

# DIE SETTING PROCEDURE

The total procedure for installing dies in a press comprises several distinct, yet related, steps. Those steps to be performed include: preparation of the press to receive the die; actual die installation; securing attachment of the die to the press; necessary adjustments of the press, die and auxiliary equipment; installation of a point of operation guard and/or safeguarding device appropriate for the operation to be performed. Press size, stroke length, speed and capacity must be suitable for the die that will be installed. If additional components such as die cushions, knockouts or feeds are required, the press should be arranged for, and equipped with, these items.

The actual procedure for setting and removing dies may vary slightly, depending upon press type and size, type of guiding arrangements, quick access features and the type of operation to be performed. The steps outlined below are of a general nature and may be amended to suit a particular press and die combination; however, never should they be amended to the extent that the job is done unsafely. Observe all warnings.

## Setting The Die

1. When installing dies, always observe the Die Setter's Safety Precautions included in this safety manual.
2. Before attempting to remove or set dies, and if feasible to reduce any possible movement, the main drive motor should be turned off, the press mode selector switch locked to the off position, the flywheel has stopped turning completely and install safety blocks if the slide is opened. Clean the die, bolster plate and slide face surfaces.

**Note:** On presses equipped with hydrostatic guiding systems and pressurized hydraulic quick access arrangements, it will be necessary to maintain power to the presses hydraulic system. These hydraulic arrangements may not allow the die setter to use the interlocked die safety block. (If necessary, the slide may be positioned at bottom dead center of stroke in lieu of installing safety blocks.)

3. Install all necessary bolster inserts, slide and bolster

### IMPORTANT

If a turnover bar is used to turn the crankshaft, it should have a spring and collar arrangement that will prevent it from being accidentally left inserted in the barring hole. (OSHA 1910.217 (d)(9)(ii))

spacer plates, together with any auxiliary equipment that may be required to obtain proper working height for the die and material handling components.

4. Make certain that the bolster plate is securely clamped to the press with bolts that are in good condition. Loose or broken bolts may allow the bolster to shift out of its correct position during press opera-

tion. A bolster plate that has shifted from its proper position can cause serious die damage and endanger the safety of the operator.

5. If die cushioning is required, pressurize the cushion and insert pressure pins in applicable bolster plate holes. Use only clean, straight pressure pins of equal length. Never use pins that are bent, mushroomed, or otherwise deformed. After inserting the pins, recheck location and exposed pin length. Plug all of the exposed pressure pin holes. Lower the die cushion to permit pins to drop below top surface of the bolster.
6. Remove safety blocks if they have been previously



## WARNING

**NEVER PRESSURIZE DIE CUSHION WITHOUT THE BOLSTER PLATE INSTALLED AND BOLTED DOWN SECURELY.**

inserted in the slide area. Turn on power to the press control and then INCH or BAR the slide to bottom dead center of its stroke. If the drive motor was started in order to lower the slide, turn it off and turn the press mode selector switch to the OFF position. Make certain the flywheel is not turning. Now measure overall height of the die and height of the opening in the press. Use the press micro-shutheight indicator if one is furnished. Adjust the slide to a position that will allow adequate working space for loading the die into the press.

Install and use only dies that are safe. Dies that are



## WARNING

**NEVER INSTALL WORN OR DAMAGED DIES. INSTALL ONLY DIES THAT ARE IN GOOD CONDITION AND PROPERLY SIZED FOR THE PRESS TO BE USED.**

worn or improperly sized can cause injuries to personnel and damage to the press.

7. Place the die in position for loading into the press. Check top and bottom of the die for any slugs, metal particles or dirt that may have adhered. Make certain these areas are clean. Load the die into the press and set it in the desired location. Fasten the lower die shoe loosely.
8. Check alignment of openings in the die, if applica-

ble, with related openings in the bolster plate before the die is clamped into position. If these openings are not properly aligned, stampings, scrap pieces or slugs may catch and pile up inside the die. This condition could cause the die to fracture and may result in possible injury to the operator due to flying die particles. Good lighting and a mirror can be quite helpful when checking alignment. Never use fingers to line up or locate holes .

9. If die cushion will be used, raise pressure pins by pressurizing the cushion. **USE ONLY LOW PRESSURE.** Check alignment of pressure pins with the die. If the die is not located properly, it may be lifted slightly by one or more of the pins; or, pin misalignment may prevent the cushion from expanding fully. If necessary, reposition the die slightly or use other safe, convenient means to assure correct alignment of pressure pins with the die.
10. Adjust the slide down until it nearly touches the top

### **WARNING**

**IF DIE CUSHION PRESSURE IS EXCESSIVE DURING THE PIN ALIGNMENT CHECK, AND THE DIE IS MISALIGNED, A HAZARD COULD BE CREATED BY THE SUDDEN RELEASE OF THE RESTRICTING PARTS. DURING THIS CHECK, APPLY ONLY THE PRESSURE NECESSARY TO RAISE THE CUSHION PRESSURE PAD.**

of the upper die. Then bolt or clamp the upper die shoe securely to the slide. If standard nuts are used, the bolt must be threaded fully through the nut. Use a single washer under every bolt head or standard nut - never stack washers. Use only bolts that are in good condition.

11. Discharge all air pressure from the die cushion if one is used.
12. If storage straps are used between the upper and lower dies, they should now be removed and secured in their proper place either on the die or away from the press. All other die storage accessories, bolts and other unused components should be marked for identification and placed in a storage area away from the press.
13. Bolt down or clamp the lower die shoe securely to the bolster. If bolts are used, they must be in good condition. If a clamping arrangement is used, the fulcrum block should be a single block which is the same height as the die shoe. Do not use shims or stacked washers for this application; however, com-

mercial type adjustable height heel blocks, designed for this purpose, are acceptable. The clamping bolt must always be located nearer the die shoe than to the fulcrum block. Be sure to use enough clamps to keep the die in position.

14. Adjust the counterbalance air pressure to properly counterbalance the weight of the slide and upper die. For instructions on setting counterbalance air pressure, see the Counterbalance Data Plate located on the press or refer to the press service manual.
15. Make certain that no tools, bolts or other obstructions are left in the die area, slide flange or anywhere else on the press where they could fall and cause damage or an accident.
16. Restore power to the press control and start the main drive motor and INCH the slide to the top of its stroke. If separator blocks, or other die storage components are used, shut off the main drive motor and turn the mode selector switch to the OFF position. Wait for the flywheel to stop turning. If you must place hands into the die area - install safety blocks and perform established lockout/tagout procedures. Remove the die storage straps or separator blocks, whichever are used, and place them in a storage area. After the die is cleared and ready for use, remove the safety blocks if they were previously inserted.
17. Adjust slide for the correct operating height and lock the adjustment.

Adjustments relating to depth of setting are vitally impor-

### **WARNING**

**DO NOT SET THE SLIDE TOO LOW. DAMAGE TO THE PRESS AND DIE AS WELL AS INJURY TO PERSONNEL COULD RESULT.**

tant because the safety of the operator is involved as well as stress on the press and its tooling. Cutting dies should be set so that the punch will enter the die opening only far enough to pierce the part. Excessive punch penetration may result in scoring and high die repair cost. On forming dies, bottoming of the die members occurs when forming takes place; and, at that moment, the press is working against a solid mass of metal. Consequently, a slide that is set too low may cause damage to the press, or failure in the die - a condition that could also be hazardous to personnel.

18. Adjust the knockout mechanism, if required. If a die cushion is to be used, pressurize the cushion and adjust for the proper operating pressure. If spring

pads are used, adjust them so that the parts will be formed correctly.

19. Check the installation and adjustment of all auxiliary equipment used in conjunction with the particular die set. Check the following items as applicable:
  - (a) Set the automatic feed equipment and scrap cutter for correct feed line height.
  - (b) Adjust the automatic feeding equipment for proper timing, length of feed and application of lubricant to the stock.
  - (c) Connect and time any die malfunction detector switches.
20. Install point of operation safeguards and/or safeguarding devices. Make certain that the safeguard installed is proper for the type of operation being performed and that it is correctly installed and adjusted. Report any defect or malfunction of any safeguard or safety device to the proper supervisor for immediate correction. Adjust parts conveyors and chutes, if used. Install tote pans or other material handling equipment in the proper location. If additional safety handling equipment or tools are required for a specific job, obtain the required items and have them placed in a convenient area for the operator's use.
21. Start the main drive motor and INCH the slide



through at least one cycle. Then insert the material and run a few sample parts, preferably on INCH. Inspect the workpieces and make further slide height adjustment if necessary. At this point, all changes in slide adjustment must be small with special care being taken not to set the slide too low. Make certain the slide adjustment mechanism is locked and that bolster bolts are tight before cycling the slide. Run several sample parts using the SINGLE STROKE mode of operation.

22. Check the parts produced during the trial run to make certain that they meet production specifications. Missing holes may indicate improper roll punch; elongated holes may indicate improper roll feeding. Marks on the parts may mean that slugs are accumulating. Large burrs on the parts can indicate that the punch or die block is dull, or that too much clearance exists between the punch and die. When

inspecting drawn parts, look for cracked sections especially near the bottom radius. Cracks can develop because of improper lubrication, improper die clearances, improper die cushion pressure, hard stock, or a combination of these conditions.

23. After all checks and adjustments have been made, observe operation of the machine for a sufficient period of time to determine that it is working correctly and safely. Keep the floor area around the press clean and free from obstructions.

### Die Stock Guiding Arrangements

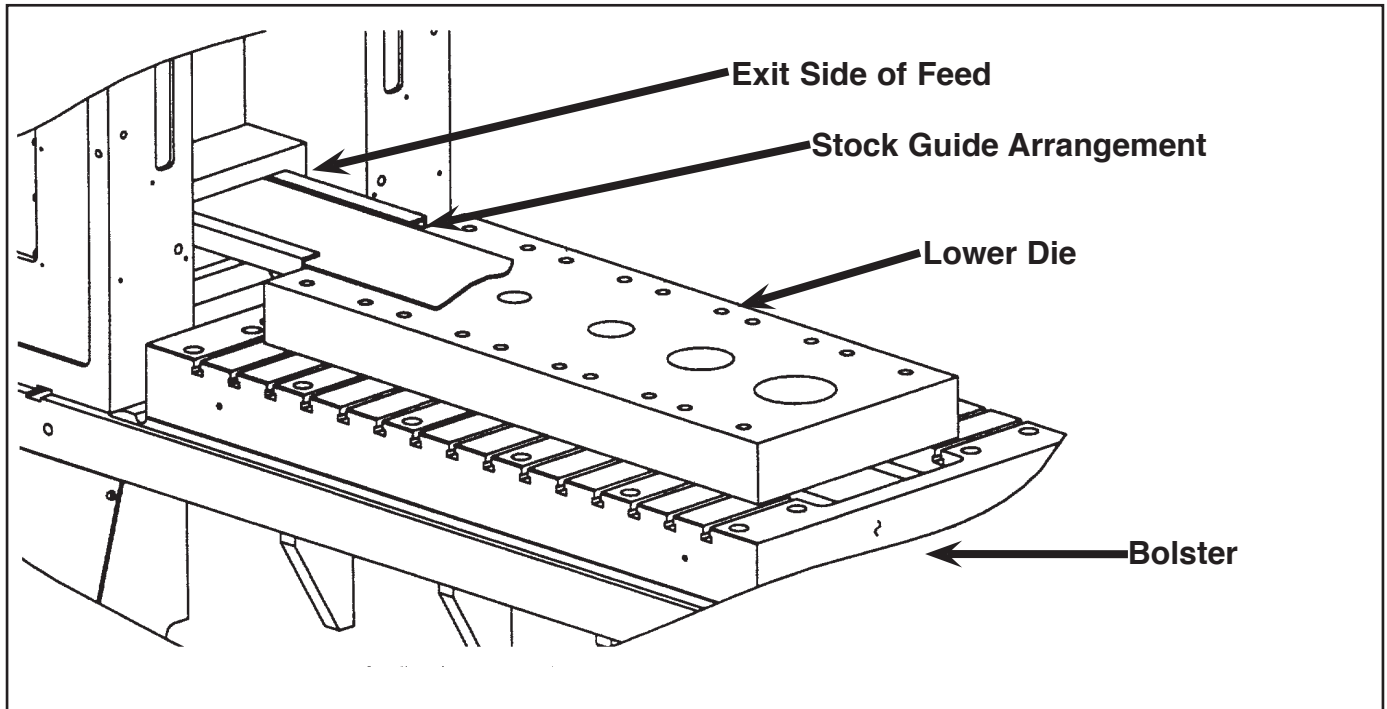
In automatic production systems, to ensure the proper threading of coil stock material through a die (blanking, progressive, etc.), the user must employ a stock guiding arrangement from the feed device to the first stage of the die. Due to the many different die configurations that could be installed in a press, the user is the only one that can accurately define and utilize this type of device.

With such a device and with the control available with your feed unit, the operator should be able to thread the material through the die, and keep their hands out of the die area completely. If the operator would be required to position the stock material in the die area, appropriate hand tools must be provided by the employer and used by the employee.

The press user may determine that a separate stock guiding arrangement should be constructed and maintained for each particular die. These devices should be constructed to withstand its operating environment. The width of the stock guides will be dependent upon the stock material employed, and the length of the device will be determined from the placement of the die within the bolster area and the resultant distance from the first station of the die to the feed's outgoing stock guide. Refer to Fig. 16 for a conceptual example.

Most metal forming employers should have an appropriate maintenance department and associated fabricating equipment to construct such devices. If the user does not have the equipment or manpower to build these type devices, sketches detailing the required dimensions of the stock guide can be provided to local fabricating shops for outside construction. After becoming accustomed to the design and fabrication of these devices, the press user may want to include these devices as part of the actual die construction specifications.

By using these type of stock guiding arrangements, the risk of injury to the press operator can be greatly reduced. Such devices can also decrease stock threading time, reduce operator fatigue and increase the efficiency of a metalforming system.



**Figure 16. Conceptual example of a die stock guiding arrangement.**

### Die Removal Procedure

1. When removing dies, always observe the Die Setter's Safety Precautions included in this manual.
2. After stopping slide in the stroke-up position, turn off the main drive motor and set the Stroking Selector switch in the OFF mode. Wait for the flywheel to stop turning completely - then install the press safety blocks.
3. Clean the die and thoroughly inspect it for possible damage, wear and general condition. If the die should require sharpening, servicing or repairs, make certain that it is routed to the die repair department immediately after removal from the press. Discharge all air pressure from the die cushion if used.
4. If wooden separator blocks (or other type spacers) are to be inserted between the upper and lower parts of the die, for storage purposes, adjust the slide height upward at least 1/16 inch (1.58 mm) more than the thickness of the separator block. Install the separator blocks as required.
5. Remove the safety blocks and return them to the proper storage area. INCH or BAR the slide down to the bottom of its stroke. If the main drive motor was started, turn it off and have the press mode selector locked to the "off" position. Make certain the flywheel has stopped turning completely. Install die storage straps or clamps, if required. The slide height may have to be adjusted slightly for this operation.
6. Unbolt the die, making sure that all bolts and clamps are removed. Adjust the slide up to a height that will permit adequate space for removal of the die from the press.
7. Pull the die from the press and load it onto the die truck. Make certain the die truck is chocked securely to prevent it from moving away as the die is being transferred. Fasten die to the truck for safe transport. Be very careful when moving the die; move the die truck slowly and proceed over solid, level floors only. Route the die to a die storage area or die repair shop, depending upon the results of the inspection (step 3).
8. If a die cushion was used, raise the cushion using low air pressure only. Remove the pressure pins and then exhaust the cushion.
9. Clean the slide and bolster surfaces.