

AVOID INSECURE AND IMPROPER DIE FASTENING

Bad diesetting practices are counterproductive and usually very unsafe. To institute good clamping practices in the plant, it is necessary to:

1. Provide enough proper fastening equipment.
2. Provide proper storage for the equipment when not in use.
3. Train the diesetters in the proper use of the equipment.

Avoid False Security

Relying solely on good ratings by insurance inspectors and government enforcement officers can create a false sense of safety security. Bad methods and individual poor habits quickly grow into everyday unsafe practices. Visiting inspectors often lack the time and knowledge to spot these problems.

Safe pressworking involves many disciplines. The die designer and process engineer must apply accurate pressworking formulas when determining press requirements. A mechanical engineer's knowledge of strength of materials is required to avoid overload and metal fatigue problems in manufacturing systems. The industrial or safety engineer's skill determines proper operator safeguards.

The many factors that pressroom personnel must deal with to insure a safe working environment may require safety procedures that inspectors from regulatory agencies might not be aware of. The die design and engineering department must specify the requirements for safe diesetting, as well as safe part loading and unloading when the process for a new stamping is approved.

Of course, it is necessary to follow government and insurance regulations. However, safe pressworking requires the application of sound engineering principles to analyze and avoid potential problems involving fastener failures.

It is unreasonable for management to assume that die designers, diemakers, and diesetters will automatically design, build and fasten dies in a safe and secure manner. Here, die design standards based on sound engineering data for the type of work involved must be determined and used.

Examples of Poor Practices

The following examples of poor diesetting are from the writer's professional work as a consultant and trainer. They are from sketches. It is not the writer's practice to document bad practices attributable to any client shop.

Unfortunately, bad clamping practices remain somewhat commonplace in some shops. Old habits and work practices are difficult to change without a concerted effort by management. Common sense safe practices require avoiding the practices illustrated.

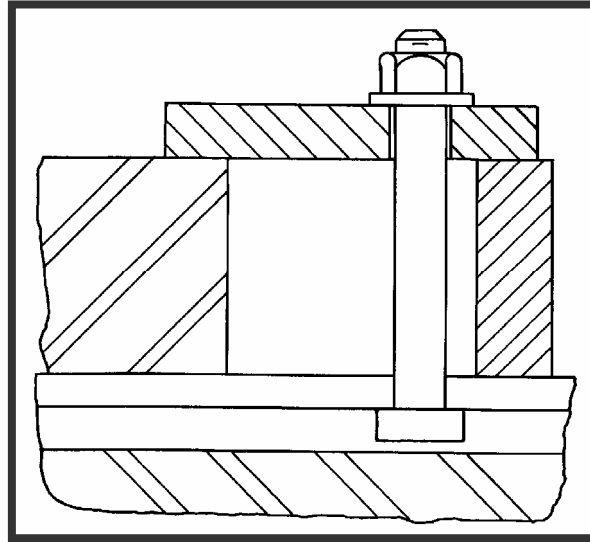


Figure 1. An example of a toe clamp or strap installed backwards. Most of the holding force is on the set up block instead of the die shoe. *Smith & Associates*

Today, nearly all shops strictly forbid these practices. Adopting safe methods requires much more than conducting safety training for pressroom personnel. Management must be willing to:

1. Supply the correct fasteners and clamping devices.
2. Provide proper storage for all needed equipment.
3. Scrap all inferior diesetting fasteners.
4. Provide training in proper methods.
5. Plan and achieve the goal of clamping standardization.

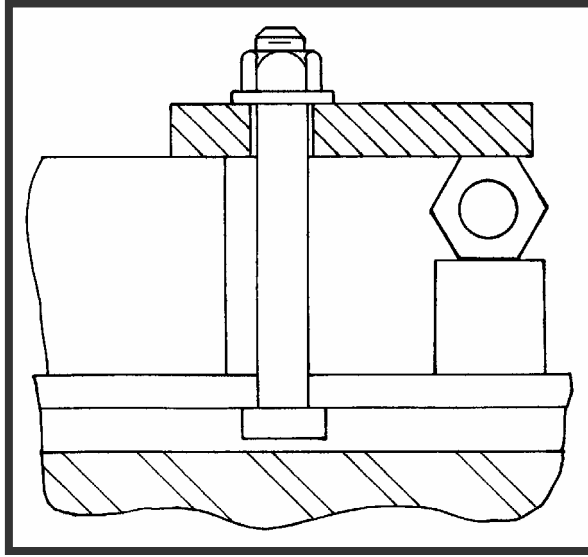


Figure 2. A steel grade eight nut intended for diesetting applications are expensive. They are not suited for use as spacer blocks—forbid the practice. *Smith & Associates*

Diesetting Washers

Common flat washers are not suitable for die fastening applications. For such applications, large thick carburized steel washers especially designed for diesetting are used.

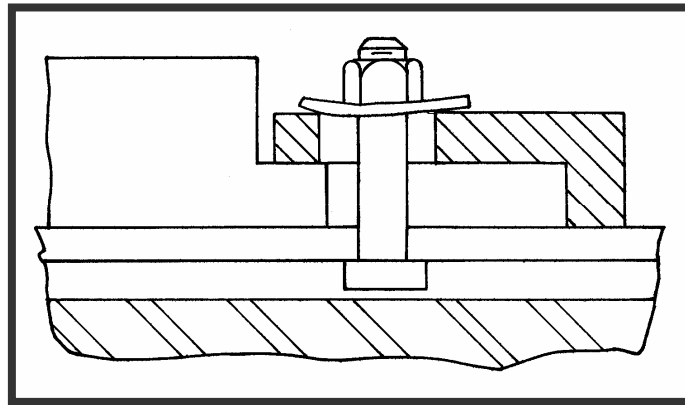


Figure 3. The hole in a good toe-clamp should only be slightly larger than the bolt. A thin washer will deform and allow the clamp to loosen if the hole is too large. This style clamp is suited for light duty short run work. *Smith & Associates*

Special dished spring washers are especially suited for heavy work. A variety of suitable die fastening washers is available from dealers in diemaking supplies.

Figure 3 illustrates a dangerous condition. Several things are wrong, including:

1. The hole in a toe-clamp that is too large for the bolt used.
2. Never use thin washers for diesetting applications.

3. The hole through the strap should be only slightly larger than the bolt.

A strap clamp is suitable for only light duty work and supervised die tryout. The hole through the strap should be only slightly larger than the bolt. A thin washer will deform and allow the clamp to loosen if the hole is too large.

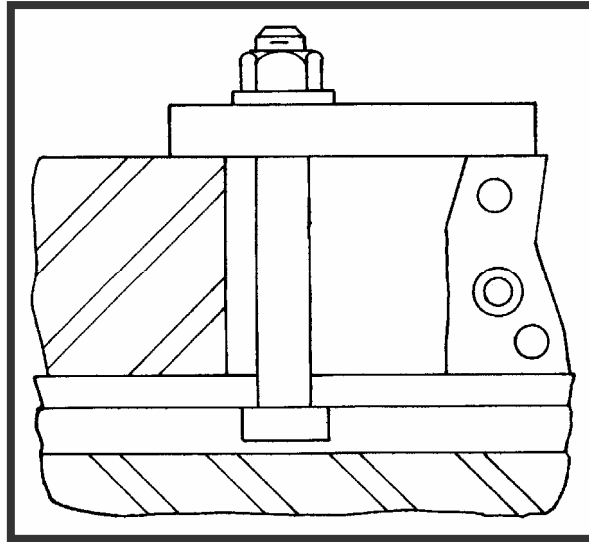


Figure 4. Never use a hardened steel section as a setup block. Such a practice invites bad housekeeping and the use of important interchangeable details as diesetting aids.
Smith & Associates

Use Proper Setup Blocks in Light Duty Die Fastening

For light duty applications involving little or no shock or impact loading, bridge clamping with a clamp bar or bridge clamping used for short run work and supervised die tryout of large dies. A solid setup block at least as wide as the clamping bar must support one end of the bridge clamp. Some additional important considerations are:

1. The same setup blocks find use on many different jobs provided a common clamping height is established.
2. Tubular setup blocks may collapse under shock or unexpected high stripping loads—avoid them.
3. Do not use hardened tool steel details such as the one illustrated in Figure 4—they may chip or fracture.
4. Forbid piles of slugs and/or washers (Figure 6) to make up sufficient setup block height.
5. The setup block must be the same height as the clamping surface. Avoid height differences as shown in Figure 7.

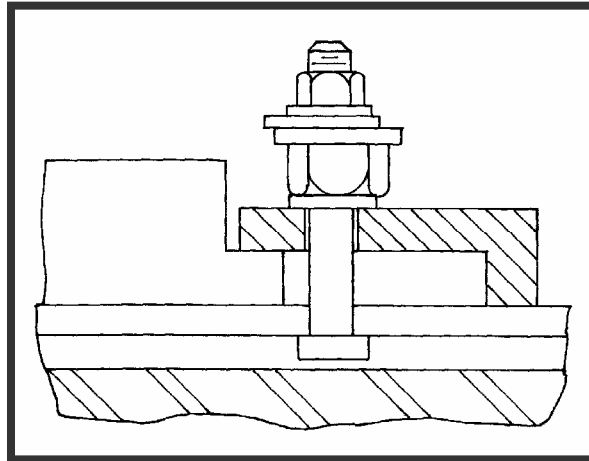


Figure 5. Always use the shortest bolt that will permit proper thread engagement. This condition can endanger the operator and is more expensive than a proper length bolt
Smith & Associates

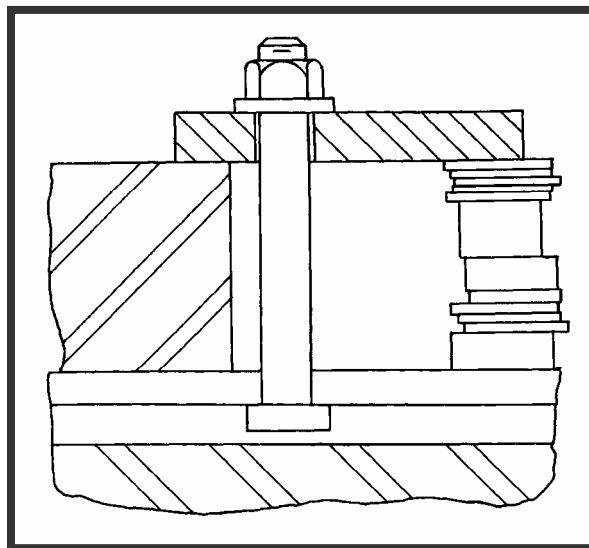


Figure 6. Never use slugs and washers to make up the required spacer block height. Slugs and washers are seldom perfectly flat, and normally have some burrs that will compress and cause the clamp to loosen.
Smith & Associates

Use Proper Length Bolts

A major advantage of establishing constant clamping heights for all dies is the use of the same bolts on all jobs. Use T-slot bolts wherever possible, especially for heavy-duty applications. However, heat-treated alloy steel T-slot nuts with grade eight screws are conditionally acceptable for light duty use.

Older and low cost presses may have threaded bolster holes. Threaded bolster holes are not suited for heavy dies or shock loading conditions.

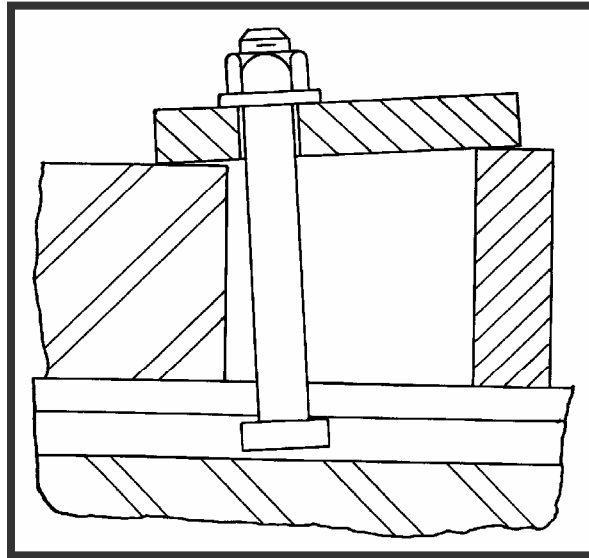


Figure 7. The spacer block is too long. In order to hold securely, the spacer block height must be the same as the height of the die surface clamped. *Smith & Associates*

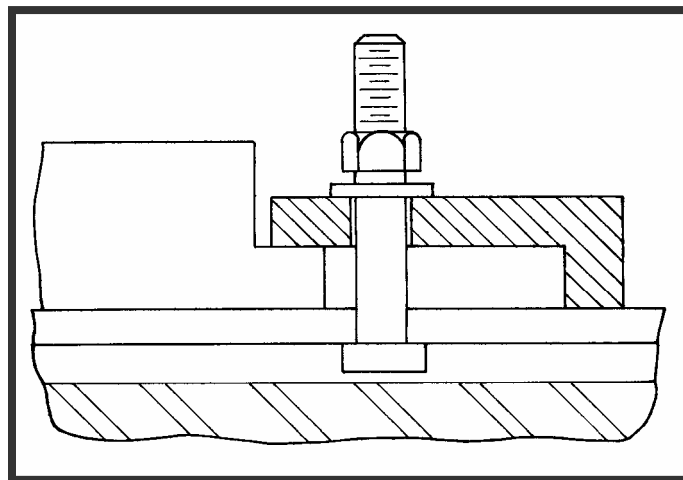


Figure 8. If too long a bolt is used, nut may bottom on the end of the threads and not actually hold the clamp in place. *Smith & Associates*

Figures 5 and 8 illustrate two bad examples. Both cases illustrate excess bolt length. Figure 5 shows a very bad practice of using too long a bolt and using oversize nuts and washers to permit nut tightening. Forbid this practice because:

1. It is not as secure as a proper length bolt.
2. A hazard for the operator results, especially in the case of hand fed operations employing pullback devices.

3. Should the bolt line up with a similar condition in the upper die severe mechanical interference or a pinch point may result.
4. Figure 8 illustrates the nut bottomed on the threads and not holding the die.

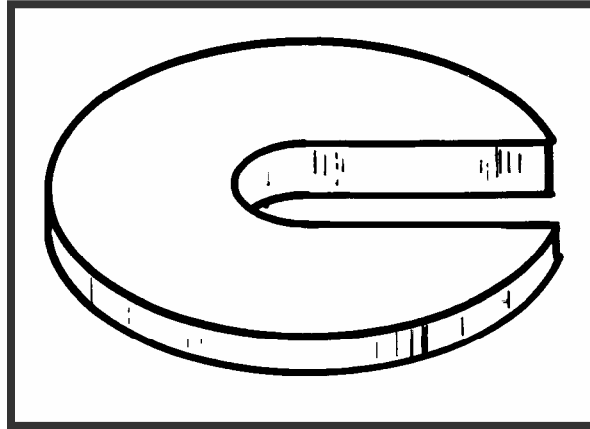


Figure 9. A slotted washer is apt to work loose and fall out. It is suitable for fixture applications, but not recommended for diesetting. *Smith & Associates*

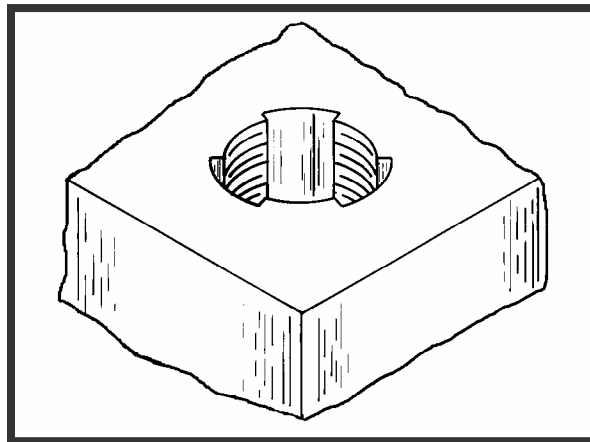


Figure 10. A one sixth turn fastener advocated by some setup reduction experts. It is unsuited for nearly all diesetting application. *Smith & Associates*

Avoid Errors in Applying Generic Setup Reduction to Diesetting

Many good pressroom improvements occur by adopted ideas and methods found in books translated from foreign languages. However, an idea that is appropriate for machine tool or fixture use is not necessarily proper for diesetting. Perhaps the best way to state the problem is that some explanation regarding correct application might have been lost during the translation into English.

C-Shaped Fixture Washers

The C-shaped washer shown in Figure 9 might be suitable for very light duty short run pressworking applications. However, there is always the danger that the washer can fall out should the die fastening method loosen.

One-Sixth Turn Diesetting Fasteners

The one-sixth-turn fastener is unsuitable for any diesetting application. There are several reasons for this recommendation which include:

1. Diesetting fasteners tightened one-sixth turn may not achieve proper tightness in 60 degrees of rotation.
2. The required thread modification will weaken the screw and female threads.
3. Dangerous stress concentration or *stress risers* may occur.

The writer is aware that the breechblock and plug on naval rifles makes use of an interrupted thread breech plug that swings into place with a hinge behind the projectile and powder charge. This is of course a highly specialized use requiring careful engineering.

In light duty, applications Unified National Course one half-inch diameter screws with the threads milled off two sides are successfully used with mating female threads. This is an unusual but successful application. Much attention to detail is required and a detent mechanism used to prevent the fastener loosening.

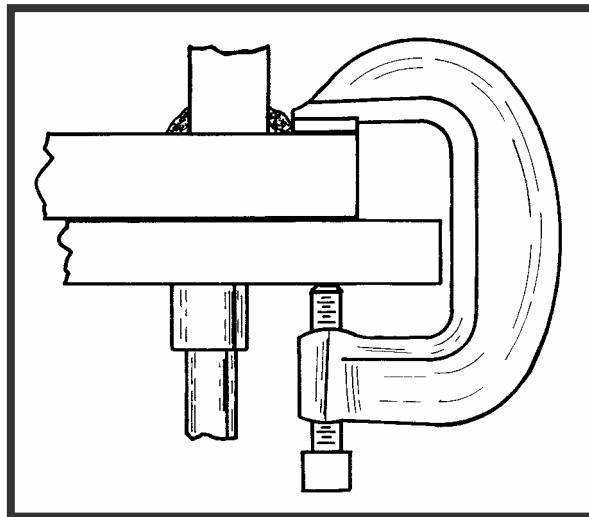


Figure 11. Heavy-duty “C” clamps suitable for machine tool setups and fabrication work are unsuitable for diesetting. *Smith & Associates*

Degrees of Nut Rotation to Properly Tighten Diesetting Fasteners

The amount of turns required to tighten diesetting fasteners varies based on a number of factors. The variables include the thread pitch, amount of desired preload and fastener length. In addition, the amount of rotation will be greater if spring washers are used.

When proper threaded fastener preload is essential to safety and process repeatability, it can be achieved by turning the fastener the correct number of degrees once resistance is sensed. The amount of required rotation is determined from fastener engineering formulas. Another accurate method is to use a calibrated torque wrench. Both methods work best if the threads are clean, free from burrs, and properly lubricated.

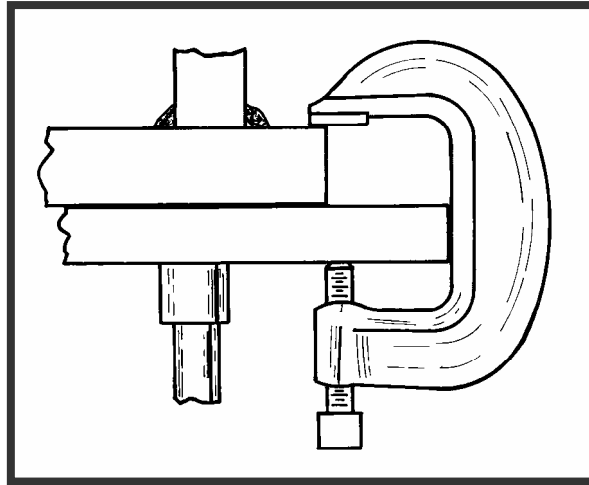


Figure 12. An extremely dangerous practice observed in a shop with a very high employee injury rate. *Smith & Associates*

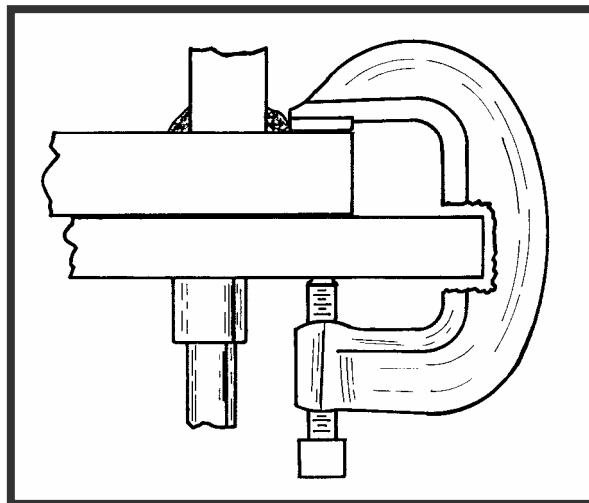


Figure 13. A “C” clamp modification observed in the same shop as Figure 12. *Smith & Associates*

Never Use C-clamps or other Insecure Die Fasteners

Figures 11 through 14 illustrate very unacceptable diesetting practices. These examples are not safe for any purpose including die tryout applications.

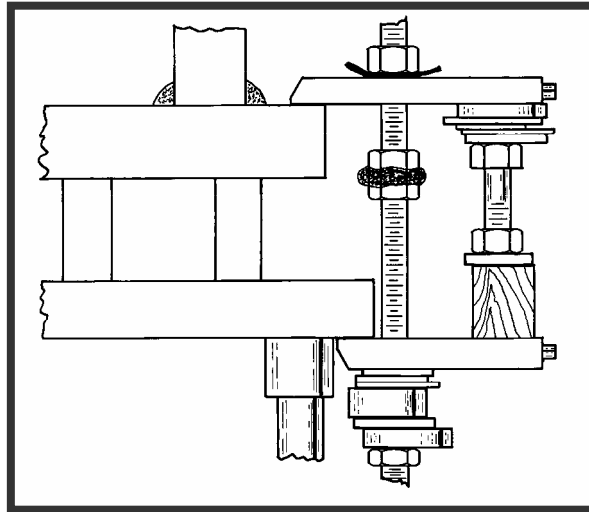


Figure 14. An untrained diesetter's way of avoiding the use of "C" clamps. The shop where this occurred shall remain anonymous. *Smith & Associates*

Welded Fasteners and Die Handling Devices

Fabricating special threaded fasteners for die setting and die handling by welding should be avoided if not strictly forbidden. The properties of the weld itself, and that of the heat-affected zone, are difficult to determine. There is an unacceptable likelihood of failure in service.

All-thread Rod

Commercial all-thread rod is not recommended. There is no simple way to know that it has the required mechanical strength to securely set the die. Some threaded rod is represented to be grade eight or equivalent material. However, since there is no easy way to mark identification on the rod, the use of such material is not advised. The author is aware that many light duty pressworking operations make use of all thread rod and other items purchased at farm supply and hardware stores. Such uses must be subject to good engineering judgement and analysis because the strength and fatigue resistance of the material is uncertain.

NOTES: _____

