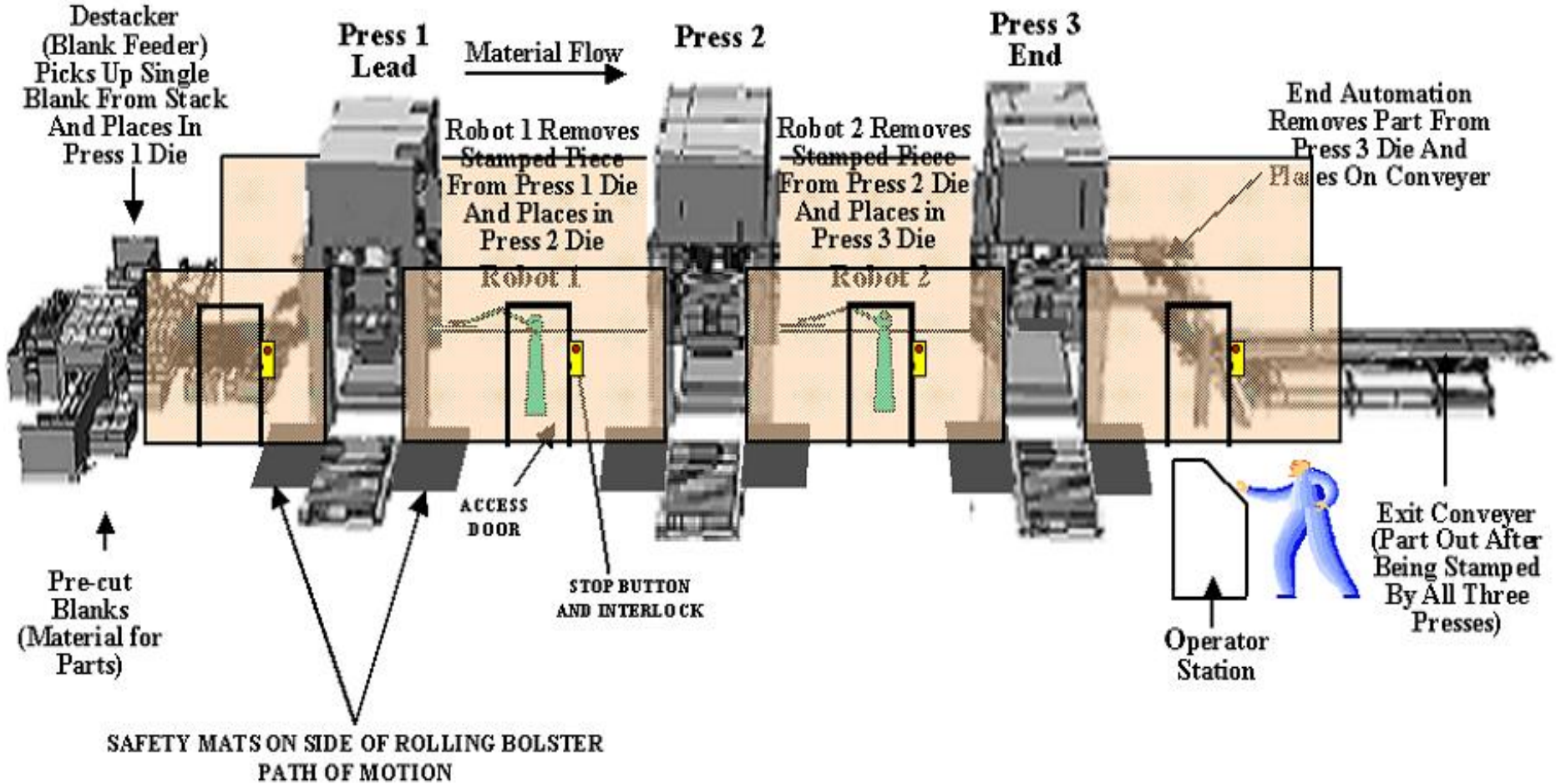
1. When the last part of the current job (production run of a particular part) comes out on the conveyer and dies must be changed to produce parts for the next job, the operator uses a personal computer or other intelligent operator terminal at his operator station enter the job number for the next operation and Initiates the automatic die change sequence. The operator terminal downloads previously stored parameters (recipe) for the new job to each individual intelligent press control and to robot and other automation intelligent controls to program press shut height and automation motion characteristics for the job.
2. After download of parameters is complete, each of the 3 presses strokes to the bottom of stroke position and stops, with upper die resting on lower die.
3. When the control for each press senses that the slide is at the bottom position, the hydraulic die clamps on the press slide automatically release the upper die.
4. Once upper dies are released, each presses slide automatically returns to the top of stroke, each rolling bolster IN THE PRESSES unlocks from the press bed, lifts up on rollers, and starts rolling out of the far side of the presses as the rolling bolsters OUTSIDE OF THE PRESSES start rolling into the presses with the dies for the new job. During this time the intelligent controls for the press automatically adjust the SHUT HEIGHT of each press to fit the new dies and robot and other automation is programmed for the new job automation based on the downloaded values of item 1.
5. When each rolling bolster carrying the new dies is in place in the press bed, it lowers and locks itself to the bed, the press slides then automatically stroke to the bottom of stroke and stop, the Hydraulic die clamps on the slide automatically clamp the upper die to the slide, and each slide then automatically returns to top.
6. Die change sequence is now complete. The operator selects and initiates the production mode. Automation automatically feeds and transfers material through the presses and the presses automatically stroke when automation has pieces in place in dies and automation is clear of the die area. Sequence can take as little as 4 to 6 minutes from production to production. POWER IS NEVER OFF, as electrical controls automatically perform the entire sequence.



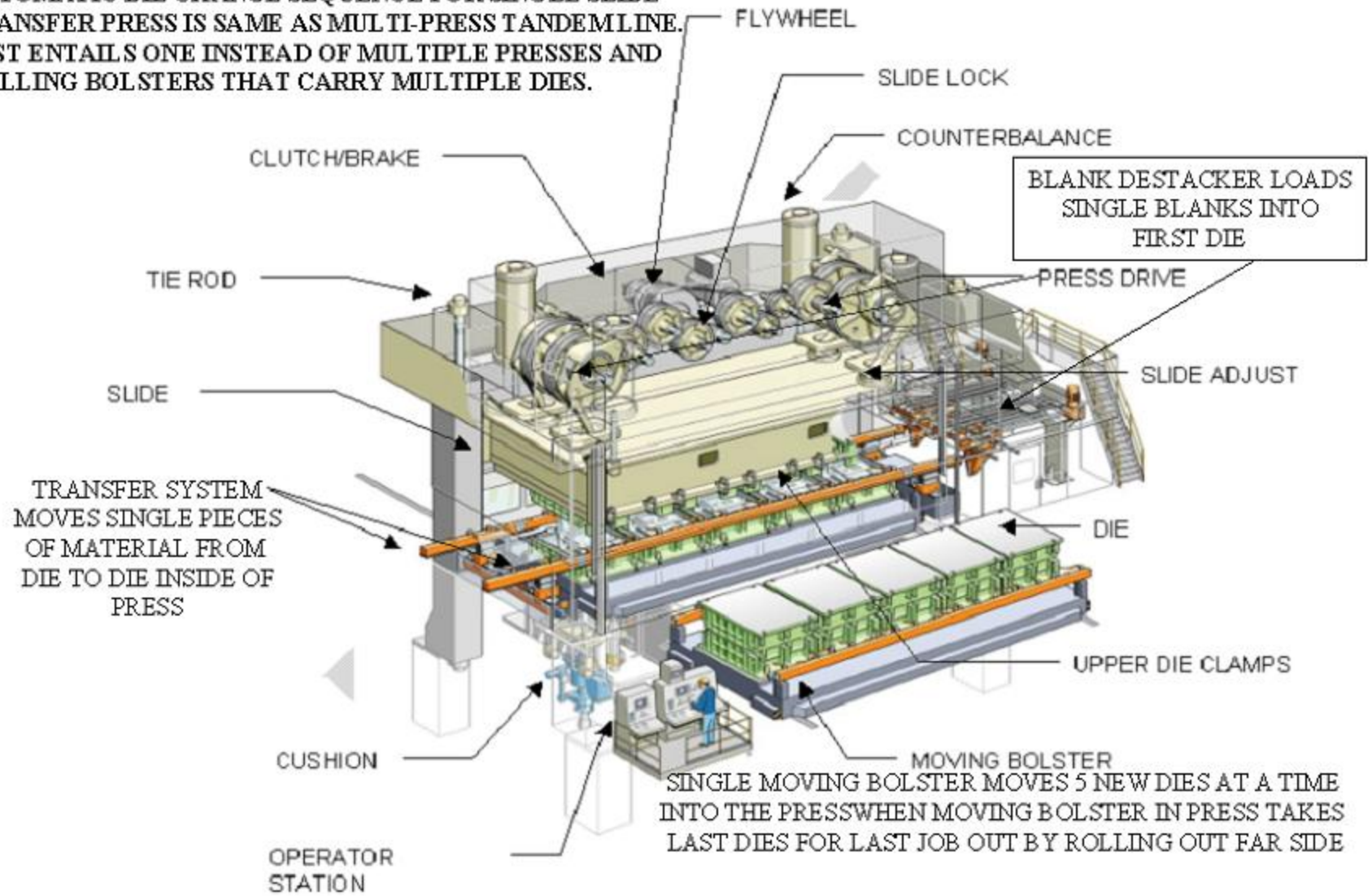
Guarding Removed For Clarity of Illustration

Rolling Bolsters INSIDE of Presses are Down and Locked to Floor Level Top of Press Bed (Bed in Pit in Floor) With Lower Dies Still Attached to Bolsters. Upper Dies are Attached to the Press Slides by Hydraulic Die Clamps. The Bolsters and Dies Inside the Press Run the CURRENT Job.

THREE TANDEM PRESS LINE WITH FEED AUTOMATION AND ROLLING BOLSTERS WITH PERIMETER SAFEGUARDING



AUTOMATIC DIE CHANGE SEQUENCE FOR SINGLE SLIDE TRANSFER PRESS IS SAME AS MULTI-PRESS TANDEM LINE. JUST ENTAILS ONE INSTEAD OF MULTIPLE PRESSES AND ROLLING BOLSTERS THAT CARRY MULTIPLE DIES.



SINGLE SLIDE TRANSFER PRESS
(With perimeter guards removed)

SAFETY IN AUTOMATIC PRESS PRODUCTION SYSTEMS

FACTORS THAT COULD EXPLAIN HIGHER THAN EXPECTED AUTOMATED PRESS PRODUCTION SYSTEM INJURIES

- According to compiled 1977-1983 OSHA accident statistics, about 19 or 20% of reported accidents happen when persons try to correct abnormalities in the production process. Stuck work pieces or scrap, misfeeds, coil buckles, slugging, die crashes, dropped pieces by transfers, and numerous other conditions on automated presses can require corrective intervention by personnel. Many accidents on automated presses occur as people try to correct problems.

AUTOMATION ASSOCIATED WITH DIE CHANGE

- Rolling bolsters are often used on large presses to reduce die change times to several minutes, as opposed to hours.

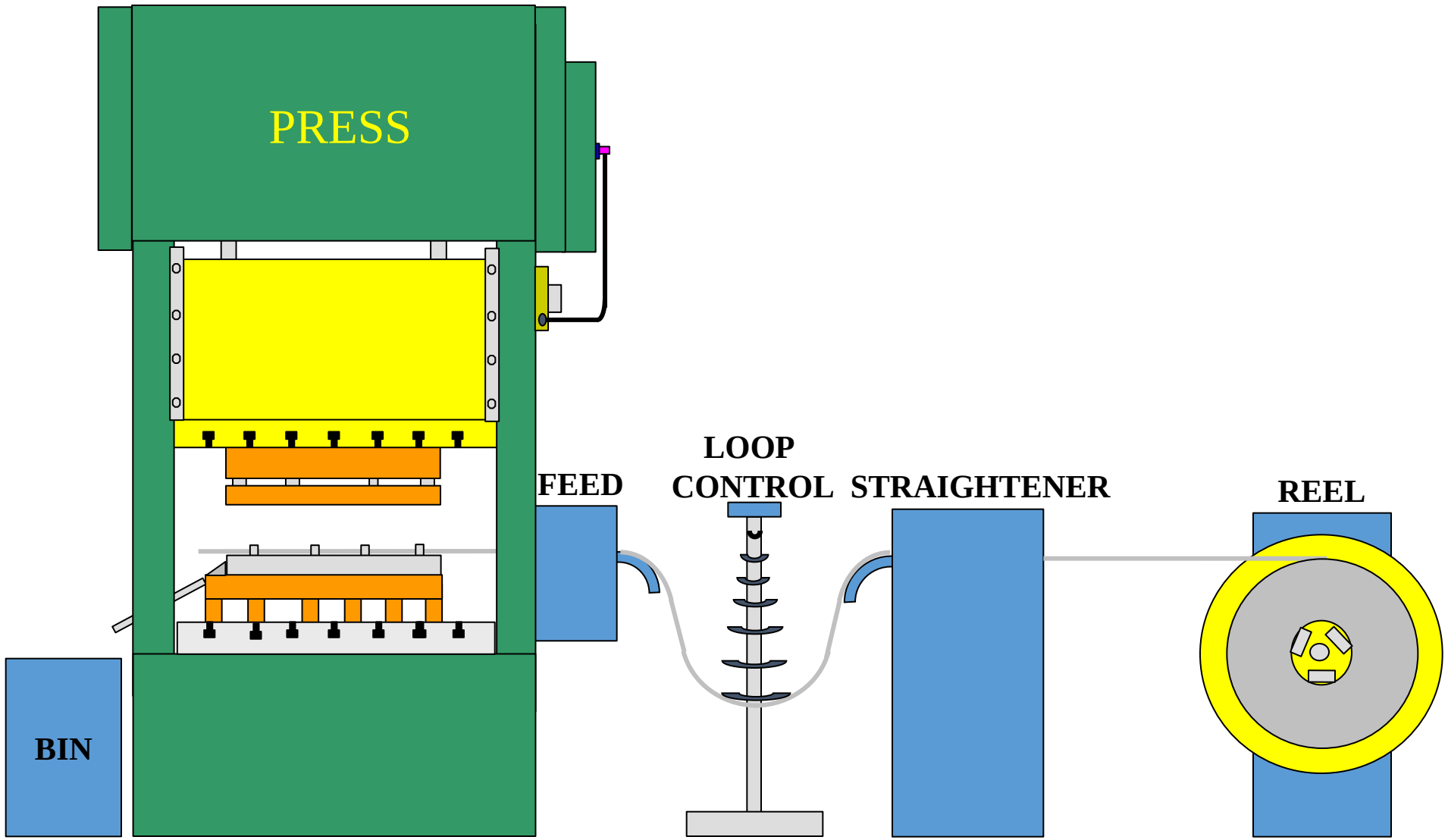
GENERAL PRODUCTION MODE GUARDING CONSIDERATIONS OF AUTOMATED PRESS SYSTEMS VS. MANUALLY FED

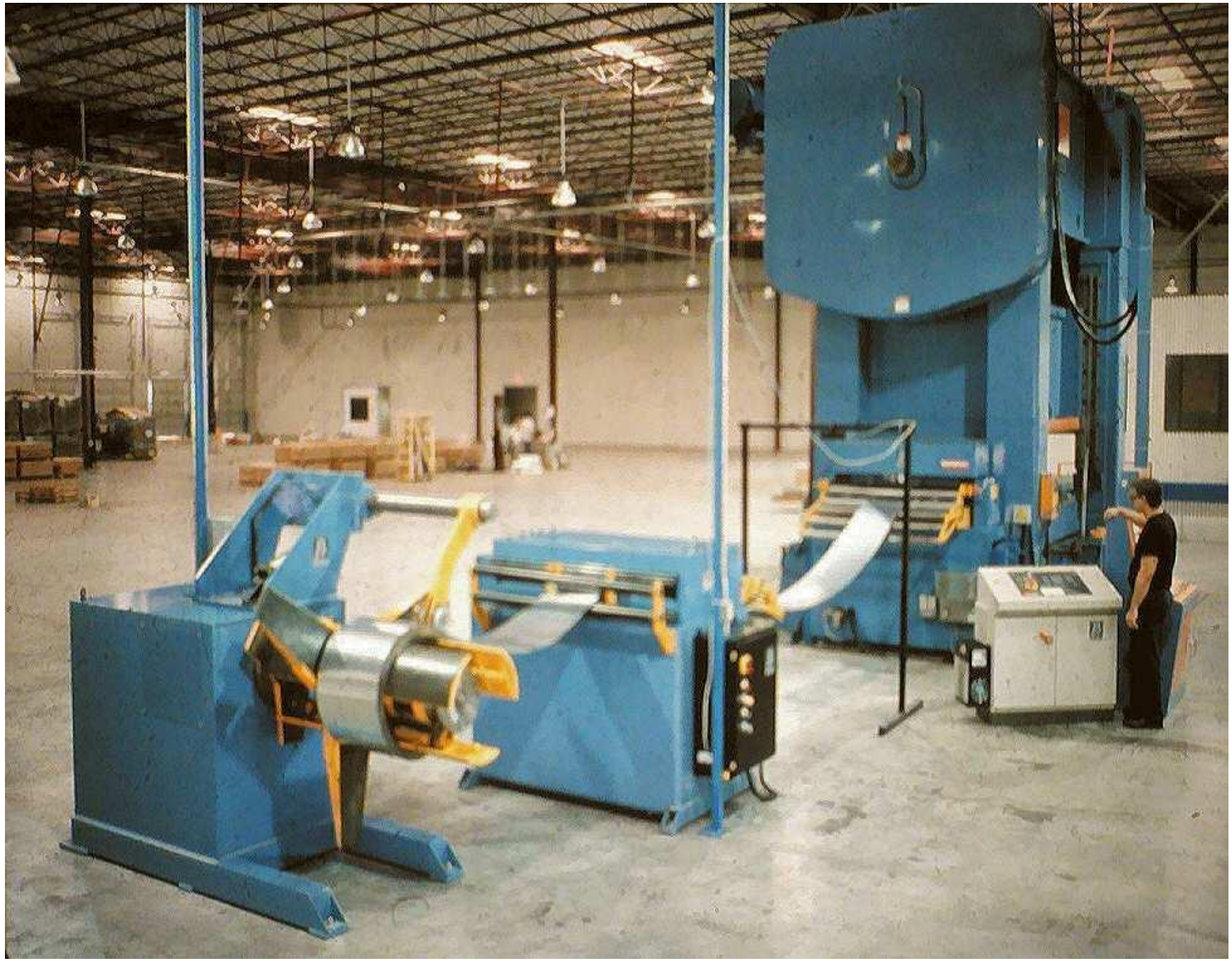
- It may not be safe to mute (de-activate) light curtains in the press upstroke where automation feeds, transfers or removes material in the dies as is often done for manual feeding. Such automation generally starts action in the upstroke. A person may be injured by the automation movement or the material itself if they reach into the path of automation or material movement through a muted light curtain that doesn’t stop the press and its automation.

HOW AUTOMATION IS DRIVEN MAKES A DIFFERENCE

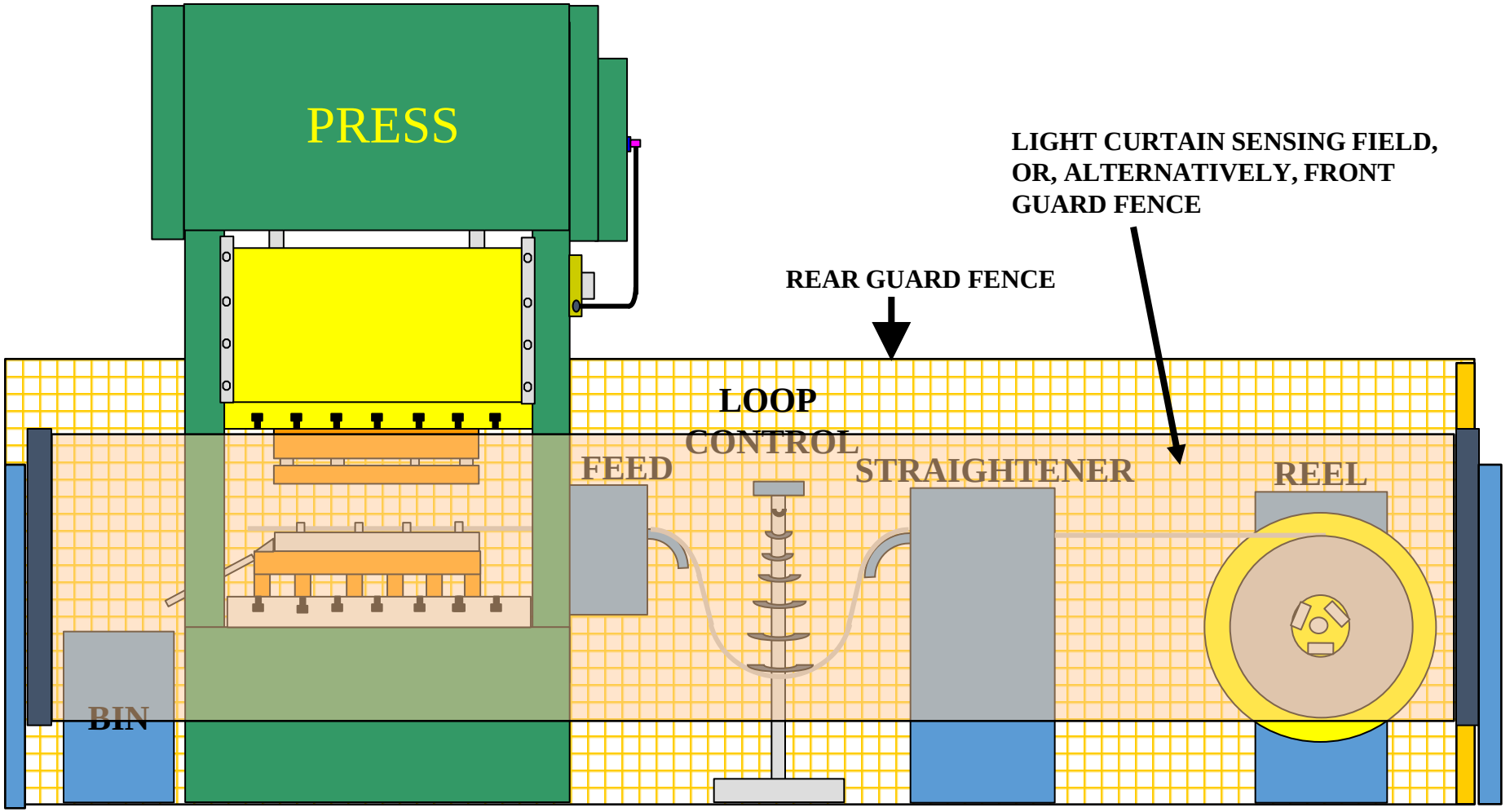
- Because of their greater ease of setup and increased productivity, feeds, transfers, loaders and un-loaders that are independently driven by servo motors or other drives predominate today. This means that the press stroking control, press stroke position, and the separate controls for the automation must be interfaced, sequenced, and interlocked. Also, the activation of a stop control or any safety device should send stop signals to the separate automation controls when dictated by hazard analysis of the system as well as to the press clutch/brake control.

COIL FED CONTINUOUS OPERATIONS



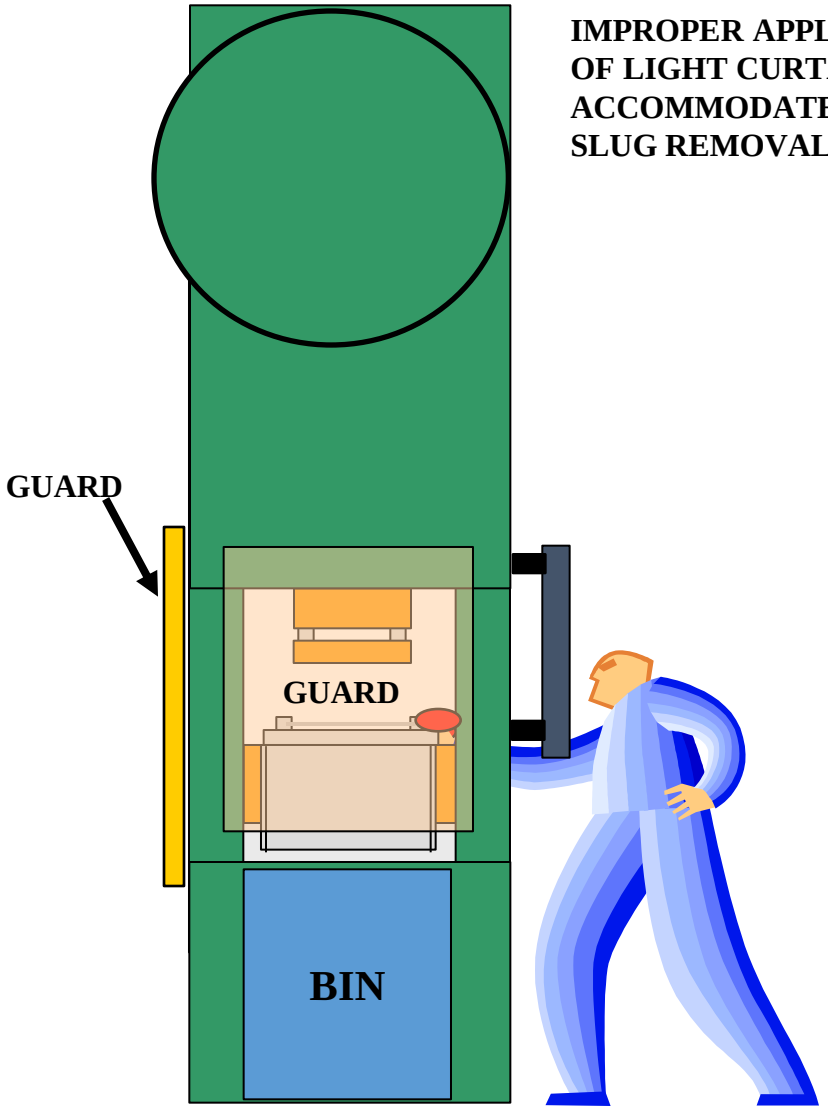


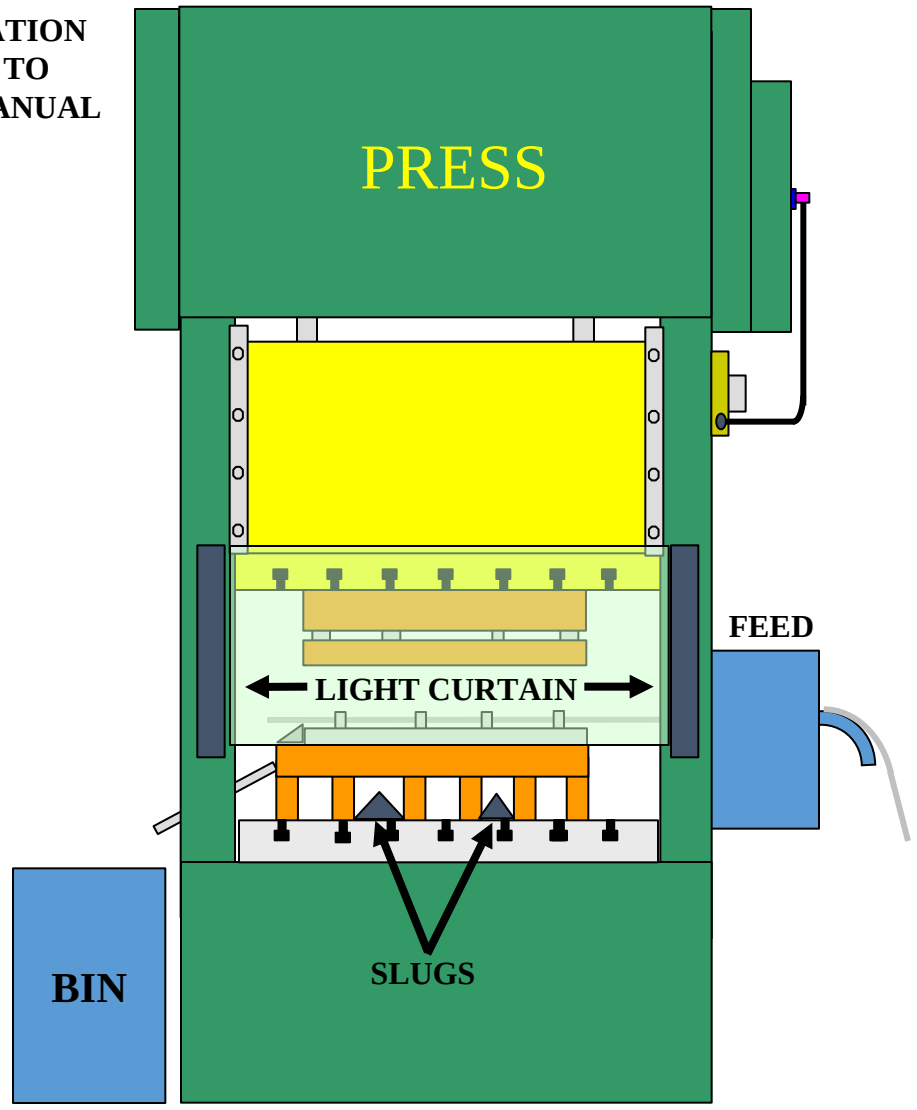
COIL FED CONTINUOUS OPERATIONS



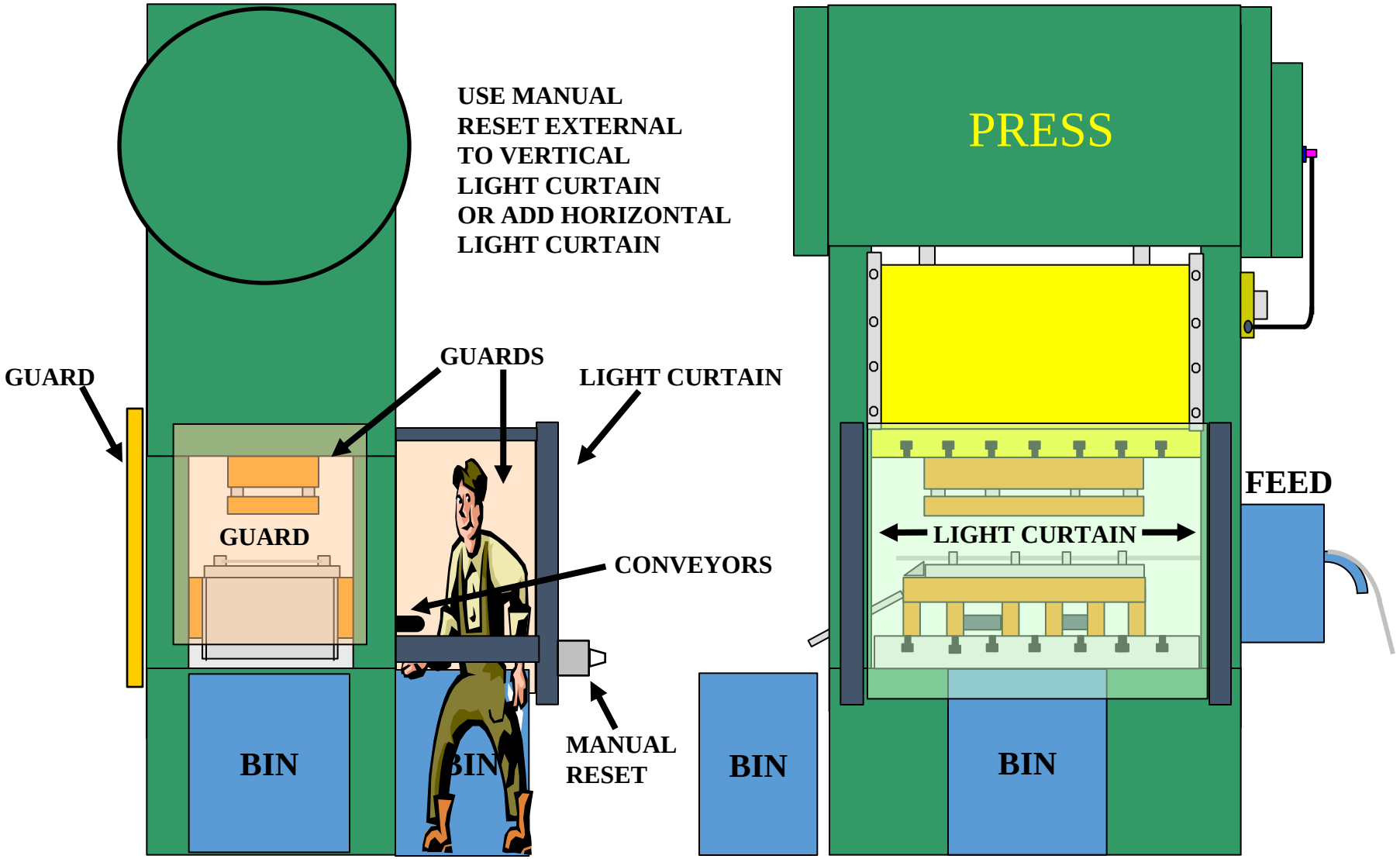
COIL FED CONTINUOUS OPERATIONS

IMPROPER APPLICATION OF LIGHT CURTAIN TO ACCOMMODATE MANUAL SLUG REMOVAL.

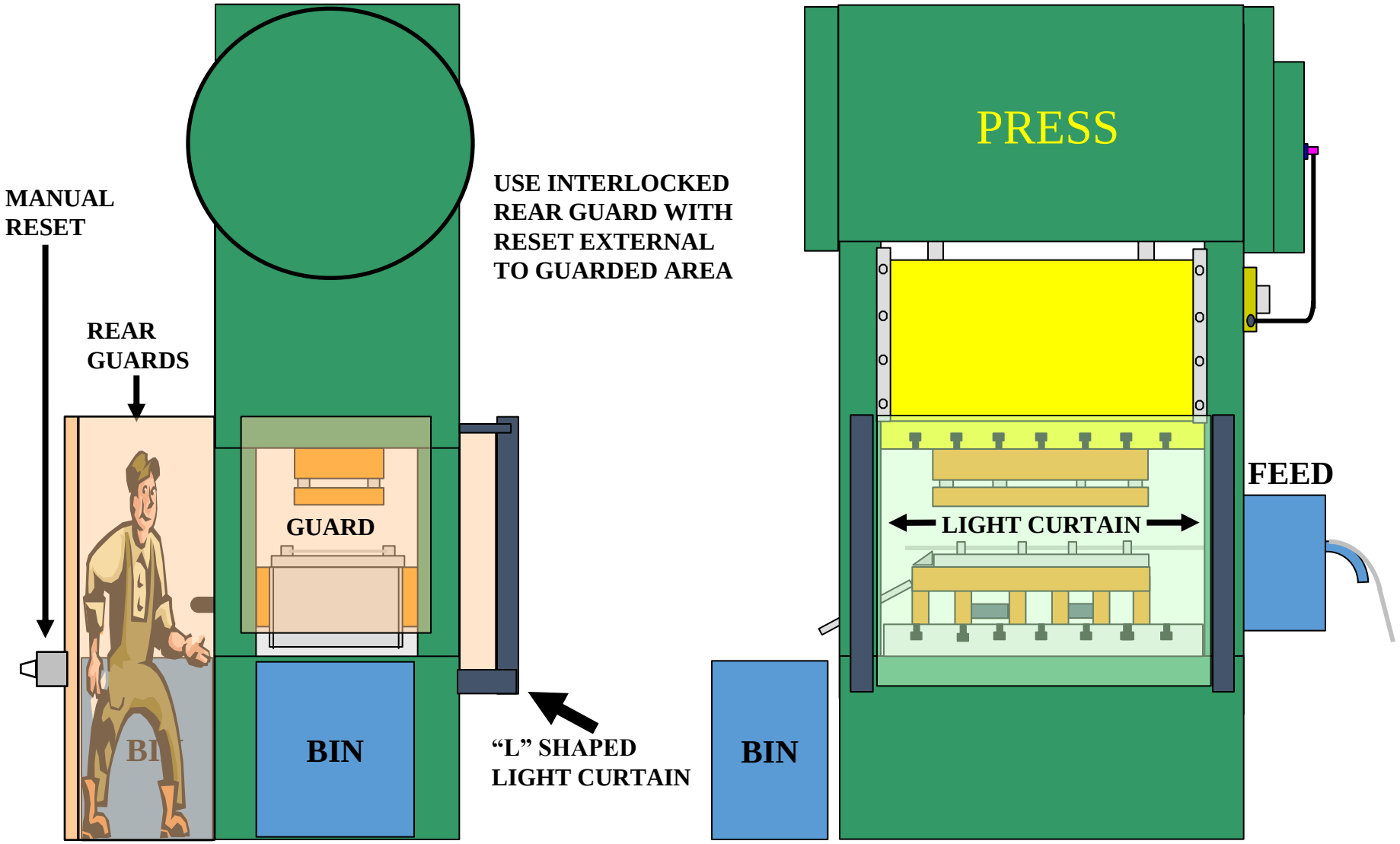




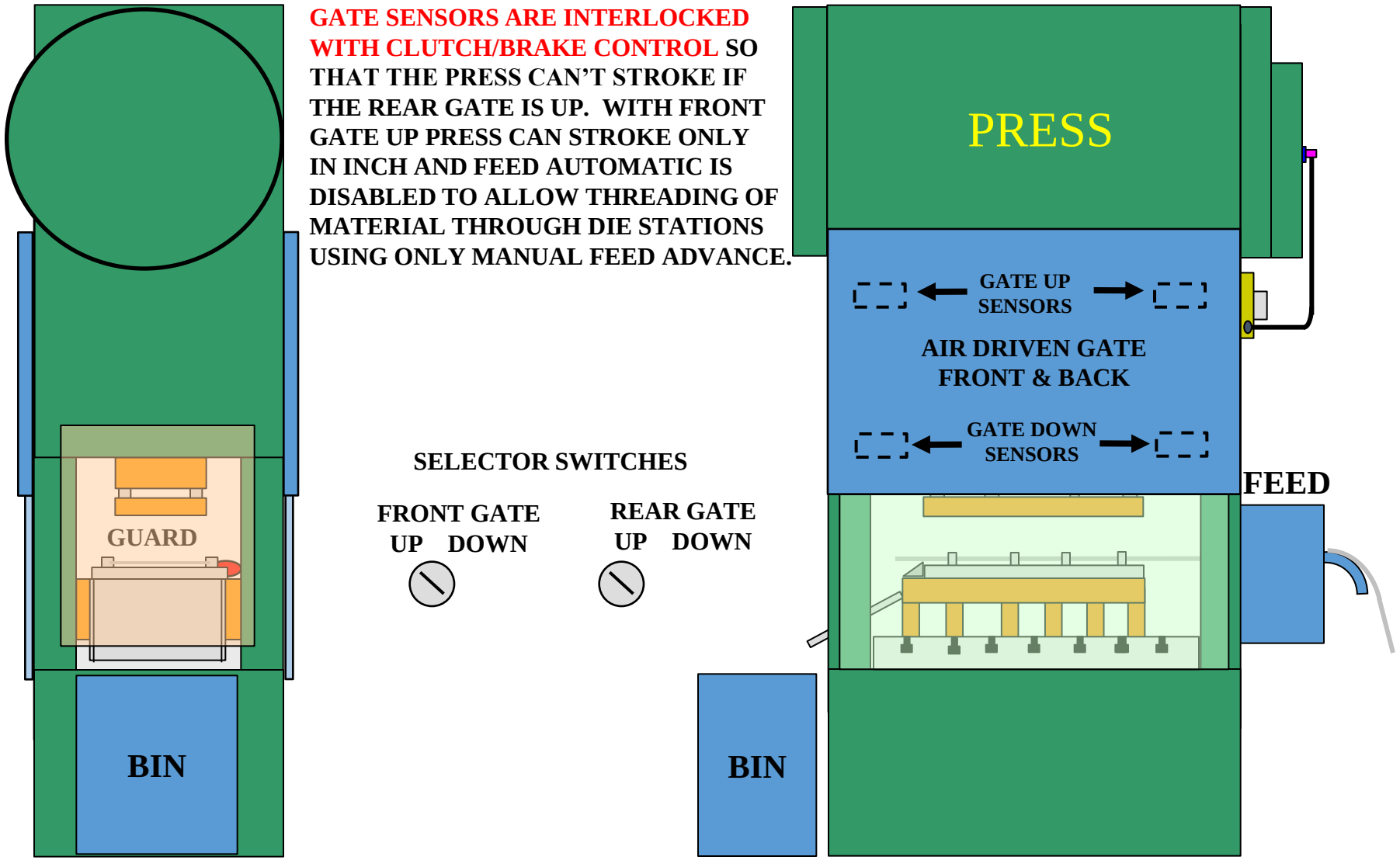
COIL FED CONTINUOUS OPERATIONS



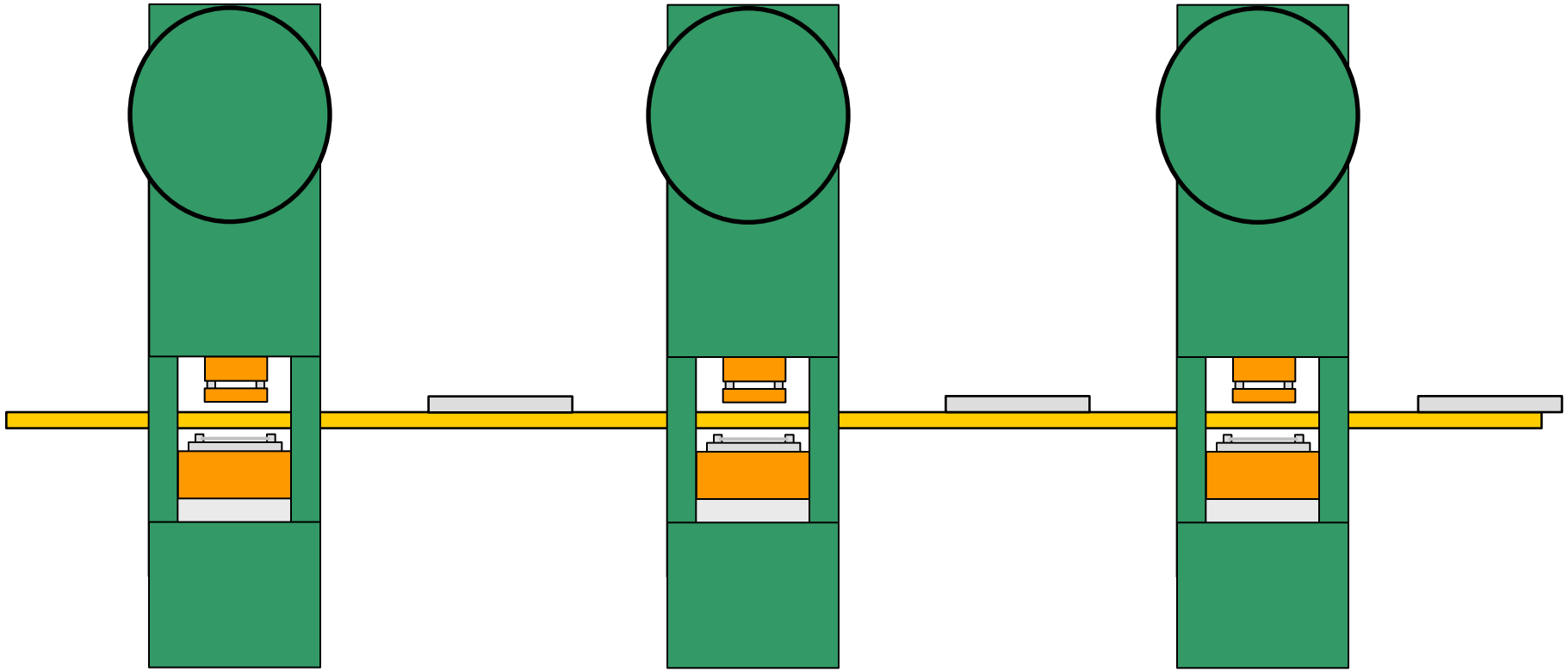
COIL FED CONTINUOUS OPERATIONS



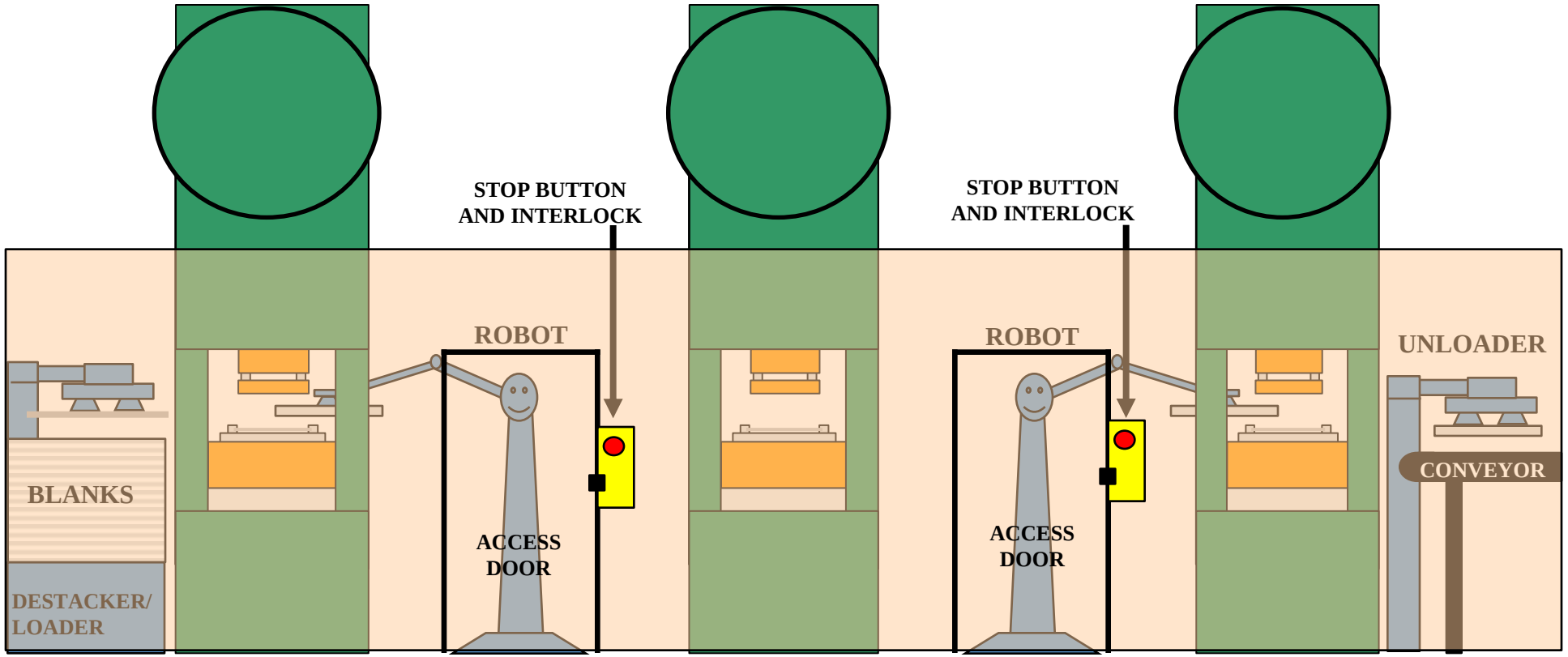
COIL FED CONTINUOUS OPERATIONS



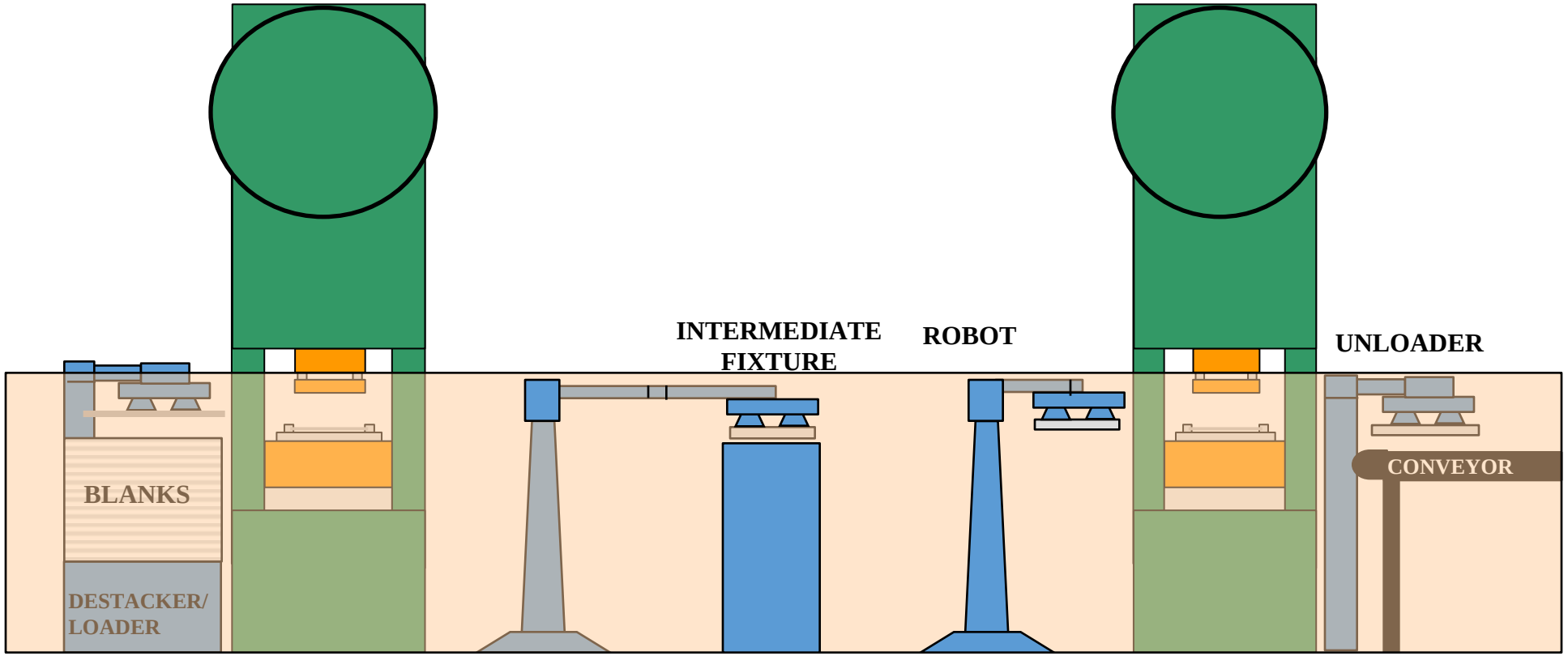
RAIL TYPE SHUTTLE TRANSFER
FOR TANDEM PRESSES



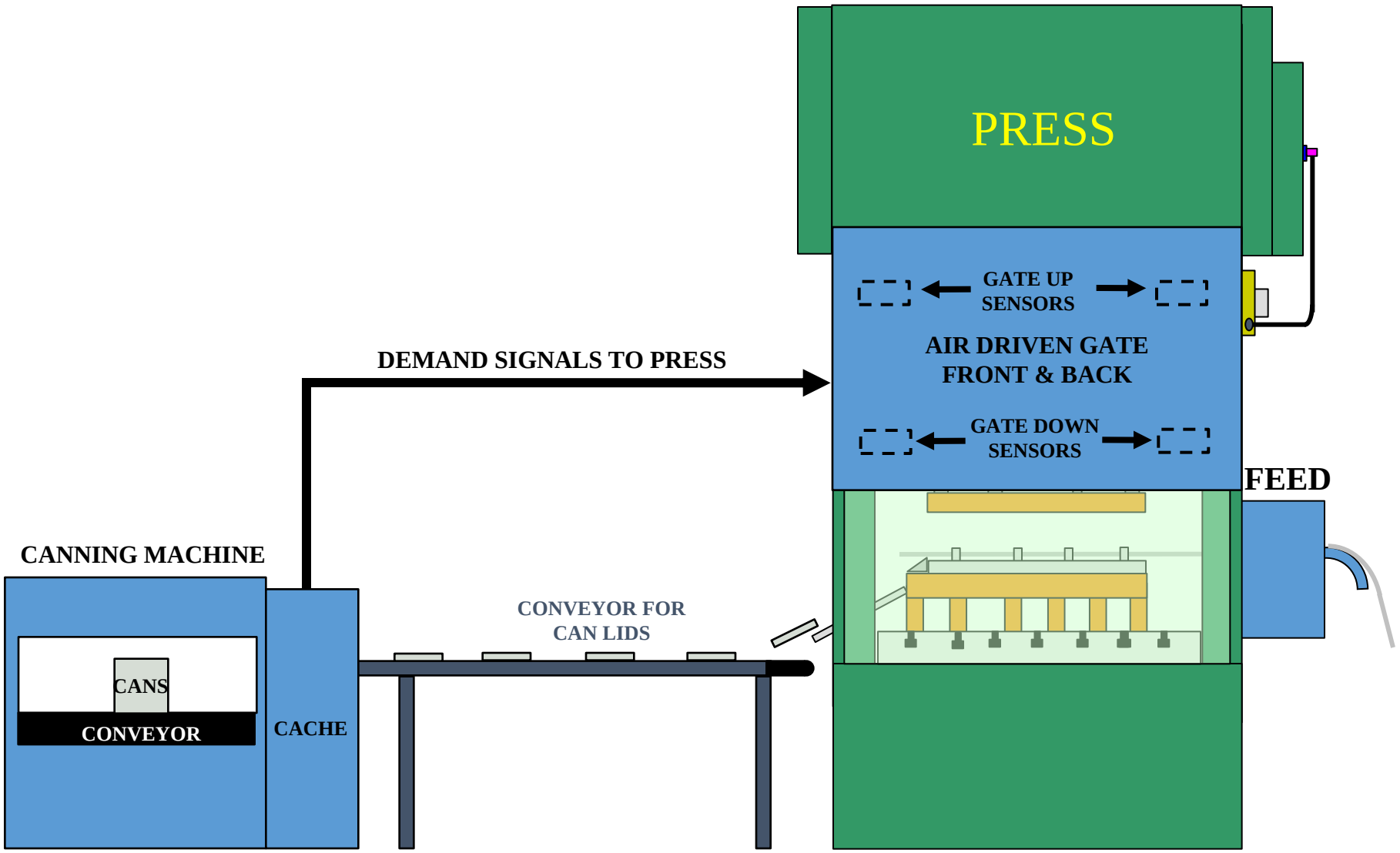
TANDEM PRESSES WITH ROBOTIC TRANSFER

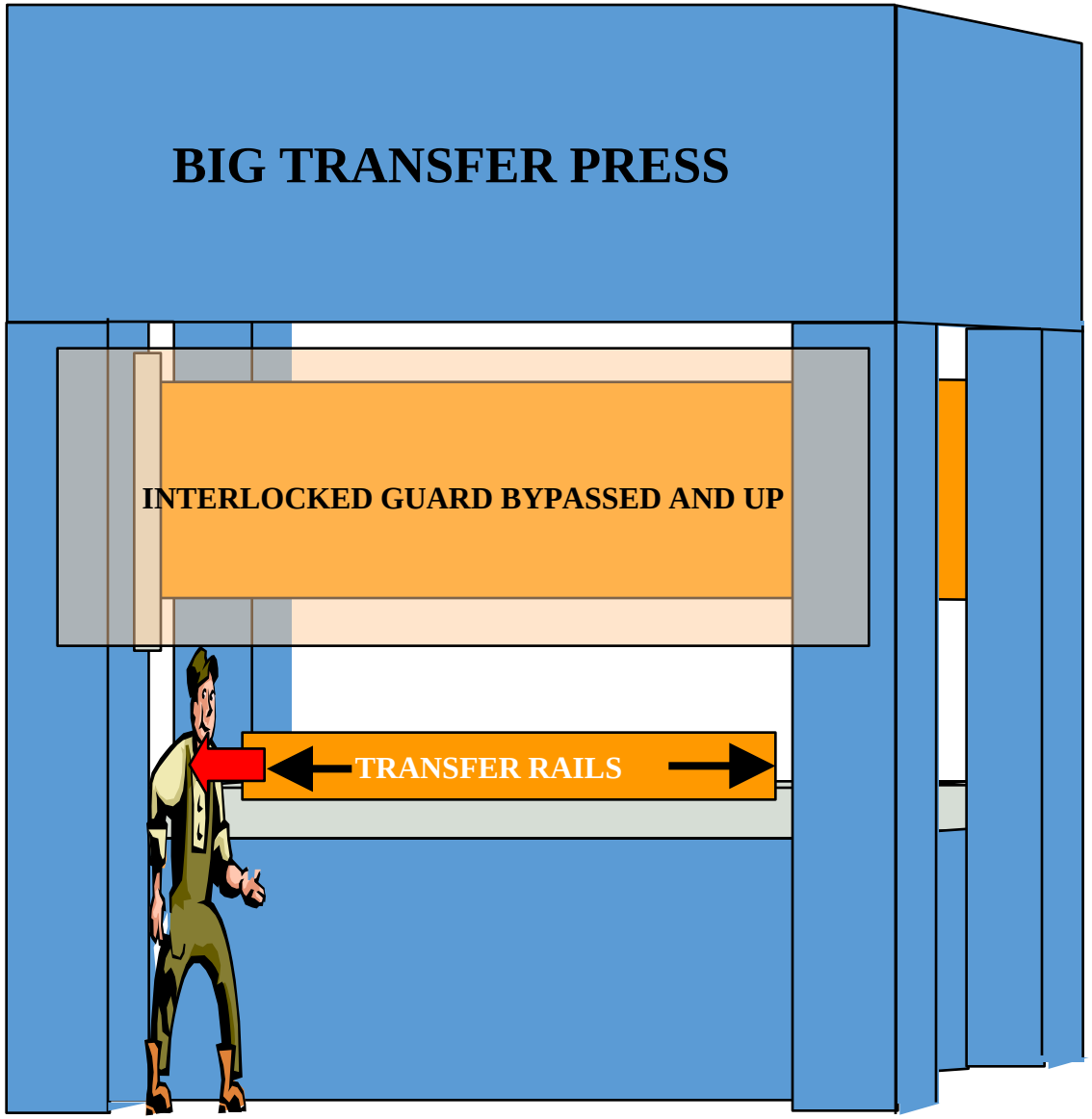


TANDEM PRESSES WITH TRANSFER TO INTERMEDIATE STATIONS



COIL FED CONTINUOUS ON DEMAND OPERATIONS




BIG TRANSFER PRESS
INTERLOCKED GUARD BYPASSED AND UP
TRANSFER RAILS

PMA PRECISION METALFORMING ASSOCIATION
TECHNICAL TRAINING

Record Keeping

OSHA 1910.217(e)(1)(i) Periodic + Regular Inspections for MPP

MISCELLANEOUS PRESS INFORMATION

SAMPLE PRESS INSPECTION REPORT

Company _____

Building _____ Department _____ Press No. _____

Parts Inspected	✔ OK	Defective Condition	Corrective Action	Date Repaired
1. Frame				
2. Motor				
3. Flywheel				
4. Gears (if applicable)				
5. Crankshaft				
6. Clutch				
7. Brake				
8. Ram and Gibs				
9. Connection (Pitman) and Ram Adjusting Screw				
10. Slide Counterbalance (if furnished)				
11. Air System				
12. Electrical System				
13. Foot Switch				
14. Point-of-Operation Safeguarding				
A) Guard				
B) Presence-Sensing (Light Curtain or Radio Frequency)				
C) Pullback (Pullout)				
D) Type A or B Gate (Movable Barrier)				
E) Restraint (Holdout)				
F) Two-Hand Trip or Control				
15. Miscellaneous				
Inspected by:		Date	☐ Approved for Use	☐ Not Approved

List Press Auxiliary Equipment here

See guide on next page

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MISCELLANEOUS PRESS INFORMATION

GUIDE FOR THE INSPECTION OF MECHANICAL POWER PRESSES

Inspection of	*Inspect for Code Violations, defects, missing parts, malfunctions, maintenance
1. Frame	Cracks? Broken or loose parts? Loose hold down bolts?
2. Motor	Clean? Lubrication? Overheating?
3. Flywheel	Rotates in correct direction? Free running? Covered?
4. Gears	Loose? Broken or cracked teeth? Excess noise? Proper lubrication? Covered?
5. Crankshaft	Cracks? Bent? Proper clearance in bearings?
6. Clutch	Full-revolution: single-stroke capability, loose or worn parts, including linkage? Weak or broken springs? Compression springs operating on rod, or guided within hole or tube? Properly adjusted? Part-revolution: air or oil leaks? Proper alignment? Disengagement? Stopping position? Worn clutch lining? Weak or broken springs? Power or air pressure failure or deactivation? Momentary operation of stop control applies brake and releases clutch? Retripping required? Red stop button?
7. Brake	Brake lining worn? Brake properly adjusted? Does it stop slide quickly? Are friction brakes set with compression springs operating on rod, or guided within a hole or tube?
8. Ram and gibs	Face of ram parallel to bolster? Proper gib clearance? Any scoring?
9. Connection (pitman) & ram adjusting screw	Proper bearing and ball seat clearances? Screw turns freely?
10. Ram counterbalance	Spring type: proper adjustment? Broken springs or loose nuts? Pneumatic type: air leakage? Proper air pressure? Loose connection to slide?
11. Air system	Proper air pressure? Valve operation? Pressure gauges? Leaks?
12. Electrical system	Can main power switch be locked only in off position? Grounding? Condition of wiring? Relays? Rotary limit switches? Solenoids? Motor starter disconnects from voltage fluctuation or power failure? Retripping required? Is any component bypassed?
13. Foot switch	Nonslip pad on contact area? Shielded from accidental operation?
14. Point-of-operation safeguarding	A) Guard - Barrier that prevents entry of operator's hands or fingers into the point-of-operation area? Adjustment and maintenance? Pinch points remaining in adjacent areas? B) Presence-Sensing (light curtain or radio frequency - part-revolution clutch only) - reliable design and proper electrical tie-in to control? Fixed at proper safety distance from pinch point? Barrier guards for other hazardous point-of-operation areas? C) Pullback (Pullout) - enough or too much pull on cables? Is proper adjustment being made for change in operator, die, shift? Records of inspection/maintenance being kept? D) Type A or B Gate (B gate for part-revolution clutch only) - point of operation enclosed before press cycle can be initiated? Barrier guards for other hazardous point-of-operation areas? E) Restraint (Holdout) - adjusted so that operator's fingers cannot reach into dies? Securely anchored? Adjusted for each operator, die, shift? F) Two-hand Trip or Control (two-hand control for part-revolution clutch only) - shielded against unintended operation? Concurrent, antirepeat? Fixed in place at proper safety distance from pinch point? Interrupted stroke protection and adequate holding time (for two-hand control only)?
15. Miscellaneous	Comment on any other items such as: Protection from falling overhead parts. Lighting. Cleanliness. Lubrication. Pressure vessels. Hydraulic-equipment. Auxiliary equipment. General maintenance. Special types of clutches or brakes. Covering of gears, belts, pulleys. Overloading. All auxiliary equipment.

**Refer to OSHA 29 CFR 1910.212, 1910.217, 1910.219, on pages 269 through 280, ANSI B11.1 & B15.1, and other applicable regulations and standards.*

Rockford Systems, Inc.
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