PRESS INSTALLATION TECHNIQUES

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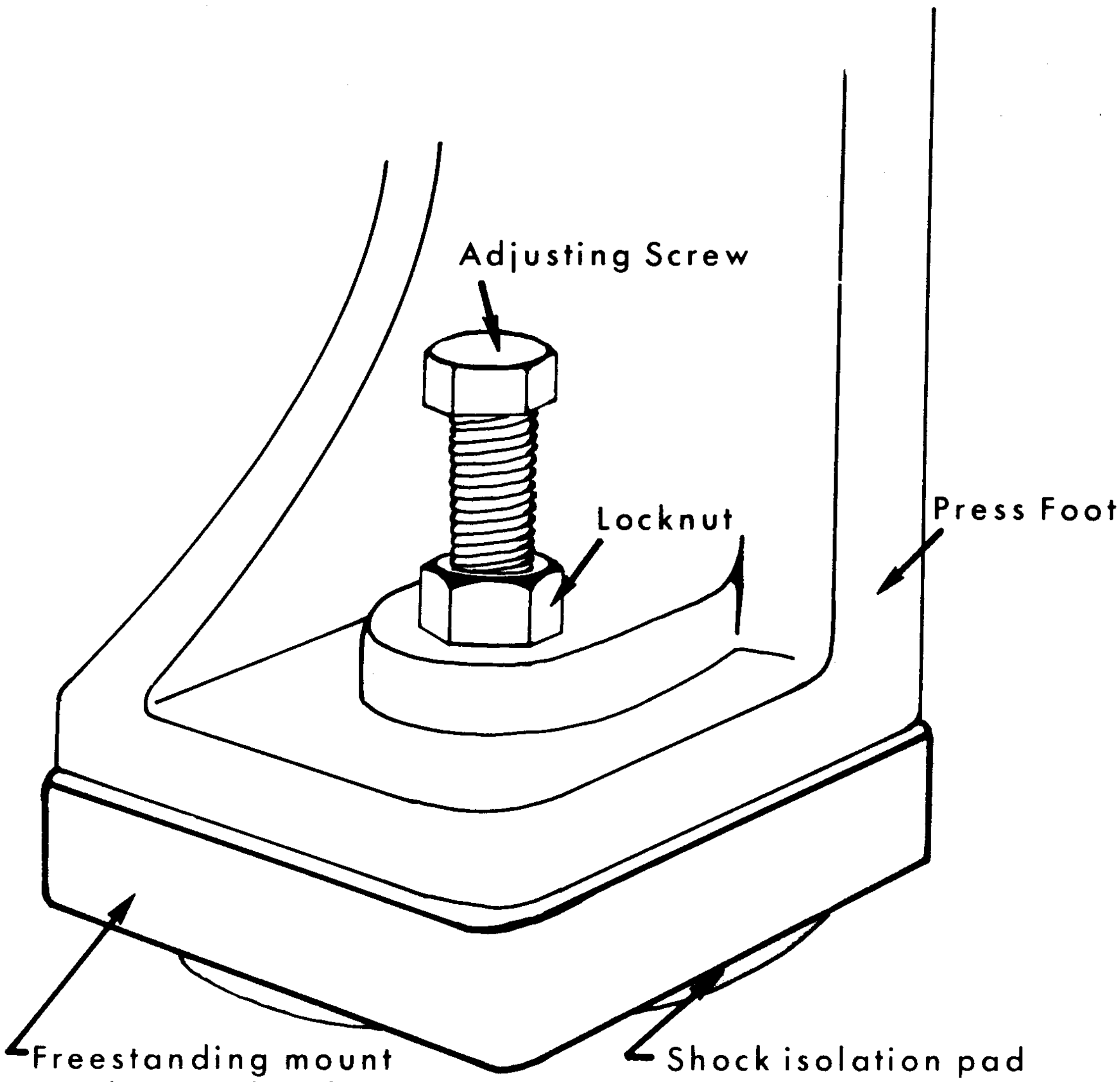

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INSTALLATION TECHNOLOGIES

Press installation techniques

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When a press installation takes place, many changes are required. Electrical and air services must be provided; plant layouts are often changed or adapted; preparations are made for materials handling and feeder equipment; and operating and maintenance personnel are added.

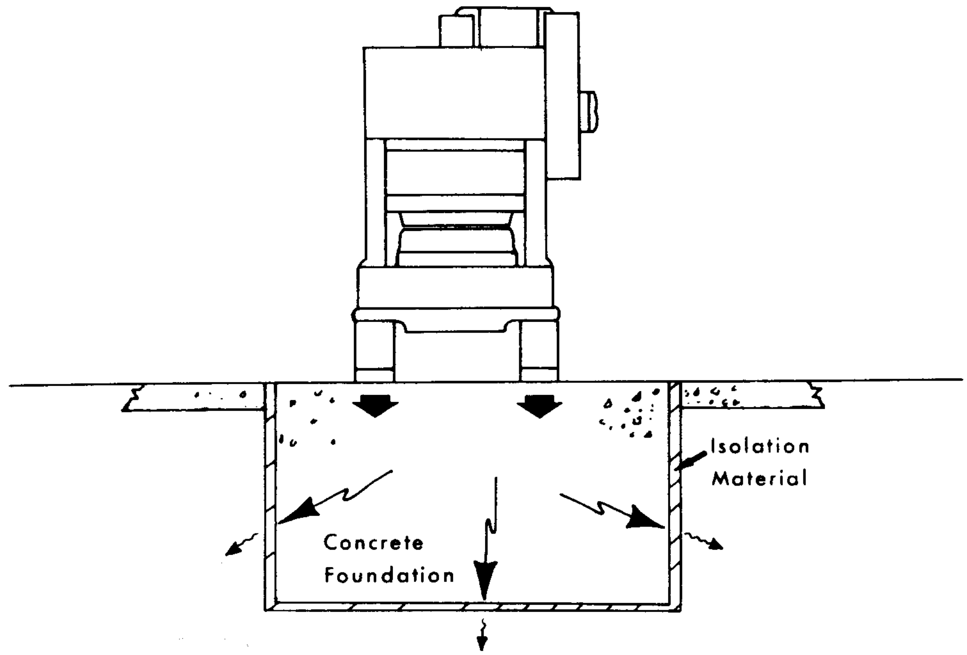
One important phase of the installation, which is often overlooked, is the press mounting system.

In order to perform to design specifications, presses must be supported adequately to maintain alignment and to maintain critical relationships between press and feed equipment. Also, presses must be supported in such a manner that the shock and vibration generated in normal operation does not transmit into surrounding areas, thereby disrupting precision machining work and/or contributing to personnel fatigue.

The support system for a press must be capable of dealing with:

1) Static loads (dead weight of the press)
2) Stamping impacts and snap-through forces
3) Slide inertia forces
4) Rotating out-of-balance forces

Isolated Inertia Blocks



Isolated inertia block prevents transmission of shock/vibration to nearby areas

When the installation of a press is undertaken where slide inertia forces exceed approximately 2/3 of the dead weight of the press one satisfactory approach is the use of a large inertia block completely isolated from the surrounding soil and structures. In this type of installation the press must be securely anchored to the block. Careful attention must be paid to high speed presses mounted in this manner as the forces imposed on the anchorbolts may actually approach 150% of the rated capacity of the press.

Static forces are those loads seen at each of the individual press mounting points with the press in operating position and completely at rest. Nearly all presses of current manufacture utilize four mounting points. Presses, however, typically are not constructed symmetrically around these four points.

It is usually the case that the rear feet of the press are located at a greater distance from the center line of the slide travel than are the front feet. Also, fly-wheels and driving equipment on mechanical type machines are typically located at one side or the other. These conditions result in an uneven weight distribution and must be taken into account in the design of any support system.

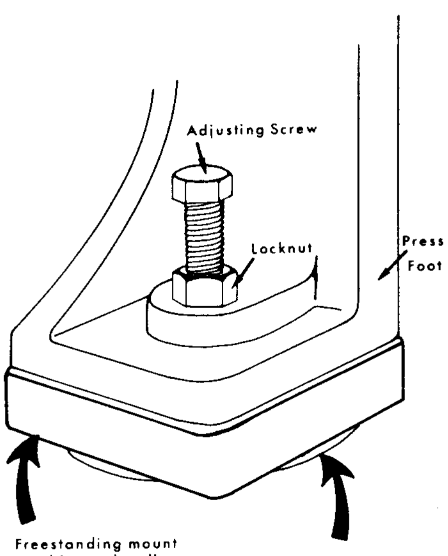
Stamping impact and snap-through forces are generated when higher speed machines are used for blanking. The rapid rate of rise of force as the stock is contacted by the punch tends to move the press crown upward and the bed downward, stretching the press uprights in the process. At maximum capacity, it can be expected that the uprights of a press will be stretched as much as .030 inches.

When the work material fractures, the opposite action occurs with the press crown moving downward and the bed upward to its original position, and because of inertia, slightly beyond. This reaction at the time of material fracture is called "snap-through shock". As the stamping load is developed and released over a small time period the press frame is excited to vibrate at a frequency many times the basic press operating speed. Observations have shown that impact generated shocks will result in a ringing vibration in the vicinity of 200-300HZ. Unless abated, this ringing will continue until the natural damping characteristics of the press frame material have absorbed the energy released.

In a blanking press that is rigidly attached to a massive foundation with the dynamic loads developed, as the punch contacts and breaks through the stock, extremely high loads are imposed on the press feet and foundation. The magnitude of these loads is influenced somewhat by the rigidity of the press structure; the rigidity of the connection to the foundation; and the stiffness of the sub-soil supporting foundation. In specific cases, loadings of 150% of the stamping capacity have been measured at press foot to foundation interfaces.

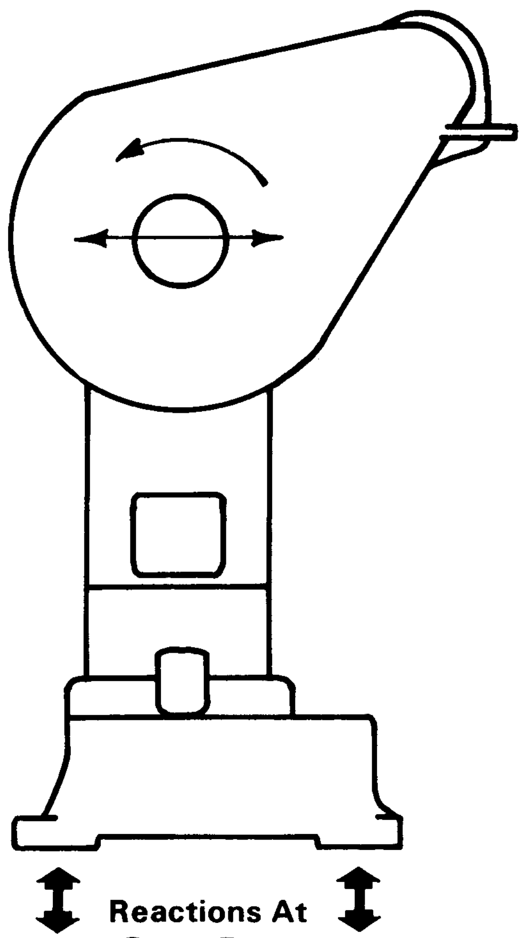
Combination BLOCK and MOUNTS are used in certain cases where floor strengths are not adequate to support the press with sufficient rigidity to permit the use of mounts. There is no rigid connection between the press proper and the foundation. Here the block serves to dissipate the slide inertia forces and the mounts the press frame vibrations. A shallow flat block may be used to compensate for poor soil bearing structure.

Shock Isolation Mounts



Shock isolation mounts can effectively serve installations where slide inertia forces are moderate (as in the case of a slow to medium speed machine or a high speed machine with a built-in dynamic balancer) and where sufficient support can be obtained from the existing floor. Here the condition of the floor and stiffness of the soil beneath the floor are primary considerations and must be carefully evaluated.

Stamping torque reaction and horizontal movement of rotational out-of-balance forces result in reactions at press feet.



Slide inertia forces resulting from the sinusoidally varying acceleration forces acting on the slide are an extremely important consideration in the design of a press mounting system. They act primarily along the direction of slide travel and tend to alternately lift the press free of the foundation and push the press into the foundation. In the cases of high speed machines, it is possible for the slide inertia force to exceed the dead weight of the press. It can then be seen that the press could be lifted free from the floor during a part of each stroke. This condition serves to estabish a limitation as to the available mounting approach for higher speed machines.

This rule of thumb relating to slide inertia forces may prove convenient when considering a new installation; a typical straight *slide* press with a stroke of one inch would generate a slide inertia force equaling its dead weight at approximately 750 strokes per minute. When the stroke is moved out to 1.5 inches, the same press will lift at approximately 600 strokes per minute.

Machines which are manufactured with dynamic balancing equipment (either the rotating or reciprocal type) do not have this problem. Slide inertia forces are quite effectively cancelled and high speed machines can be operated without being rigidly connected to the foundation.

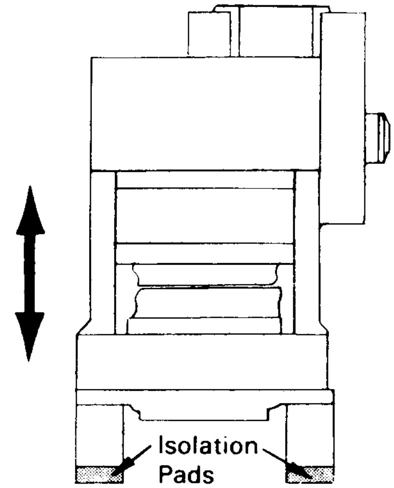
For each specific installation involving a medium to high speed machine, particularly where a longer stroke is encountered, a careful analysis of the slide inertia force should be performed before a decision is made as to how to proceed with the installation. This situation is not so prevalent with the OBI machines as slide weights are a much smaller percentage of the total machine weight.

Rotating out-of-balance forces result from crankshaft imbalance and produce a to-and-fro rocking of the press about its mounting points, unless proper action is taken to restrain the press. This problem is most severe in presses of older manufacture which do not have balance weights on the crankshaft to balance the crank throws and big ends of the connecting rods.

Most presses of modern manufacture, and intended to run over 150 strokes per minute, have finely balanced crankshafts, and the problems are minimal. Some older machines, and in some cases narrow modern machines which lack sufficient space for crankshaft balance weights, are not in rotating balance and must be properly restrained.

When a rotating out-of-balance condition is present it is possible to predict by calculation the amplitude of the rocking motion that will occur if sufficient engineering data can be obtained on the press. Otherwise, a stiffer than normal installation must be furnished to minimize the rocking motion.

Isolation Pads



Stamping impact shock tends to move press crown upward and bed downward at moment of impact; forces reverse as fracture of the part material occurs

This approach is most often taken with smaller machines and involves the use of a resilient pad placed directly between the machine foot and the floor. The function of this pad is essentially the same as it would be in a shock isolating mount with the exception that the leveling capability is not present. When pads alone are used presses must be shimmed into level to assure proper alignments.

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