

## INTRODUCTION TO THE MACHINE SHOP

### MACHINE SHOP WORK

Machine shop work is generally understood to include all cold metal work by which an operator, using either power driven equipment or hand tools, removes a portion of the metal and shapes it to some specified form or size.

### Laying Out Work

"Laying out" is a shop term which means to scribe lines, circles, centers, and so forth, upon the surface of any material to serve as a guide in shaping the finished work piece.

### COMMON LAYOUT TOOLS

#### SCRIBER

To obtain an accurate layout, fine lines must be scribed in the metal. A scriber is the layout tool that is used to produce these lines. The point is made of hardened steel and is kept clean by honing on an oilstone.



#### DIVIDER

When laying out circles, arcs, and radii, it is best to use the divider. The legs of the divider must be of the same length and be kept sharp.



#### TRAMMEL

When scribing circles, arcs, and radii that are too large to be produced with the divider, a trammel should be used.



#### HERMAPHRODITE CALIPER

The hermaphrodite caliper is a tool used to layout lines that are parallel with the edges of the work piece. It can also be used to locate the center of cylindrical shaped workpieces.



#### VERNIER HEIGHT GAGE

The vernier height gage is a caliper with a special foot block to adapt it for use on a surface plate.



### SURFACE GAGE

A surface gage is used for many purposes, but is most often used for layout work. The gage can be used to scribe layout lines at any given distance parallel to the work surface.



### STEPS IN MAKING A LAYOUT

1. Study the shop drawing or blueprint carefully before you cut off the stock. Allow enough material to square the ends if required.
2. Remove all oil and grease from the work surface and apply layout dye.
3. Locate and scribe a reference or base line. All the other measurements should be made from this. If the workpiece already has one true edge, it can be used in place of the reference line.
4. Using the base line as a reference line, locate and scribe all center lines for each circle, radius, or arc.
5. Mark the points where the center lines intersect using a sharp prick punch.
6. Scribe all circles, radii, and arcs using the divider or trammel.
7. Using the correct type protractor, locate and scribe all straight and angular lines.
8. Scribe all lines for internal openings.
9. All layout lines should be clean, sharp, and fine. Reapply layout dye to all messy, wide, or incorrect lines and re-scribe.

### GENERAL SHOP SAFETY

#### EYE PROTECTION

Using eye protection in the machine shop is the most important safety rule of all. Metal chips and shavings can fly at great speeds and distances and cause serious eye injury. Safety glasses must be worn when working with hand cutting tools, since most hand cutting tools are made of hardened steel and can break or shatter when used improperly.

#### HAZARDOUS NOISE PROTECTION

Noise hazards are very common in the machine shop. High intensity noise can cause permanent loss of hearing. Although noise hazards cannot always be eliminated, hearing loss is avoidable with ear muffs, ear plugs, or both.

#### FOOT PROTECTION

The floor in a machine shop is often covered with razor-sharp metal chips, and heavy stock may be dropped on the feet. Therefore, safety shoes or a solid leather shoe must be worn at all times.

# Workshop Theory And Practice Mechanical Engineering

**Inter-University Board of India**



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