Workshop Layout

AIM: To study the workshop layout in the college.

Description: The arrangement of the machinery and equipment in a workshop is called 'Workshop layout'. The workshop layout is the art of planning and positioning the machine tools, equipment, operator workbenches, assembly area, storage areas (for raw material, associated items, and finished product), and supervisor area, shipping area, and allied items in a manner. A good workshop layout is a well-planned positioning of the company's plant, machinery, and equipment, which gives excellent ambiance for the employees to give out their best and improves the overall efficiency of the company and also better utilization of labour, machinery, and material.

Following are the three basic types of workshop layout:

1. **Process layout**

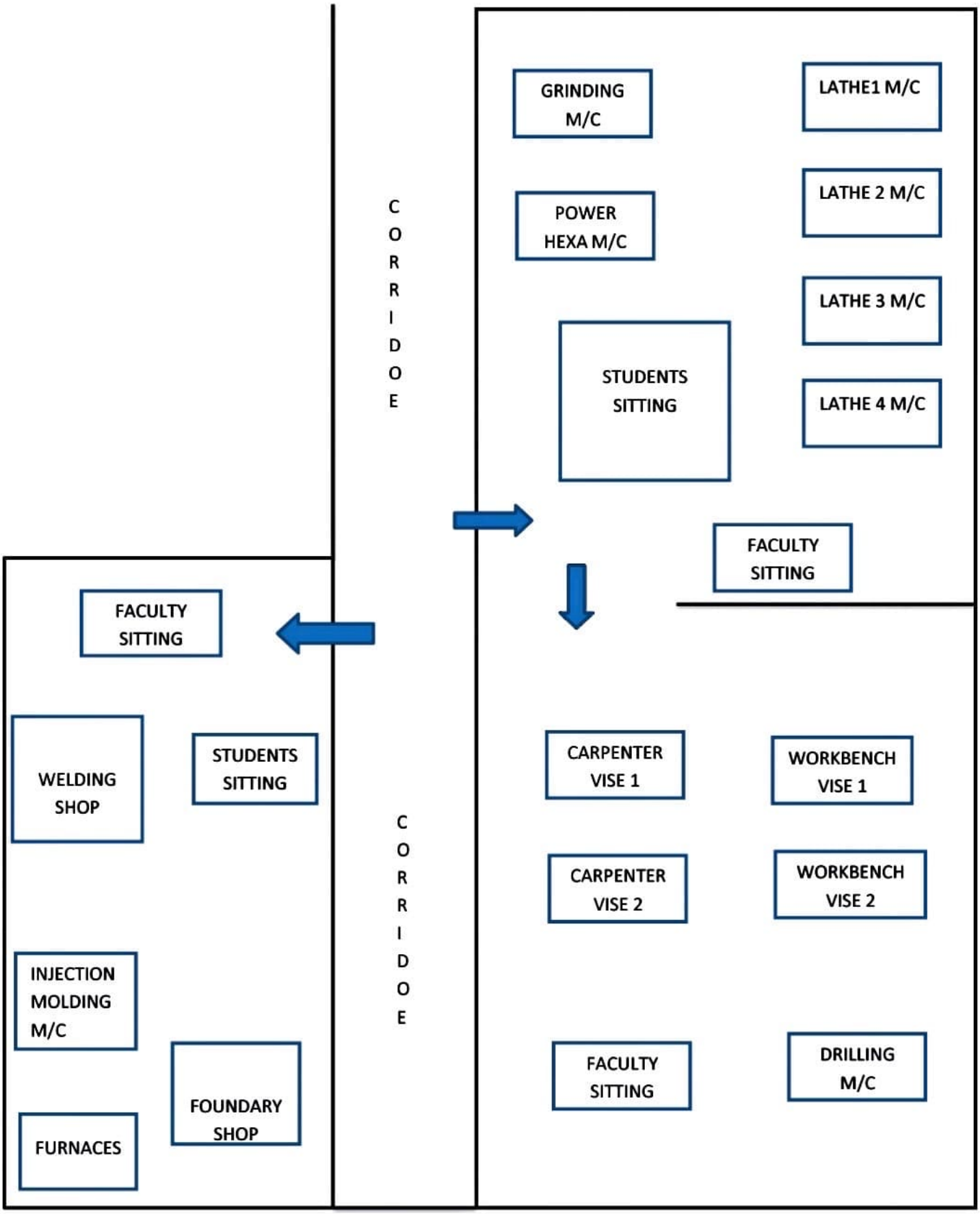
Process layouts are typically used for job workshops that have no specific product. Job workshops get orders for jobs from different customers, and each job will be different. The workshop layout for a job workshop is oriented towards the process rather than for an end product. The machines can be arranged in a regular sequence viz. cutting section – turning section – milling section – drilling section – heat treatment – grinding, and so on. Process layouts are also known as **functional layouts.**

2. Product layout

Product layout or line layout is concerned with locating machines and other auxiliary services as per the product's processing sequence. Its main focus is on the sequence of operations related to production or assembly which is required for a product or any of its part's assembling or manufacturing. Usually, product layout is beneficial for industries that have mass or continuous production such as oil refining, automobile assembling, cement manufacturing.

3. Fixed Position Layout

This type of layout allows a product to maintain at a certain place and the required resources such as machinery, equipment, manpower, material, etc. are transported to the product's location. In other words, the location of the main element or part of the product remains fixed due to its bigger size or heavy body. Also, the cost of shifting or transportation costs will be lesser in the case of moving resources as compared to the transportation cost involved in the movement of the product.


GRINDING M/C
LATHE1 M/C
POWER HEXA M/C
LATHE 2 M/C
LATHE 3 M/C
STUDENTS SITTING
LATHE 4 M/C
CORRIDOE
FACULTY SITTING
FACULTY SITTING
WELDING SHOP
STUDENTS SITTING
CARPENTER VISE 1
WORKBENCH VISE 1
CARPENTER VISE 2
WORKBENCH VISE 2
CORRIDOE
INJECTION MOLDING M/C
FOUNDARY SHOP
FACULTY SITTING
DRILLING M/C
FURNACES

Lap Joint

OBJECTIVE:- To make a Lap joint, using two given M.S pieces by arc welding.

MATERIAL REQUIRED:- Two Mild steel pieces of given size.

TOOLS AND EQUIPMENT USED

1. Welding Machine
2. Connecting cables
3. Electrode holder
4. Ground clamp
5. Electrodes
6. Chipping hammer
7. Welding shield
8. Goggles

PROCEDURE

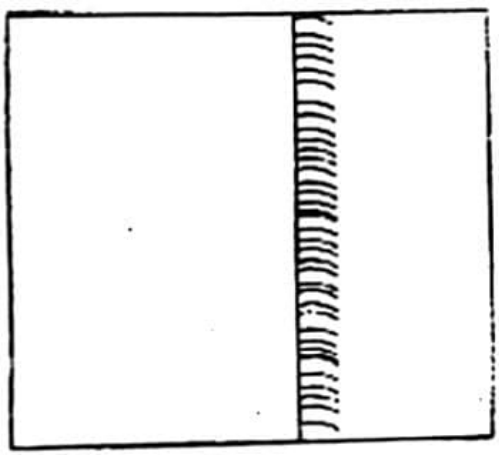
1. The given M.S pieces are thoroughly cleaned of rust and scale.
2. The two pieces are positioned on the welding table such that, the two pieces overlapped one over the other as shown in drawing.
3. The electrode is fitted in the electrode holder and the welding current is ser to be a proper value.
4. The ground clamp is fastened to the welding table.
5. Wearing the apron and using the face shield, the arc is struck and the work pieces are tack-welded at both the ends and at the centre of the joint.
6. The alignment of the lap joint is checked and the tack-welded pieces are required.
7. The scale formation on the welds is removed by using the chipping hammer.
8. Filling is done to remove any spanner around the weld.

PRECAUTIONS

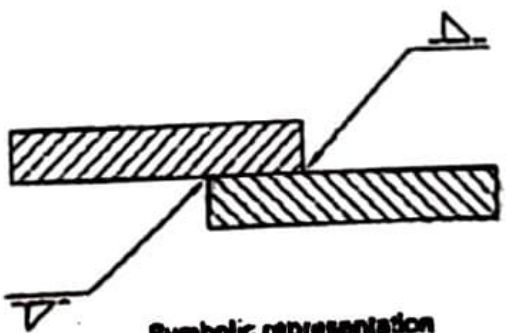
1. Use goggles, gloves in order to protect the human body.
2. Maintain the constant arc length.

RESULTS

The Lap joint is made by using arc welding process.



Representation of lap joint



Symbolic representation

lap joint

welding Shop

(Butt Joint) x

OBJECTIVE:- To make a butt joint using the given two M.S. pieces by are welding.

MATERIAL REQUIRED:- Two Mild steel pieces of given size.

TOOLS AND EQUIPMENT USED

1. Welding Machine
2. Connecting cables
3. Electrode holder
4. Ground clamp
5. Electrodes
6. Chipping hammer
7. Welding shield etc.
8. Goggles

PROCEDURE

1. The given metallic pieces filled to the desired size.
2. On both pieces beveled in order to have V groove.
3. The metallic pieces are thoroughly cleaned from rust grease, oil, etc.
4. The metallic pieces are connected to terminals of Trans former.
5. Select electrode dia based on thickness of work piece and hold it on the electrode holder. Select suitable range of current for selected dia.
6. Switch on the power supply and initiates the arc by either striking arc method or touch and drag method.
7. Take welding to be done before full welding.
8. In full welding process after completion one part before going to second part. Slag is removed from the weld bed. With the metal wire brush or chipping hammer.
9. Then the above process will be repeated until to fill the groove with weld bed or weld metal.

PRECAUTIONS

1. Use goggles, gloves in order to protect the human body.
2. Maintain the constant arc length.

RESULTS

The single V-butt joint is made by using arc welding process.

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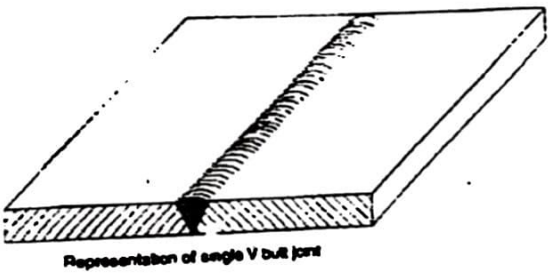
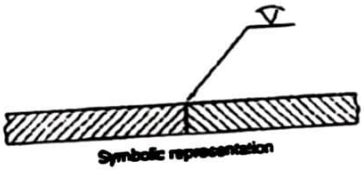


Representation of single V butt joint



Symbolic representation

V – butt joint

Fitting Shop (Job No.-2)

OBJECTIVE

To prepare a metallic U shape in fitting shop.

TOOLS USED

Steel scale, try square, scriber, punch, hand hacksaw, bench vice, file, hammer etc

MATERIAL

Mild steel flat (50 x 50 x 5) mm – 1 piece.

OPERATION TO BE CARRIED OUT

1. Filing
2. Checking flatness and square ness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing

PROCEDURE

1. The burrs in the pieces are removed and the dimensions are checked with a steel rule.
2. The pieces are clamped one after the other and the outer mating edges are filed by using rough and smooth files.
3. The flatness, straightness and square ness i.e. right angle between adjacent sides are checked with help of Try-square.
4. Chalk is then applied on the surfaces of the two pieces.
5. The given dimensions of the U-shape are marked.
6. Using the dot punch, dots are punched along the above scribed lines.
7. Using the hack saw, the unwanted portions are removed.
8. The cut edges are filed by the half round file.
9. The corners of the stepped surfaces are filed by using a square or triangular file to get the sharp corners.

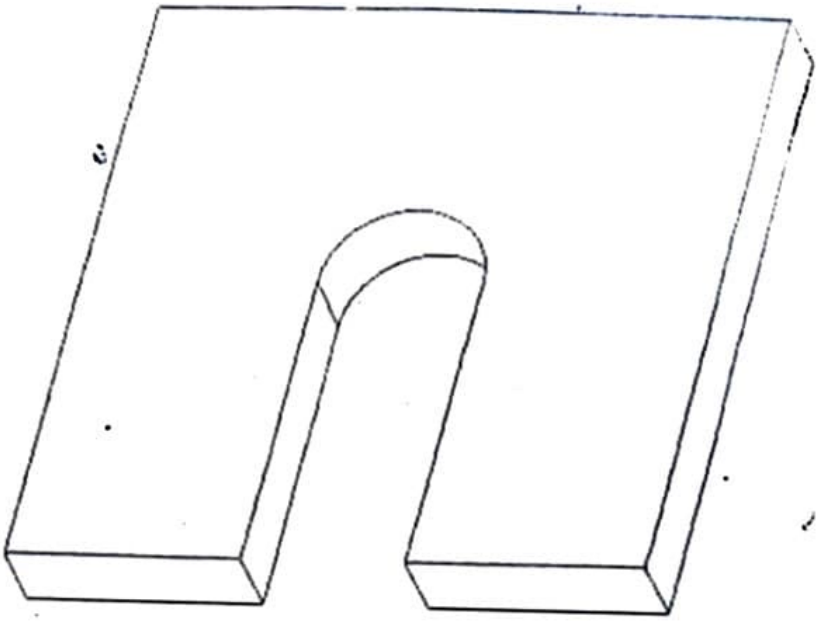
PRECAUTIONS

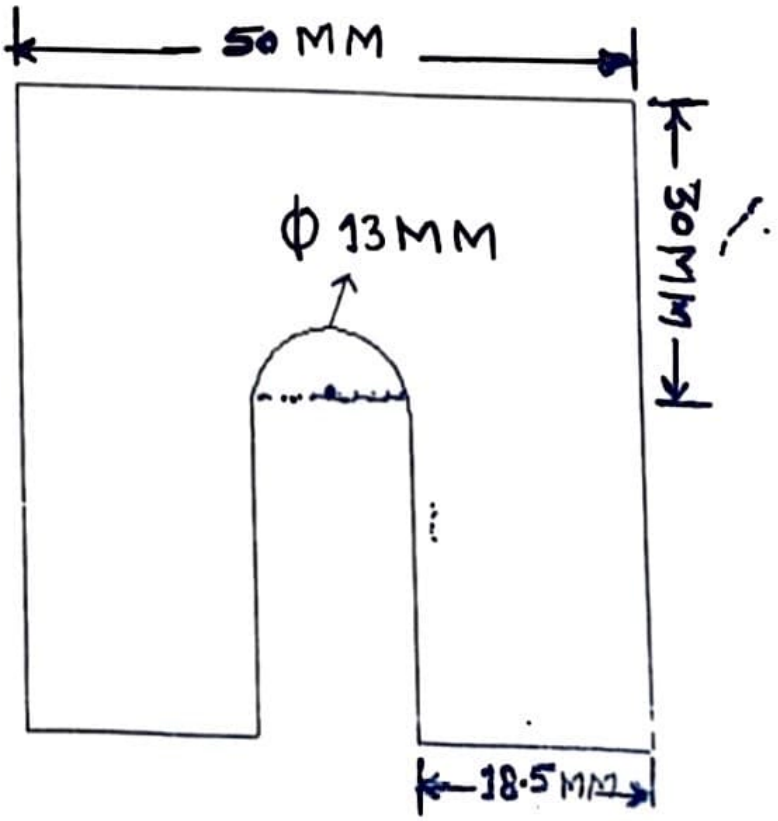
1. Care is taken to see that the marking dots are not crossed, which is indicated by the half of the punch dots left on the pieces.
2. Apply pressure in forward direction during hack sawing.
3. Don't rub steel rule on the job.
4. Fix blade in hack saw frame with correct tension.
5. During hack sawing the coolant like water or lubricating oil is to be used.

6. Use precision instruments like vernier calipers and vernier height gauge carefully.
7. Files are to be cleaned properly after using.

RESULTS

U-shape is made as per the required dimensions.



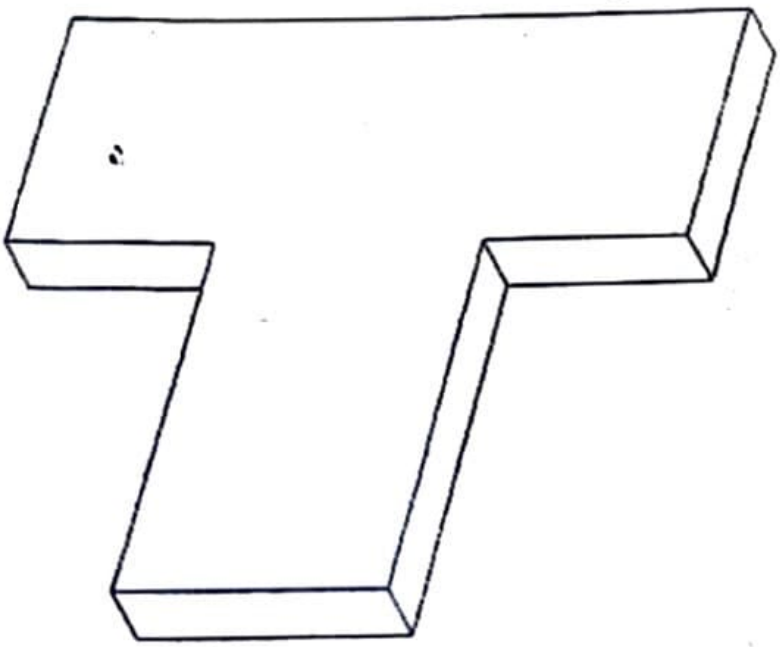


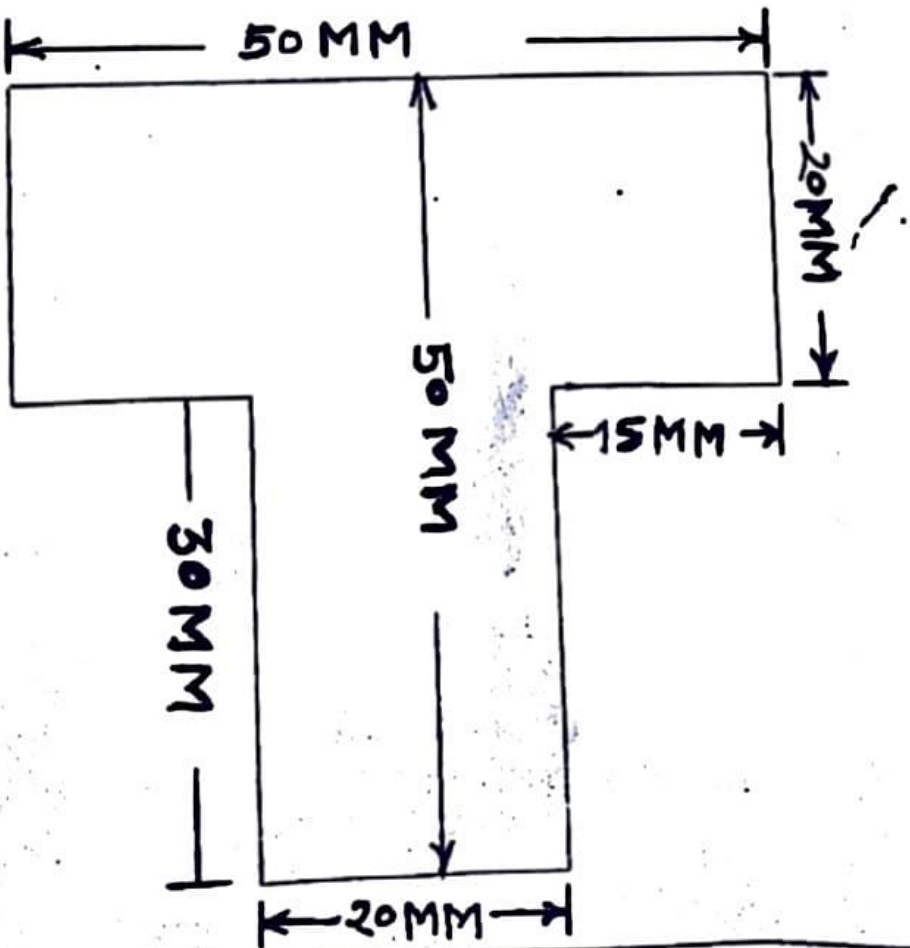
6. Use precision instruments like vernier calipers and vernier height gauge carefully.
7. Files are to be cleaned properly after using.

5

RESULTS

T-shape is made as per the required dimensions.





5

Cross Half Lap Joint

OBJECTIVE:- To make a cross half lap joint.

MATERIAL REQUIRED:- (120mm x 55mm x 22mm) two pieces.

TOOLS AND EQUIPMENT USED

1. Steel rule
2. Try square
3. Marking gauge
4. Rip saw
5. Tenon saw
6. Mortise chisel
7. Mallet
8. Jack plane
9. Wood rasp file

OPERATION TO BE CARRIED OUT

1. Planning
2. Marking
3. Sawing
4. Chiseling
5. Finishing

PROCEDURE

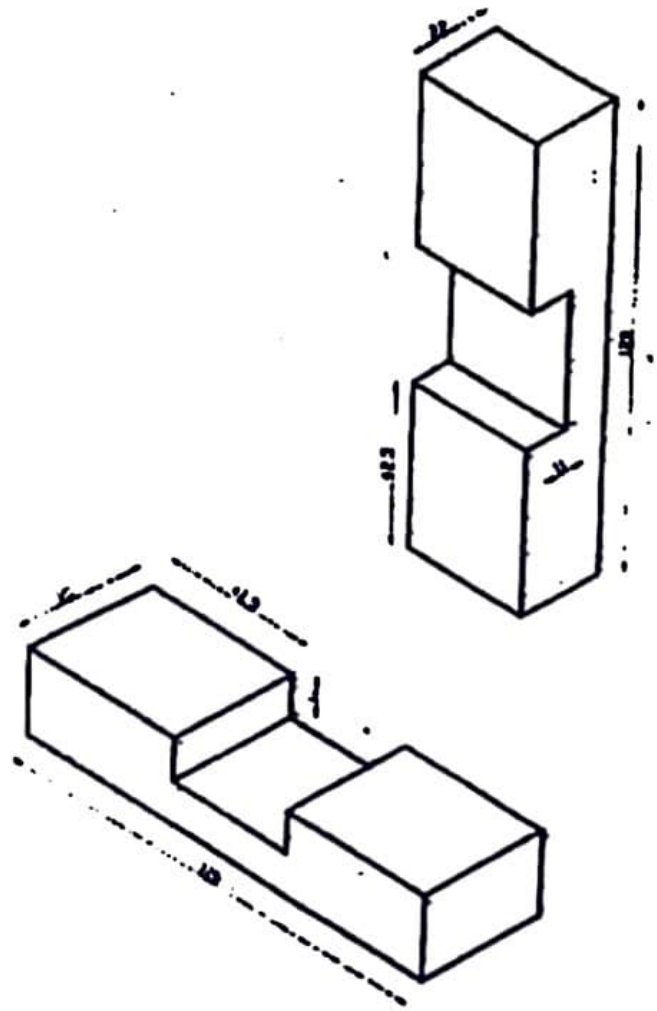
1. The wooden pieces are made into two halves and are checked for dimensions.
2. One side of pieces is planned with jack planeand for straightness.
3. An adjacent side is planned and checked for square ness with a try square.
4. Marking gauge is set and lines are marked at 40-50 mm to make the thickness and width according to given figure
5. The excess material is planned to correct size.
6. Using tenon saw, the portions to be removed are cut in both the pieces
7. The excess material in X is chiseled with mortise chisel.
8. The excess material in Y in chiseled to suit X
9. The end of both the pieces is chiseled to exact lengths.

PRECAUTIONS

1. Reaper should be free from moisture
2. Marking is done without parallax error
3. Care should be taken while chiseling
4. Matching of x and y pieces should be tight.

RESULTS

The cross half lap joint is made success fully.



Cross Half Lap Joint

Machine Shop (Job No.-1)

7

OBJECTIVE

To prepare a work piece on a center lathe as per drawing.

TOOLS USED

Chuck key, tool post key, turning tool bit, parting off, knurling tool, surface gauge, steel rule, vernier caliper.

MATERIAL

MS round bar of 25 mm dia. and length 105 mm.

OPERATION TO BE CARRIED OUT

1. Centering	2. Facing	3. Plain turning	4. Step turning
5. Taper turning	6. Knurling	7. Chamfering	

THEORY

A Centre lathe is one of the oldest and perhaps most important machine tools ever developed. The job to be machined is rotated and the cutting tool is moved relative to the job.

MAIN PARTS OF CENTRE LATHE

Bed: - It is the base or foundation of the lathe. It is a heavy and single piece casting made to support the working parts of the lathe.

Headstock: -It serves to support the spindle and driving arrangements. The headstock spindle, a hollow cylindrical shaft supported by bearings, provides a drive from the motor to the work holding device.

Tailstock: - Tailstock can be locked in any position along the bed. It is also used for holding and feeding the tools such as drills, reamers, taps etc.

Carriage: - The carriage controls and supports the cutting tool. By the help of this, tool moves away or towards the headstock. It has five major parts.

1. **Saddle: -** It is a H-shaped casting fitted over the bed. It moves along the guide ways.
2. **Cross-slide: -** It is mounted on the saddle. It carries the compound slide and tool post, can be moved by power or by hand.
3. **Compound rest: -** It is mounted on the top of the cross-slide. It is marked in degrees, used during taper turning to set the tool for angular cuts.
4. **Tool post: -** It is mounted above the compound rest. The tool is clamped on the tool post.
5. **Apron: -** It is attached to the saddle and hangs in front of the bed. It has gears, levers and clutches for moving the carriage with the lead screw for thread cutting.

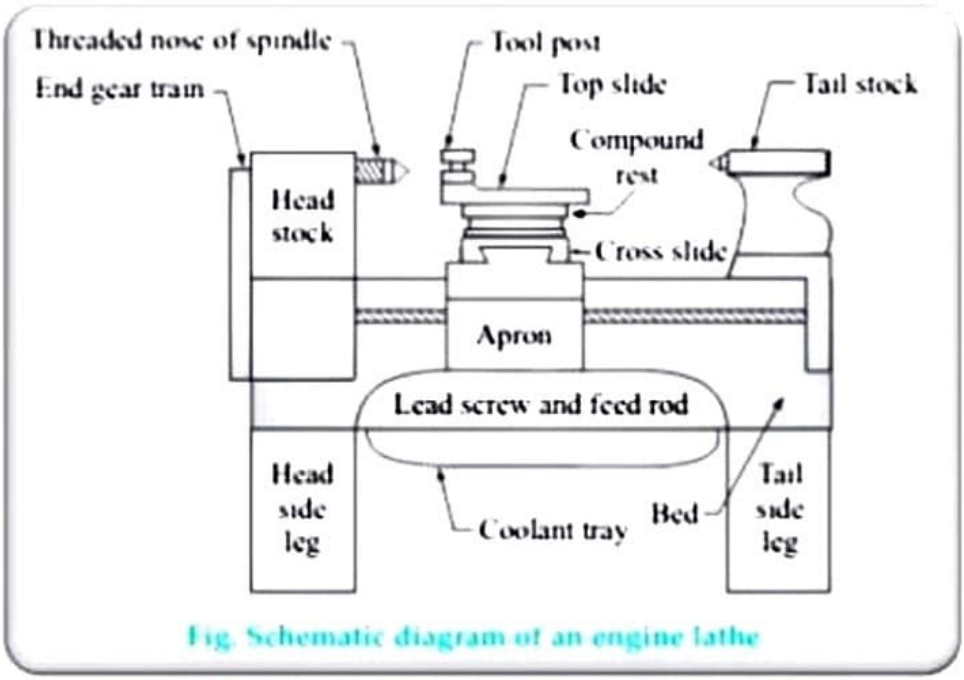


Fig. Schematic diagram of an engine lathe

Feed Mechanism: - The movement of the tool relative to the work is termed as feed. A lathe tool may have three types of feed.

1. **Longitudinal Feed: -** When the tool moves parallel to the work i.e. towards or away from the headstock.
2. **Cross Feed: -** When the tool moves perpendicular to the work i.e. towards or away from the operator.
3. **Angular Feed: -** When the tool moves at an angle to the work. It is obtained by swiveling operated.

PROCEDURE

1. Hold the MS bar properly in chuck on lathe machine.
2. Check the position of job. It should be in centre of chuck and check with the help of surface gauge.
3. Mount the tool bit in the tool post in proper position. It should be tight and tip of tool bit should coincide with the centre of job.
4. Then by threading with the help of cross slide wheel tilt the tip of tool bit to reach at the centre of job. This process of metal removing is known as facing.
5. After facing, feed will be given with the help of star wheel. This metal removing process from surface of job is known as plain turning.
6. Make greater diameter first then turn the position of job in the chuck and do plain turning up to desired length and diameter as per given dimensions in drawing. This plain turning of different dia at different length is known as step turning.
7. Replace the turning tool with knurling tool bit and do knurling same applying feed as in plain turning applied.

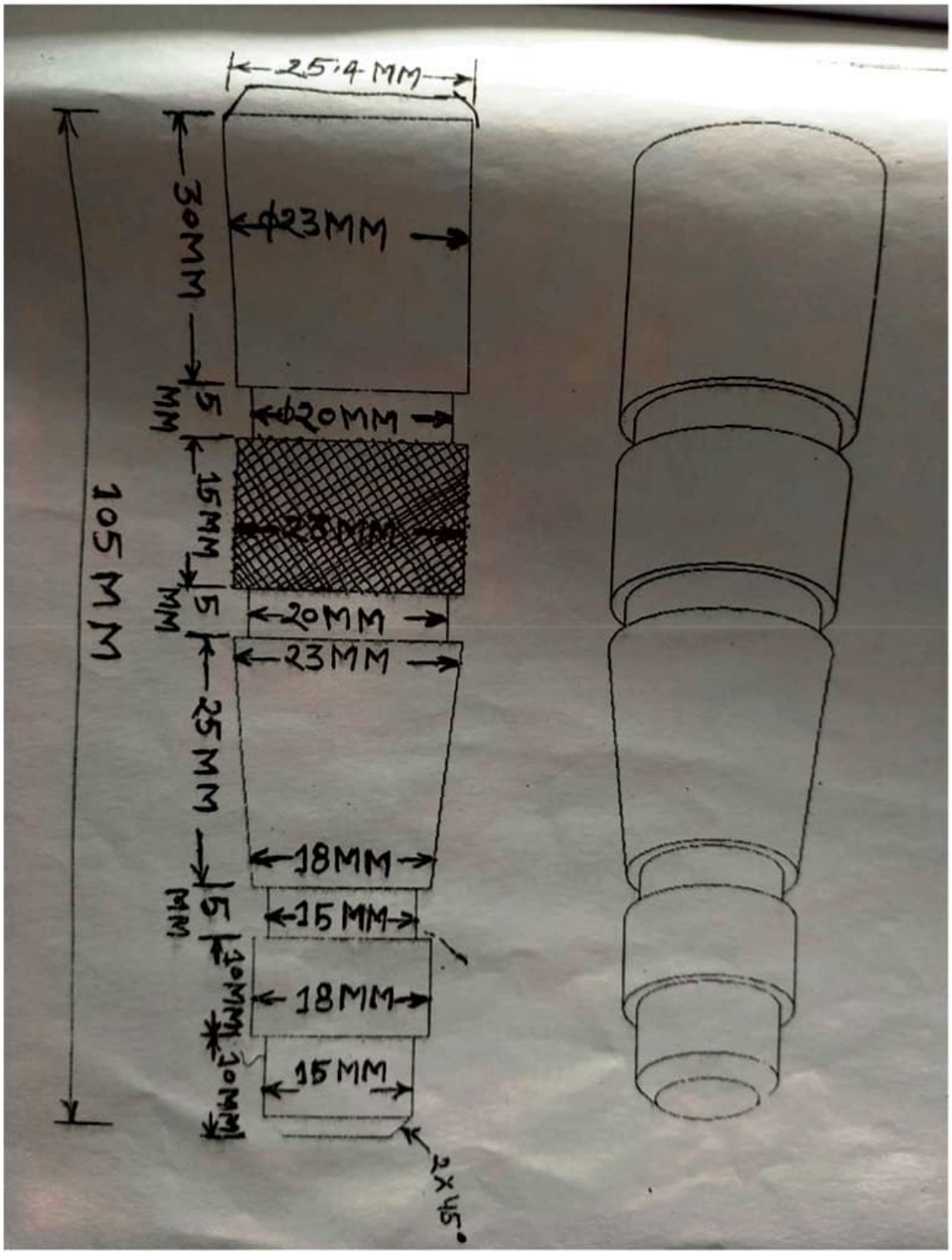
8. Calculate the angle for compound rest swivel and set the compound rest at that angle, and feed the tool with the help of compound rest wheel till get the desired dimensions.
9. Using a parting tool make undercuts for 12 dia or 20 dia.
10. Use a chamfering tool and turn chamfer at the end of the flat portion.
11. Check all the length and diameters turned on them.

PRECAUTIONS

1. Know the basics of operational mechanism very well before operating lathe machine.
2. Adopt always right tool and right procedure for every operation in machine.
3. Make sure the job and tool bit are mounted well in proper position and tightened enough before starting machining.
4. Always make large diameter first and smaller one in the last.
5. Never use outside caliper/steel rule/vernier caliper etc in running condition.
6. Threading and knurling should be done on minimum speed along with sufficient cutting fluid etc.
7. Check tip position of threading tool bit with the help of centre gauge.

RESULTS

The work piece as per drawing is made success fully.


25.4 MM
105 MM
30MM
15 MM
ϕ23MM
ϕ20MM
15MM
23MM
15 MM
20MM
23MM
25 MM
18MM
15 MM
15MM
18MM
15MM
15MM
2 x 45°

Foundry Shop (Job No.-5)

OBJECT: To make a mould with core and casting.

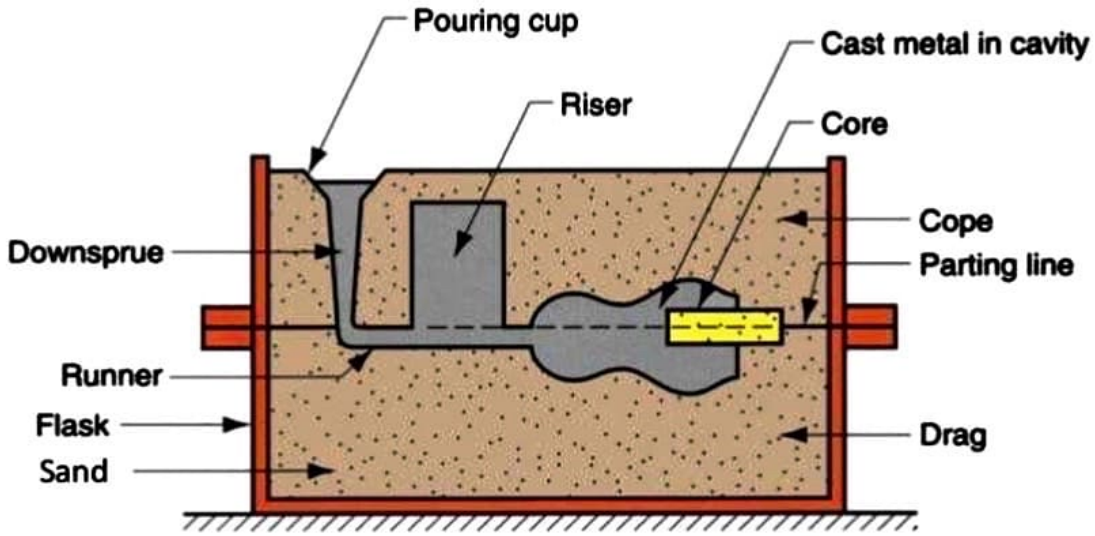
REQUIREMENTS:

Materials- Moulding box, pattern, core, moulding sand.

Tools -Moulding tools - shovel, riddle, rammer, strike off bar, vent wire, sprue pin, lifter, slicks, trowels, gate cutter, bellows etc.

THEORY:

The cavity prepared in the sand for casting a job is called mould. The process of forming mould is called moulding. A core is that portion of the mould which forms the hollow interior of the casting or hole through the casting. A core is a mass of dry sand which is prepared separately, backed in an oven and then placed in the mould .It gives hollow portion in the casting which cannot be readily obtained by the mould proper. After preparing the mould, the casting is done. Casting consists of introducing the molten metal in the mould and allowing the metal to solidify.



PROCEDURE:

1. Place the board and drag upon it in proper position.
2. Fill in the drag with moulding sand and ram it properly.
3. Place the pattern (a gear blank) horizontally in the center of the drag on such that its half portion is in the sand and the remaining half portion above sand.
4. Place the core in proper position.
5. Cut the gate and place the sprue pin in proper position.
6. Sprinkle the parting sand on the whole surface of the moulding sand in the drag
7. Place the cope and clamp it properly with the drag.
8. Fill in the cope with the moulding sand and ram it properly.
9. Make vent holes in the sand of the cope.
10. Remove sprue pin and then the cope.
11. Remove pattern keeping the core in position.
12. Again clamp the cope with the drag and tight them.
13. Now the mould is ready for casting.
14. Pour the molten metal in the mould through the sprue and let it solidify.
15. When it is cooled, remove the casting.

RESULT

A mould with core for gear blank is made and casted.

PRECAUTIONS:

1. Ram the sand properly.
2. Clamp the cope and drag in proper position.
3. Remove the pattern properly.
4. Finish the mould and gate properly.
5. Pouring should be done very carefully.