

JOB REPORT **ON** **MACHINE SHOP**

1. **NAME OF THE JOB.** Straight, step and taper turning, facing, centre drilling and drilling practice.

2. **OBJECTIVE.** The objective of this job is to practice the preparation of a straight turning, step turning, taper turning, facing, centre drilling and drilling operation with the help of a lathe machine.

3. **THEORY.**

◆ **Machine Tools.** A machine which performs the material removal with tools to produce desired shape and size of the work piece is known as a machine tool.

◆ **Types of Machine Tools.** There are various types of machine tools commonly used in workshops. They are as follows:

- Lathe Machine.
- Shaper Machine.
- Planer Machine.
- Drilling machine.
- Grinding machine.
- Milling machine.

◆ **Lathe Machine.**

The lathe is one of the most important machines in any workshop. Its main objective is to remove material from outside by rotating the work against a cutting tool. It is a power driven, well purpose machine tool, which is used for producing cylindrical work piece.

An engine lathe is a power-driven, general-purpose machine tool used for producing cylindrical work-pieces. As the piece of metal to be machined is rotated in the lathe, a single-point cutting tool is advanced radially into the work piece a specified depth and moved longitudinally along the axis of the work piece, removing metal in the form of chips. Both inside and outside surfaces can be machined on a lathe by using attachments and accessories. Other operations such as drilling, reaming, boring, taper and angle turning, screw-thread chasing, form turning, knurling, milling, grinding, and polishing may be performed.

◆ Types of Lathe Machine.

- Speed lathe
- Bench lathe
- Engine lathe
- Tool room lathe
- Capstan and turret lathe
- Automatic lathe
- Special purpose lathe

◆ Parts of Lathe Machine.

◆ Major parts.

Bed

Headstock

Tailstock

Carriage. Carriage have five major parts. They are as follows:

Saddle.

Cross-slide.

Compound rest.

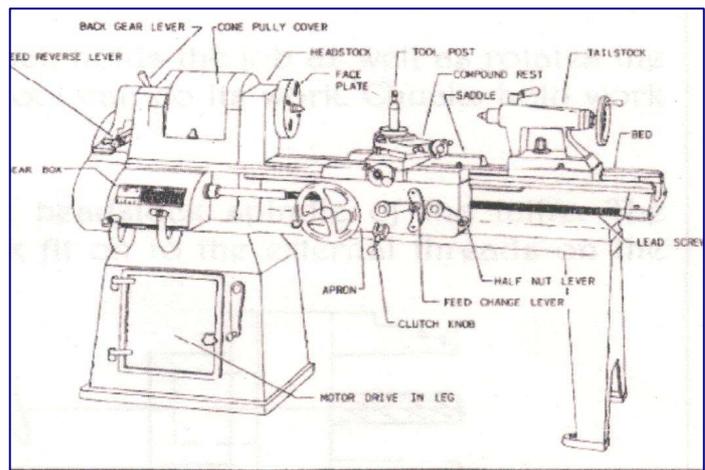
Tools Post.

Apron.

Power feed and thread cutting mechanism.

◆ Other Parts.

- ★ Carriage wheel
- ★ Compound slide
- ★ RPM selector dial
- ★ Compound rest
- ★ Apron
- ★ Rack
- ★ Tailstock spindle
- ★ Lock lever
- ★ Hand wheel
- ★ Lead screw
- ★ Set over screw
- ★ Control rod
- ★ Chip pan
- ★ Tool holder
- ★ Feed plate



Parts of a Lathe Machine

- ★ Taper wheel

✱ Spindle	✱ Sliding gear
✱ Mandrels	✱ Feed rod
✱ Lead Screw	✱ Carriage stop
✱ Emergency stop	✱ Feed compound
✱ Control handle	✱ Follower rest
✱ Angle plate	✱ Rests
✱ Carriage	✱ Wheel

◆ Working principles of Lathe Machine.

In a lathe machine the operations, which are done is defined as a job. The job is held in a chuck or between centers and rotated about its axis at a uniform speed known as RPM (Revolutions per minute). The cutting tool held in the tool post is fed into the work-piece for a desired direction. Since there exists a relative motion between the work-piece and the cutting tool, therefore the material is removed in the form of chips and the desired shape is obtained.

◆ Lathe Operations. The most common operations which can be carried out on a lathe are:

◆ Straight Turning.

It is an operation of removing excess amount of material from the surface of the cylindrical work piece. In this operation, the work is held either in the chuck or between centers and the longitudinal feed is given to the tool either by hand or power.

◆ Step Turning.

It is an operation of producing various steps of different diameters in the work place. This operation is carried out in the similar way as plain turning.

◆ Taper Turning.

It is an operation of producing an external conical surface on a work piece. A small taper may be produced with the help of a forming tool or chamfering tool, but the larger tapers are produced by swiveling the compound rest, at the required angle or by offsetting the tailstock or by taper turning attachment.

If D is the larger diameter, “d” is the smaller diameter and “l” is the length of taper, then,

$$\text{Taper, } \theta = \tan^{-1}(D-d)/2l$$

◆ **Facing.**

This operation is almost essential for all works. In this operation, the work piece is held in the chuck and the facing tool is fed from the center of the work piece towards the outer surface or from the outer surface to the center, with the help of a cross slide.

◆ **Centre Drilling.**

It is an operation of locating the centre of the job before proceeding for the drilling operation. In this operation, the work piece is held in a chuck and the drill centre is held in the tailstock. The drill is fed manually into the rotating work piece, by rotating the tailstock hand wheel.

◆ **Drilling.**

It is an operation of making a hole in a work piece with the help of a drill. In this operation, the work piece is held in a chuck and the drill is held in the tailstock. The drill is fed manually into the rotating work piece, by rotating the tailstock hand wheel.

◆ **Knurling.**

It is an operation of providing knurled surface on the work piece. In this operation, a knurled tool is moved longitudinally to a revolving work piece surface.

4. **Apparatus Needed.**

- Adjustable wrench
- Slide calipers
- Cutting tool
- Knurling tool
- Chuck key
- Facing tools
- Turning tools
- Taper Turning tools
- Chamfering tools
- Form or profile tools
- Parting or necking tools
- Drilling tools
- External and internal threading tools

5. Diagram of the Job.

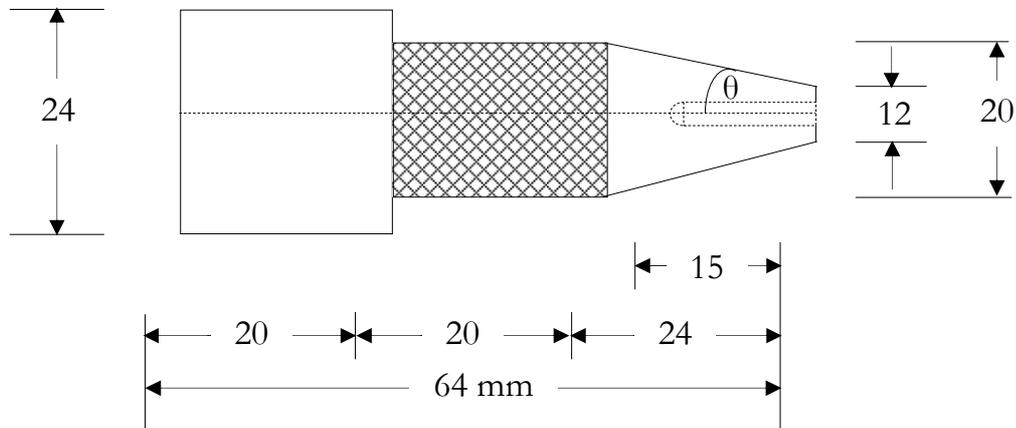


Figure: Diagram of the Job

Note: All the dimensions are in mm.
Length of every section is equal.
Drill size is 6-7.5 mm.
Metal: Mild Steel.

6. Working Procedure. The job was prepared as per the following sequence:

- ⊙ Facing.
- ⊙ Straight Turning.
- ⊙ Step Turning.
- ⊙ Centre Drilling.
- ⊙ Drilling.
- ⊙ Taper Turning.
- ⊙ Knurling.

◆ Facing.

- ⊙ The piece of metal was supplied of 24 mm diameter.
- ⊙ The work piece was held in the chuck and the facing tool was fed from the lathe center of the work piece towards the outer surface with the help of a cross slide.
- ⊙ The machine was operated counter clockwise and the facing was done.

◆ Straight Turning.

- ⊙ The work piece was to reduce in its diameter by 2 mm.
- ⊙ First, the entire length of 60 mm was measured with the help of the slide calipers.
- ⊙ The marking was done on the 60 mm position by the turning tools.
- ⊙ This extra metal over the diameter was measured by the slide calipers and adjusted to the machine.
- ⊙ Then the work piece was held in the chuck and the machine was switched on.
- ⊙ Finally, the cross slide was operated towards the left and again towards the right so long the entire work piece was reduced to 22 mm diameter.

◆ Step Turning.

- ⊙ In this operation, first the 40 mm length was measured with the help of a slide calipers, leaving the 20 mm portion intact of 22 mm diameter.
- ⊙ Then the marking was done on the 40 mm position by the turning tools.
- ⊙ The work piece was to reduce in its diameter by 2 mm in this length.
- ⊙ The extra metal of 2 mm diameter was measured by the slide calipers and adjusted to the machine.
- ⊙ Then the work piece was held in the chuck and the machine was switched on.
- ⊙ Finally, the cross slide was operated towards the left and again towards the right so long the 40 mm length of the work piece was reduced to 20 mm diameter.

◆ Centre Drilling.

- ⊙ It is an operation of locating the centre of the job before proceeding for the drilling operation.
- ⊙ Here, the work piece was held in a chuck and the drill centre was held in the tailstock.
- ⊙ The drill centre was fed manually into the rotating work piece, by rotating the tailstock hand wheel.
- ⊙ Then the machine was switched on and centre drilling was done of near about 02 mm length.

◆ Drilling.

- ⊙ The diameter of the drill was given as 6-7.5 mm.
- ⊙ A drill bit of 7 mm was selected for that purpose.
- ⊙ The length of the drill 15 mm was adjusted to the machine.

- ⊙ Then the work piece was held in a chuck and the drill was held in the tailstock.
- ⊙ The drill is fed manually into the rotating work piece, by rotating the tailstock hand wheel.
- ⊙ And finally the drilling of desired diameter and length was done.

◆ Taper Turning.

- ⊙ For taper turning, the larger diameter D was 20 mm, smaller diameter d was 10 mm and length of the taper turning was 20 mm.
- ⊙ So, as per the formula, the angle was found, 14.04 degree.
- ⊙ The angle was set in the machine with the help of the adjustable range.
- ⊙ Finally, the desired angled taper turning was done from the right towards the left direction.

◆ Knurling.

- ⊙ The knurling tool was set in the machine.
- ⊙ The same was centred and knurling was done in the middle 20 mm portion of the work piece.
- ⊙ Here, a knurled tool was moved longitudinally to the revolving work piece surface.

7. Discussions.

1. Lathe machine should be stopped before making adjustments to the tool holder.
2. A short piece of winding wood may be used to push the winding chip down into the lathe pan.
3. A lathe chip is both hot and sharp and should never be touched by hand.
4. Chuck key should not be leaved in the chuck.
5. It is bad practice to stop the lathe before the required length of knurl is completed.
6. A brush should be used to remove the chips resulting from a knurling operation.
7. In case of emergency, the emergency stop should be used to stop the machine.
8. For smooth working and to prevent the job from becoming too much hot, the cooling fluid should be used.
9. Care should be taken so that any time while turning is done, the marked portion should not be crossed.

10. Extreme care should be taken so that the tool post is not colliding with the head stock while the machine is on. In this case, there may be a damage of the machine.
11. The slide calipers should be used accurately, otherwise the lengths and the diameters may be varied.
12. Necktie, wrist watch and jewelry such as rings should not be wearing during the operation.
13. The mechanist should wear an apron, shop coat, or coveralls.
14. Apron strings should be tied at the back, and bulging pieces of cotton waste should be tied at the back.
15. The mechanist should not wear woolen sweater.
16. The mechanist should wear canvas shoes.
17. Gloves should be worn when the worker is moving sheet metal or large pieces of stock.
18. The worker should wear goggles or safety glasses to save the eye from the flying particles of metal.

8. Conclusions. Machine shop provides us the opportunity to learn how to prepare different jobs on ground. This is of immense importance and of extreme practical usefulness to prepare such jobs in the machine shop, which will make the students beneficiary in the long run.

9. Remarks by the Instructor.

10. Grading Obtained.