

8

Wire EDMing One-Piece Stamping Dies

Blanking Die

Wire EDM has made it possible to produce high quality dies from one piece of tool steel. This method of producing dies with wire EDM can result in substantial savings. Following is a description outlining this method.

A. Desired Stamping

The desired stamping can be either the slug or the blank, as shown in Figure 8:1.

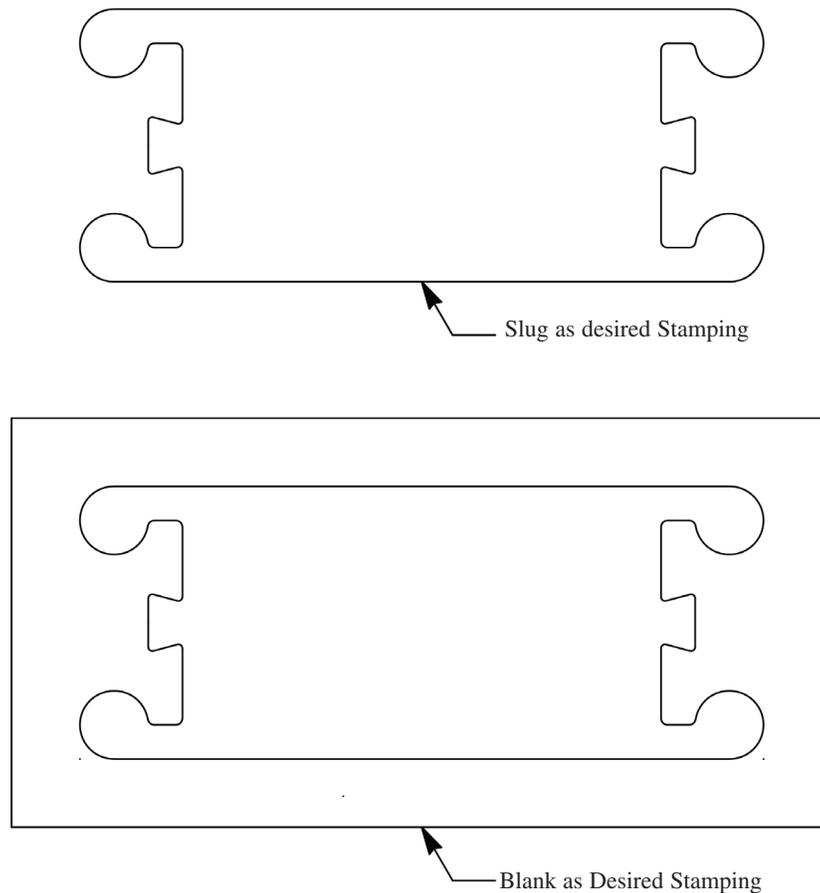


Figure 8:1 Desired Stamping: Slug or Blank

B. Preparing the Tool Steel Blank

Drill, ream and tap all holes for punch, die and stripper as shown in Figure 8:2.

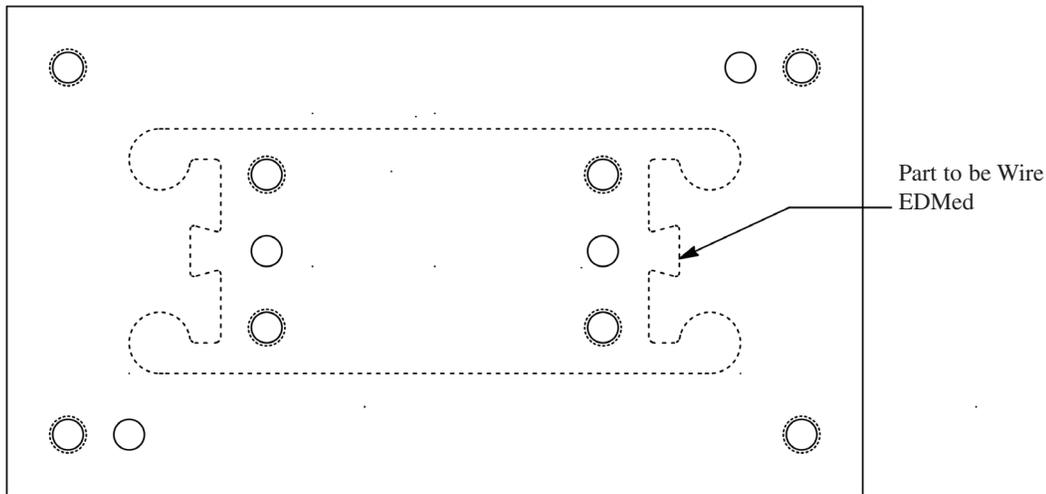


Figure 8:2 Part to be Wire EDMed
Drill, Ream and Tap All Desired Holes.

C. Placement of Starter Hole

The starter hole can be placed in either the punch section or the die section. The small line created with wire EDM is, in most cases, negligible; however, the line should be placed in the part which will produce the scrap.

1. Punch Shape is the Desired Stamping

If the desired stamping will be the shape of the punch, then the starter hole should be in that punch. The part will take the shape of the die section. Place the starter hole about $\frac{1}{4}$ " from the cutting edge.

Rule: Starter holes should always be placed in the desired shape that is in the die. Ex: If the punch is the desired shape, the starter hole should be put in the punch section of the die. See Figures 8:3 and 4.

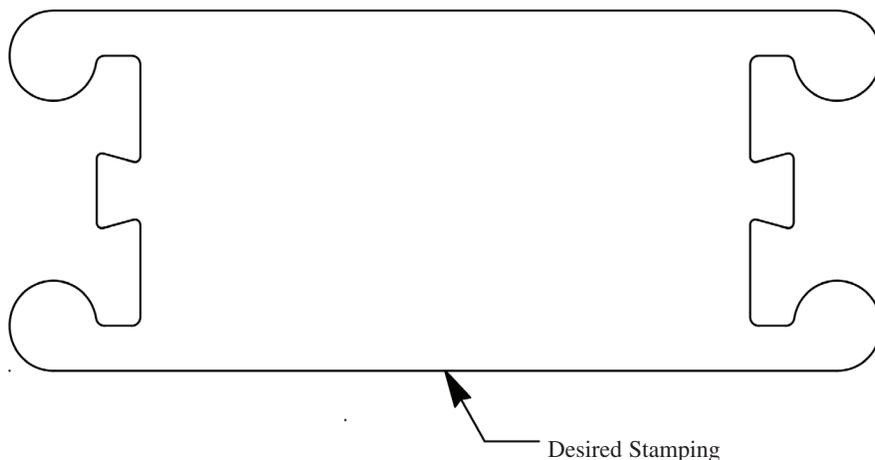


Figure 8:3 Desired Stamping is the Slug.

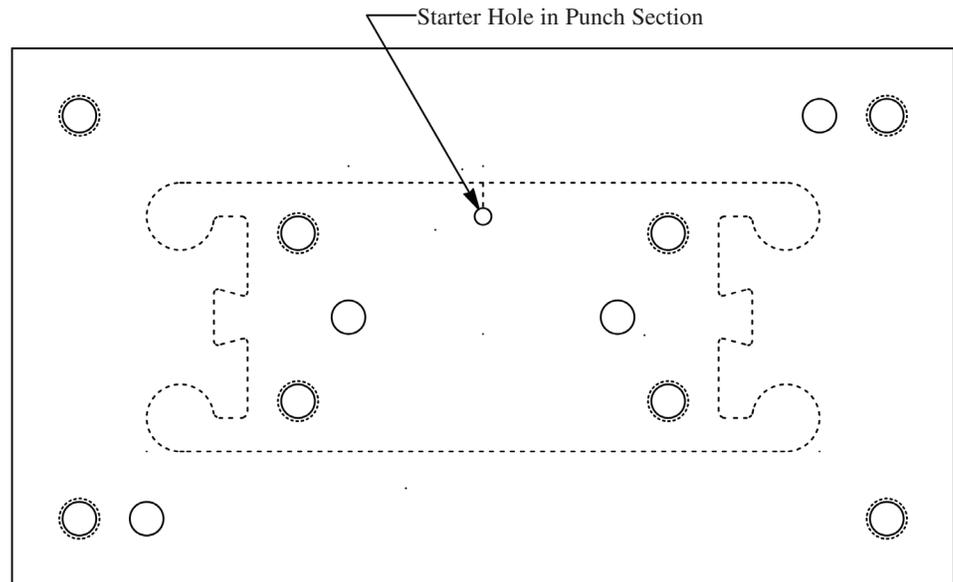


Figure 8:4 Placement of Starter Hole

If punch is desired shape, place starter hole in the punch section of the die.

2. Blank Shape is the Desired Shape

If the desired stamping will be in the shape of the remaining blank, then the starter hole should be placed in the die section. The part will take the shape of the punch. See Figure 8:5 and 6.

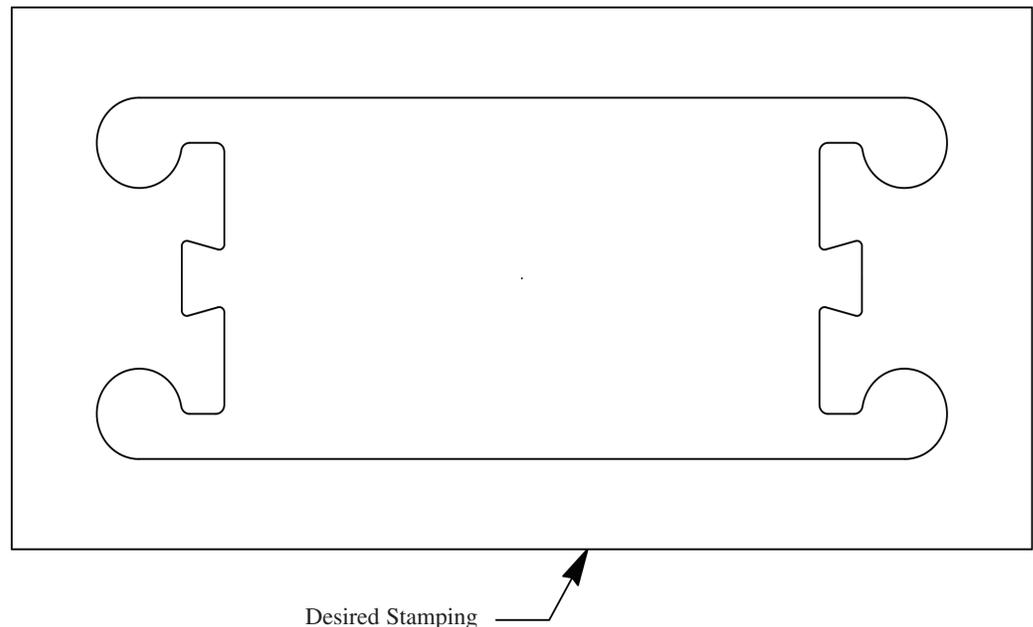


Figure 8:5 Desired Stamping is the Blank

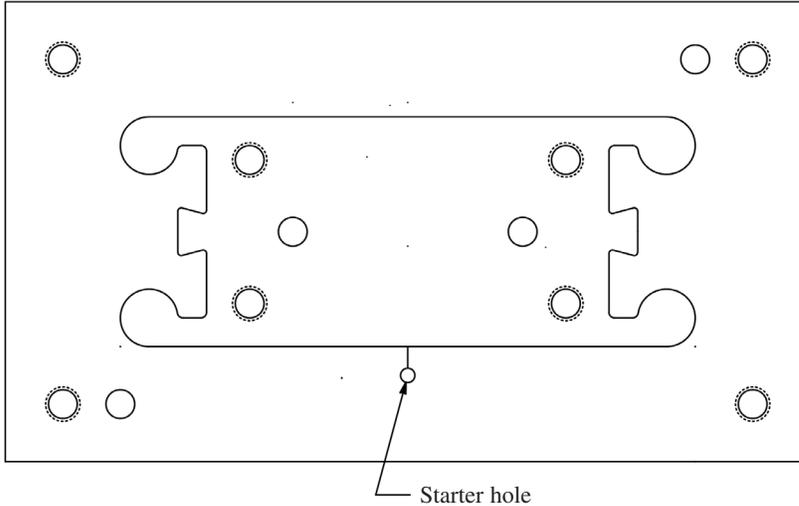


Figure 8:6 Placement of Starter Hole
 If the remaining blank is the desired shape, place the starter hole in blank section of the die.

D. Harden the Tool Steel Blank

After all holes have been put in, the tool steel blank should be heat-treated and tempered to desired hardness. In close fitting dies, the steel should be stress relieved and double or triple tempered. Air hardening tool steels should be used. Oil hardening steels have more internal stress after heat-treating and tend to move more.

E. Stripper Plate

Transfer all holes into the stripper plate, including the starter hole. Remove the stripper plate.

F. Punch Holder

Transfer holes from punch to punch holder, as illustrated in Figure 8:7. Drill and ream all punch holes. Remove punch holder.

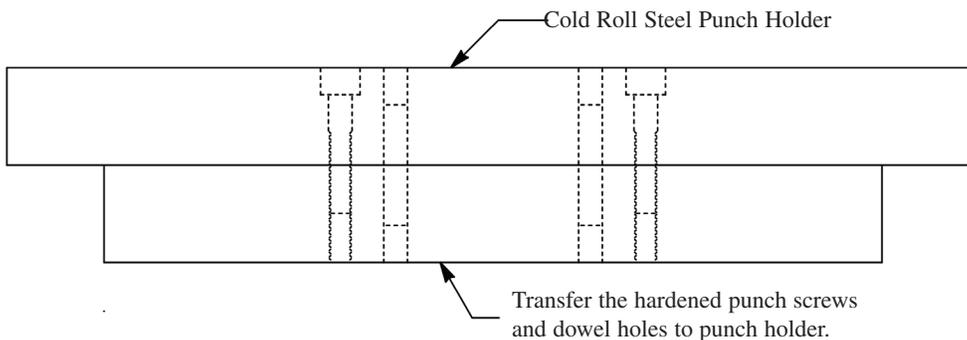


Figure 8:7 Mount Hardened Punch Section
 The punch section is mounted to the punch holder with screws and dowels.

G. Mount Die Blank on Die Set

Drill and ream the die block to the bottom die set as in Figure 8:8. Bolt and dowel the die blank to the bottom die set. Do not remove the bolted die section from the die set.

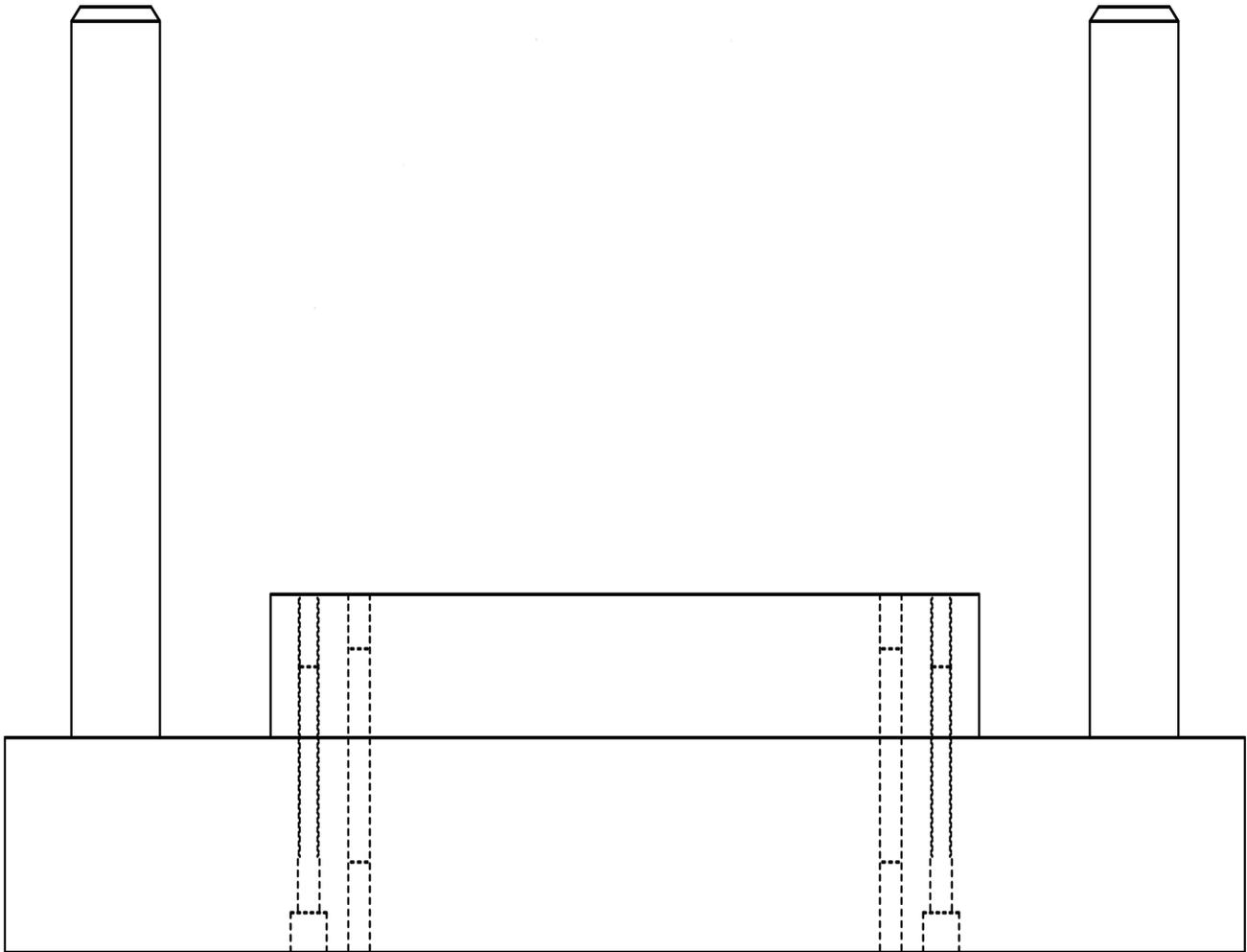


Figure 8:8 Mount Hardened Die Section
Die Section Mounted on Die Set with Screws and Dowels

H. Mount Punch Holder onto the Die Set

Bolt and dowel punch mounting plate to punch section that was previously done. Put on upper die shoe and drill and tap for bolts, then drill and ream for dowel pins into the punch mounting plate.

Mounting the punch holder before the die is wire cut eliminates the need for the difficult task of lining up the punch with the die sections. This method produces a perfect alignment, as illustrated in Figure 8:9.

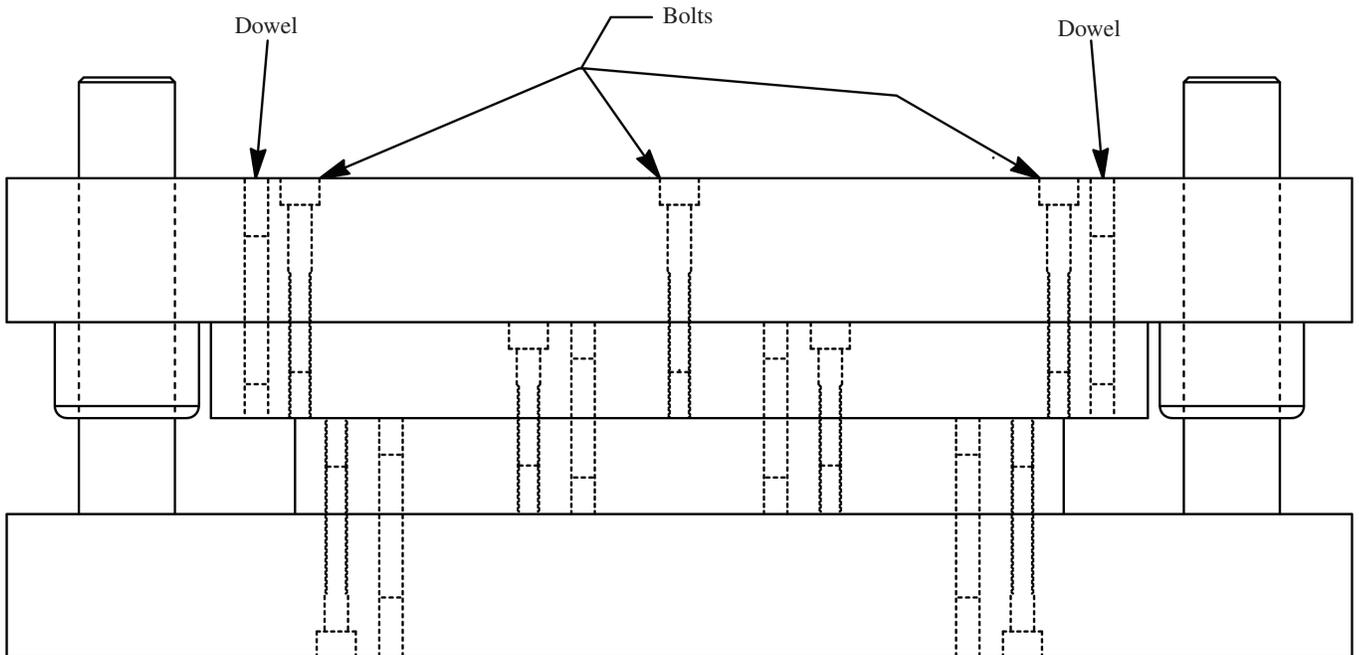


Figure 8:9 Mount Die Section on Upper Die Set

With the die section mounted on the die set, and the punch holder mounted on the hardened blank, the cold roll punch holder is screwed and bolted and reamed in place. Now, when the die is wire EDMed, there will be a perfect alignment between the punch and die sections.

I. Mount Stripper on Bottom of Die Section

By mounting the stripper on the bottom of the die section, it will be cut at the same time as the regular die section and have proper clearance all around. The dowel pins can be used to line up and hold the stripper. See Figure 8:10.

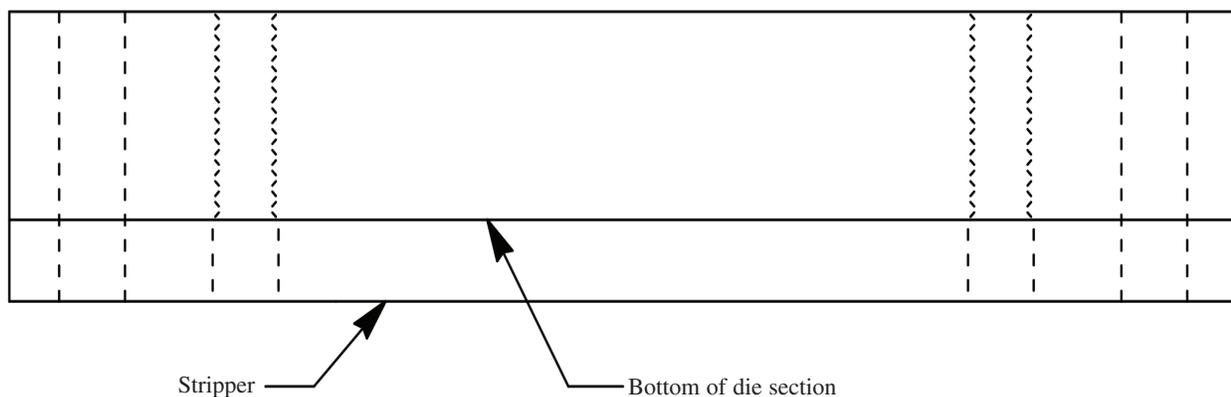


Figure 8:10 Wire EDMing Stripper with Die section.

J. Wire Cut the Punch, Die and Stripper

The EDM programmer calculates the exact taper needed to produce the proper clearance. With one cut, the punch, die, and stripper will be produced, as in Figure 8:11. The stripper slug may be used to extend the punch. Land can be easily done on the die section with a skim cut. See Figure 8:12.

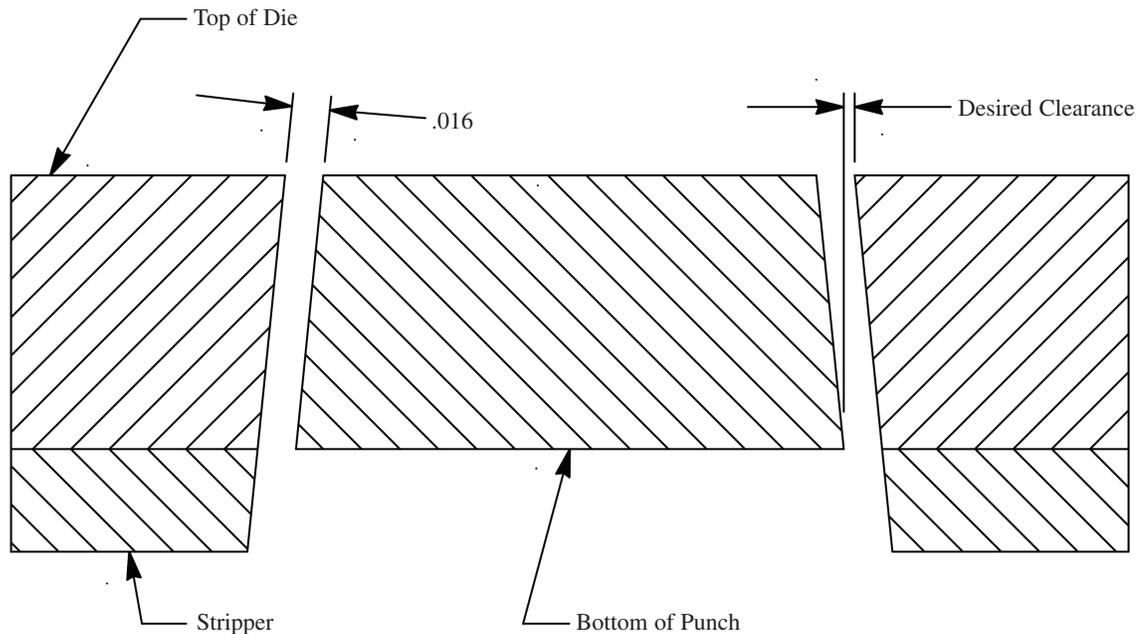
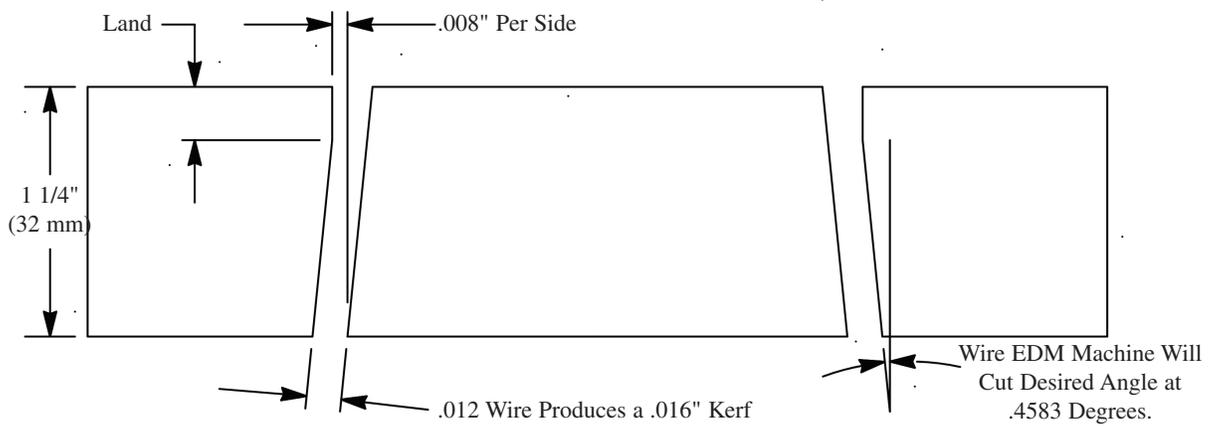


Figure 8:11 Punch, Die, and Stripper Can be Made with One Cut

Example: Material—14 gauge cold roll steel with 12% clearance per side.

EDM programmer will determine the proper angle to cut the die section.



**Figure 8:12 Calculating Desired Clearance
(Clearance is Exaggerated)**

Total Burr-Free One-Piece Blanking Die

For most dies, placing the starter outside the punch or die and leaving the narrow kerf for cutting has a negligible effect on the part. On thin materials below 1/32" thick, there may be a raised area that for precision stamping parts may be objectionable.

There is another method in making a one-piece die which produces no kerf. The starter hole is drilled on an angle where it intersects directly in the middle of the punch and die section. See Figure 8:13 and 14.

If there are other punch and die holes in the part, the starter hole should be precisely located. In the other method of using a straight starter hole and leaving a kerf, the placement of the starter hole is not critical.

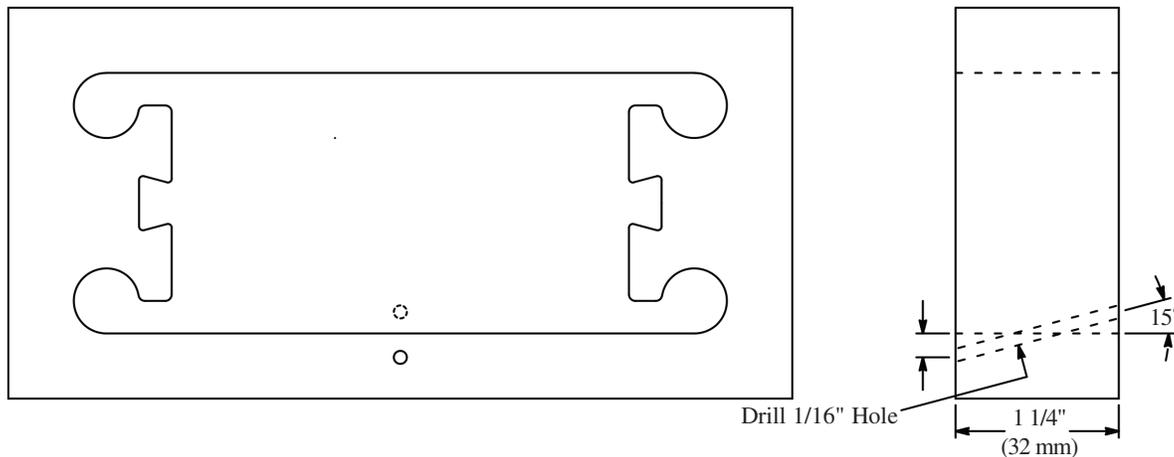


Figure 8:13 Burr-Free One-Piece Blanking Die
Recommended for Precision Stampings.

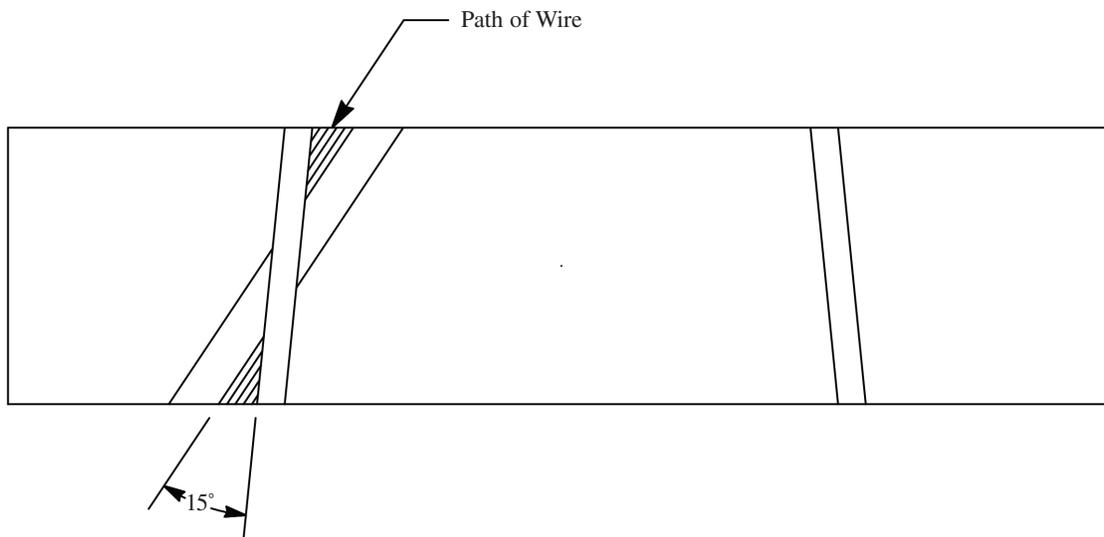


Figure 8:14 Path of Wire

The path of the wire will leave a kerf halfway on the top of the punch and halfway on the bottom of the die where stamping does not take place.

Compound Blanking Dies

Following these instructions can reduce costs dramatically in producing compound blanking dies.

A. Desired Stamping (Figure 8:15)

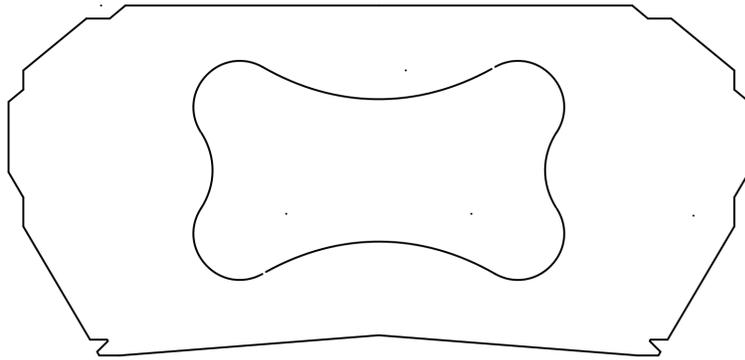


Figure 8:15 Desired Stamping

B. Prepare Tool Steel Blank

Drill, tap, and ream all necessary holes, including starter holes. See Figure 8:16. Remember: put starter holes before hardening.

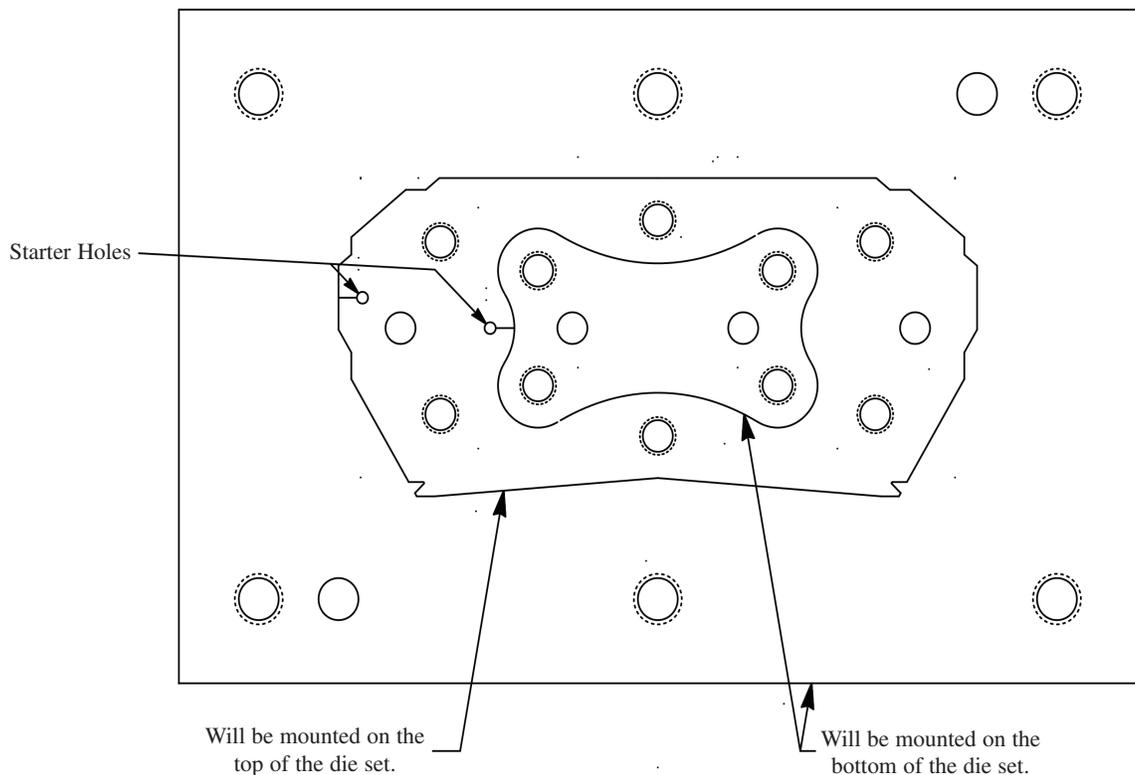


Figure 8:16 Prepare Tool Steel Die Section
Put in all desired holes before hardening.

C. Mount Punch Holder

Mount punch onto a punch holder, as in Figure 8:17. Make sure the punch holder is large enough to hold the stripper bolts and springs. Remove punch holder.

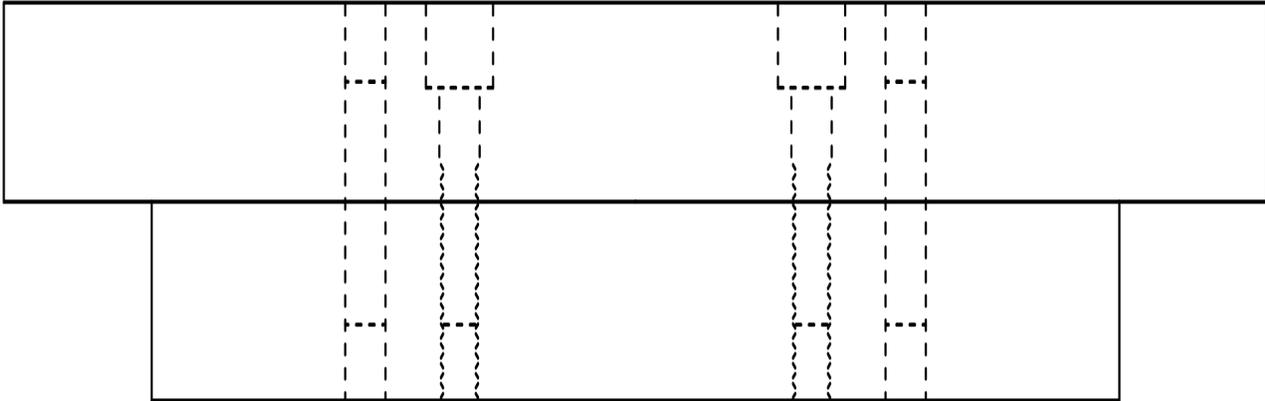


Figure 8:17 Mount Punch on Punch Holder
Mount middle punch section onto the die.

D. Mount Die Block on Bottom of Die Set

Drill and ream all holes for sections that will be mounted on the bottom of the die section, as shown in Figure 8:18.

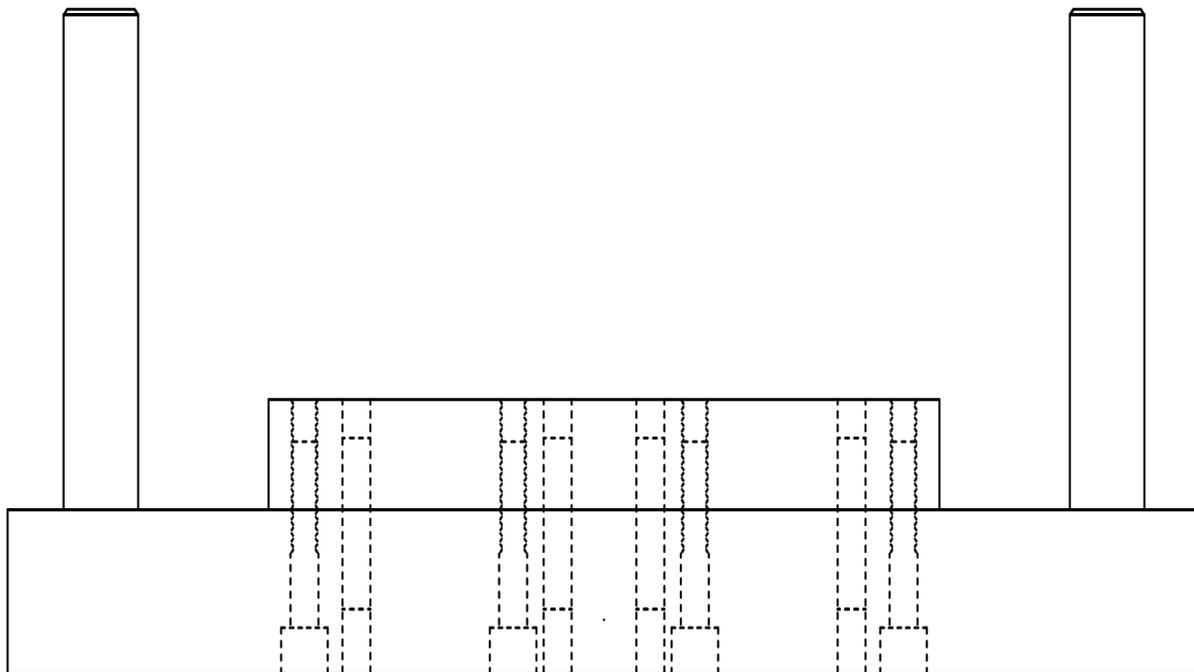


Figure 8:18 Mount Die Blank on Bottom Die Set
Mount both the inside and outside sections of the die.

E. Mount Punch Holder on Top of Die Set

Mount punch on the punch holder with dowel pins, as illustrated in Figure 8:19. Drill, ream, and tap holes from top of die set to punch holder. Now the die section can be removed for wire EDMing. Mounting the punch holder before wire EDMing creates a perfect alignment for the clearance between the punch and die.

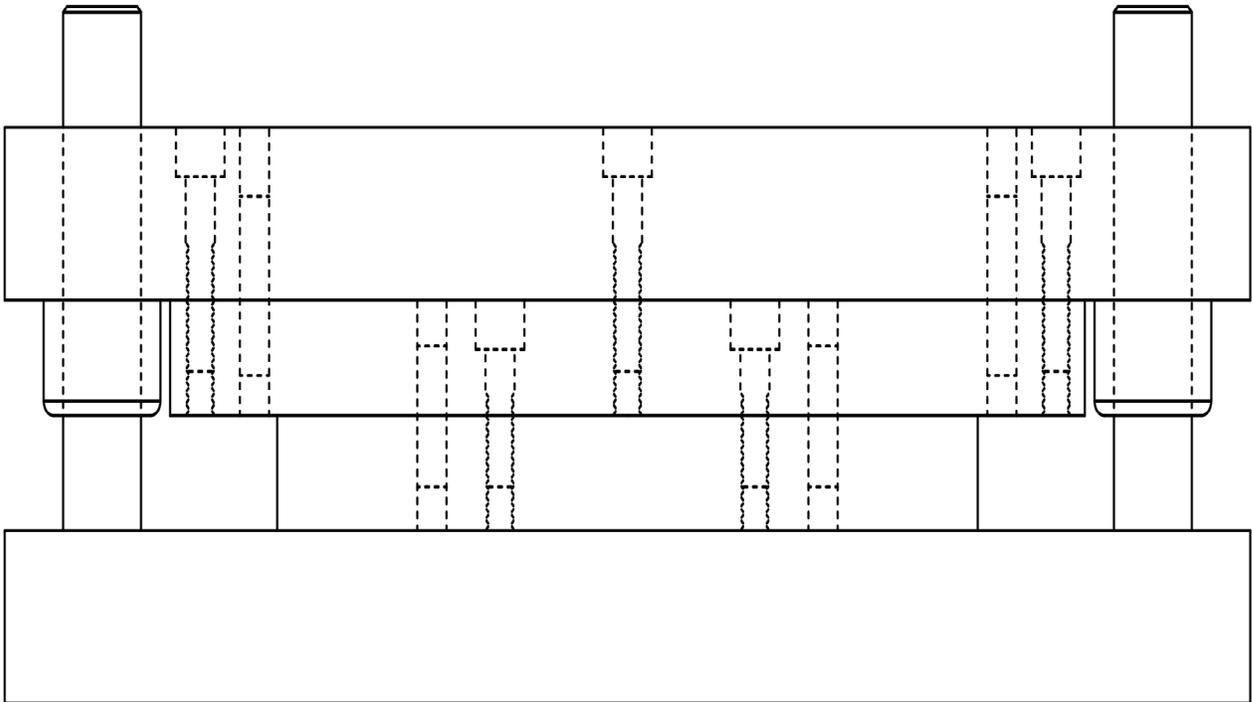


Figure 8:19 Mount Punch Holder

Mount punch on punch holder, then bolt and dowel punch holder to upper die set. This procedure will guarantee a perfect alignment of the punch and die sections after the die is EDMed.

F. Stripper Plate

Since this is a compound blanking die, parts of the stripper will be on both the top and the bottom of the die shoe. Drill no holes on the stripper except for the two starter holes.

If the angle of the cut is relatively straight, then the stripper can be clamped on the die section and wire EDMed at the same time. Otherwise, the stripper may have to be cut separately.

G. Wire EDM Compound Die

The EDM programmer will calculate the exact angle for proper clearance. From one piece of tool steel, a high performance inexpensive compound die can be produced. See Figure 8:20.

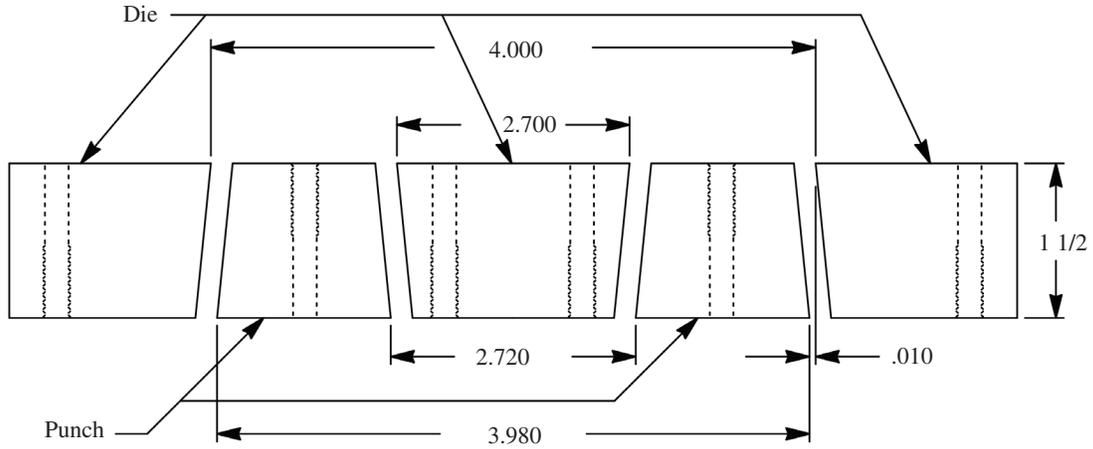


Figure 8:20 Compound Die from One Piece of Tool Steel
 From one piece of tool steel, a high performance
 inexpensive compound die can be produced.
 (Clearance is exaggerated.)

H. Completed Die

1. Stripper with Springs

Mount stripper with stripper bolts and springs on both top and bottom of die set.
 See Figure 8:21.

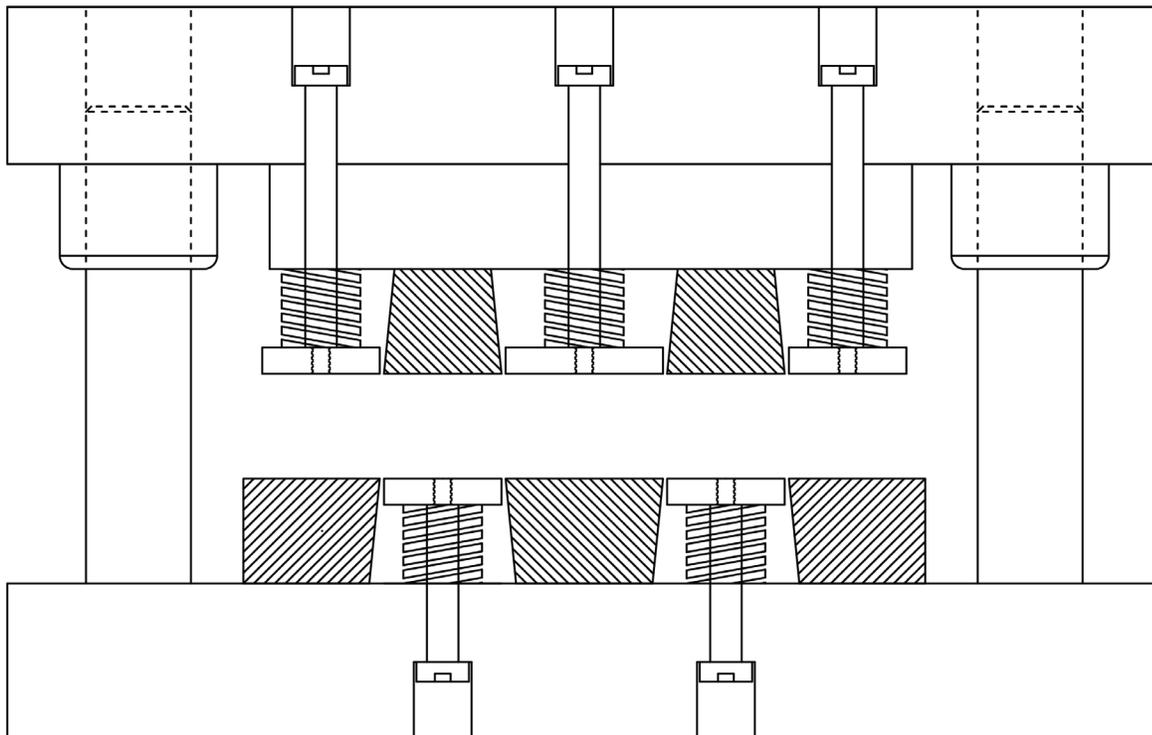


Figure 8:21 Completed Compound Die with Spring Mounted Strippers

2. Stripper with Knockout

The advantage of a knockout die is that the scrap and part will be separated. See Figure 8:22.

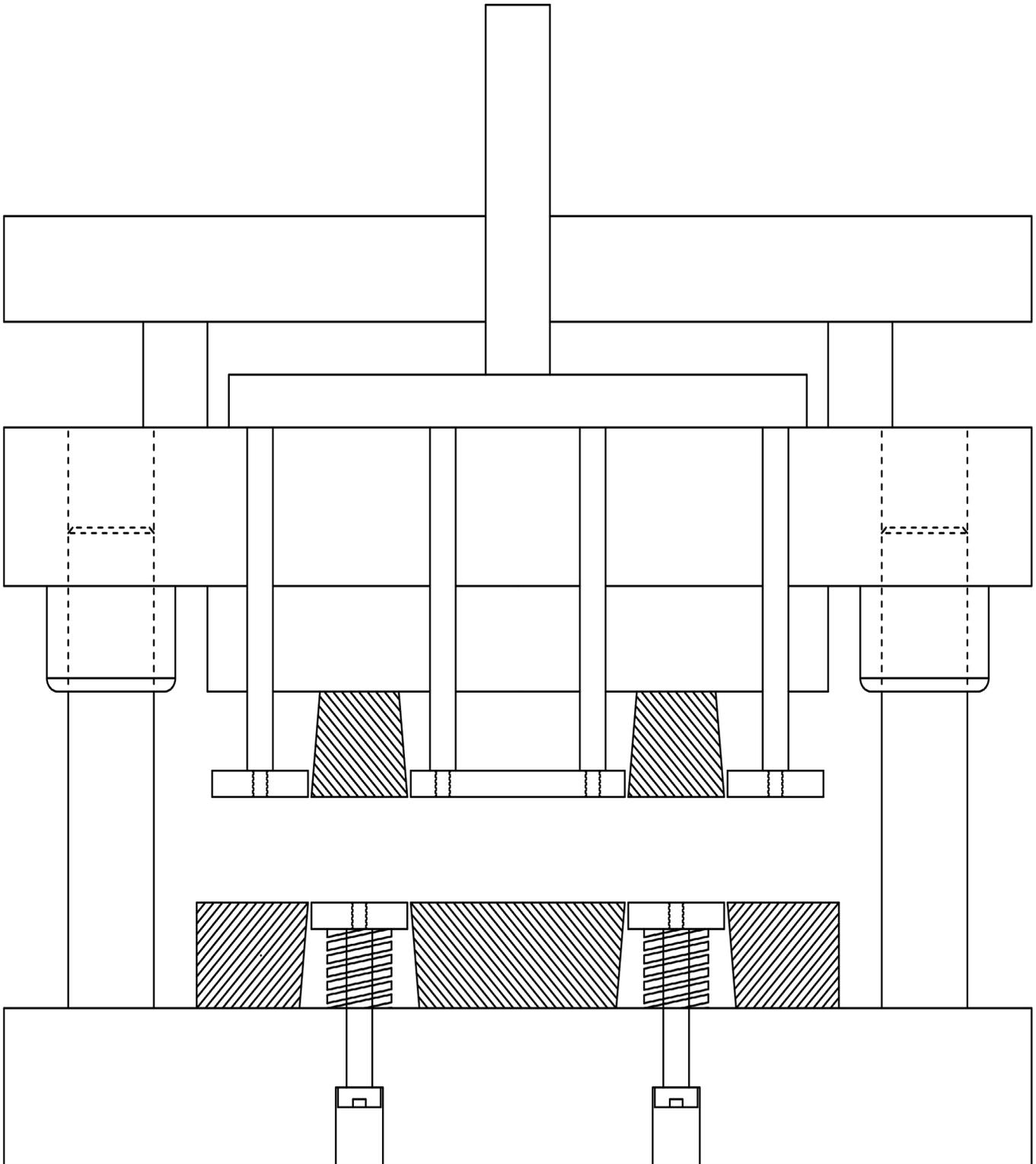


Figure 8:22 Completed Die with Knockout
Knockout removes slug from part.

Wave of the Future

Wire EDM has revolutionized machining. With today's high-speed cutting machines, wire EDM will increasingly replace work performed with traditional methods.

Today, manufacturers, designers, engineers, and those responsible for determining machining methods should endeavor to understand the wire EDM process in order to maximize its great potential. Their knowledge of this process will result in their company saving money, time, and effort while increasing quality product.

Let's examine another unique method of EDMing. With today's sophisticated ram EDM machines many new possibilities exist.