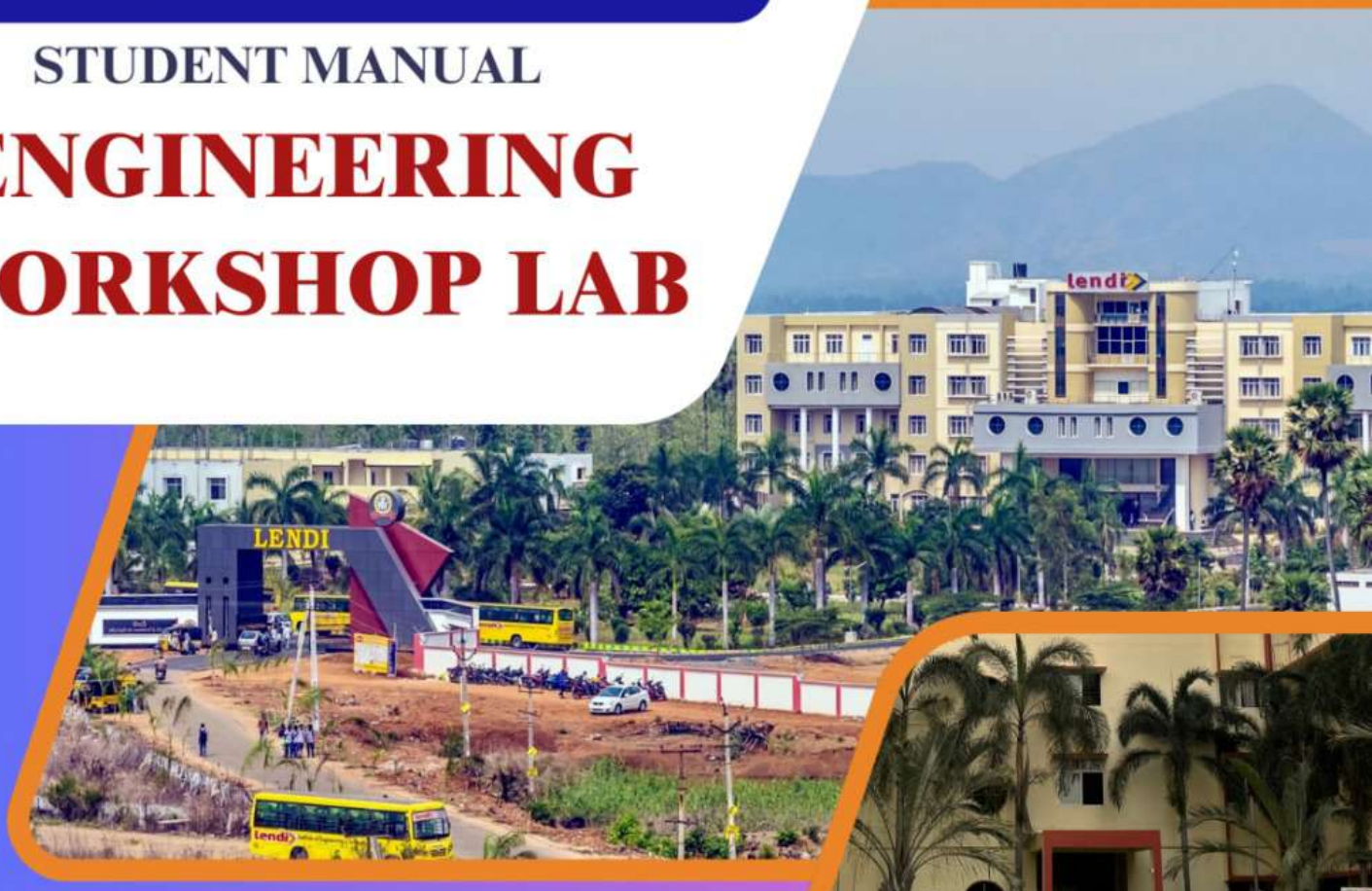
LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY

STUDENT MANUAL

ENGINEERING WORKSHOP LAB



B.Tech - Mechanical Engineering

Department of Mechanical Engineering

ENGINEERING WORKSHOP

LAB MANUAL

For

MECHANICAL ENGINEERING

Name : ----------

Register No. : ----------

Year and Semester : ----------

Branch and Section : ----------

Course Code and Title : ----------

Academic Year : ----------

DEPARTMENT OF MECHANICAL ENGINEERING

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Jonnada (Village), Denkada (Mandal), Vizianagaram District, Andhrapradesh– 535 005

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DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING WORKSHOP LAB MANUAL

DEGREE	**B.Tech (U.G)**
SUBJECT WITH CODE	**Engineering workshop lab (EWS LAB)** (R23MEC-ES1101)
REGULATION	R23
PROGRAM	**MECHANICAL ENGINEERING**
YEAR & SEMESTER	I B.TECH II SEM
COURSE AREA/DOMAIN	PRODUCTION
CREDITS	1.5

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INSTITUTE

VISION

- Producing globally competent and quality technocrats with human values for the holistic needs of industry and society.

MISSION

- Creating an outstanding infrastructure and platform for enhancement of skills, knowledge and behaviour of students towards employment and higher studies.
- Providing a healthy environment for research, development and entrepreneurship, to meet the expectations of industry and society.
- Transforming the graduates to contribute to the socio-economic development and welfare of the society through value based education.

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DEPARTMENT OF MECHANICAL ENGINEERING

VISION

- Envisions Mechanical Engineers of globally competent and skilled professionals to meet the needs of Industry and society

.

MISSION

- Providing state of art facilities with inspiring learning environment to develop skill and ethical values of students towards higher studies and employment.
- Creating a conducive environment for technological development, research and entrepreneurship to fulfil the evolving needs of Industry and Society.
- Transforming the graduates to contribute towards wellbeing of society and sustainable development goals turn value based and sustainable engineering education.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduate shall have strong knowledge, skills and professional aptitude towards employment, higher studies and research.

PEO2: Graduates shall comprehend latest tools and rapidly changing technologies to analyze, design and develop sustainable systems for real life applications.

PEO3: Graduates shall develop multidisciplinary approach, ethics, good communication, teamwork to become competent technocrats and entrepreneurs.

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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Capable of design, develop and implement sustainable mechanical and environmental systems.

PSO2: Qualify in national and international competitive examinations for successful higher studies and employment.

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ENGINEERING WORKSHOP

(Common to all branches)

Course Objective:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes:

After completion of this lab the student will be able to

CO1: Prepare the required joints with woodworking, fitting and welding operations. (Apply)
CO2: Make tapered trays and conical funnels with sheet metal working operations. (Apply)
CO3: Prepare molds using the given pattern. (Apply)
CO4: Demonstrate electrical wiring connections for series and parallel circuit. (Understand)
CO5: Assemble pipe joints with couplings using plumbing tools for various applications. (Apply)

SYLLABUS:

1. **Demonstration:** Safety practice and precautions to be observed in workshop
2. **Wood Working:**

   Familiarity with different types of woods and tools used in wood working and make following joints.

   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint.
3. **Sheet Metal Working:**

   Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. a)Tapered tray b) Conical funnel c) Elbow pipe d) Brazing.
4. **Fitting:**

   Familiarity with different types of tools used in fitting and do the following fitting exercises

   V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two wheeler tyre .
5. **Electrical Wiring:**

   Familiarities with different types of basic electrical circuits and make the following connections

   a) Parallel and series b) Two way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires.

6. Foundry Trade:

Demonstration and practice on molding tools and processes, preparation of Green Sand Molds for given patterns.

7. Welding Shop:

Demonstration and practice on Arc Welding and Gas Welding, preparation of Lap joint and Butt joint.

8. Plumbing

Demonstration and practice of plumbing tools, preparation of pipe joints with couplings for same diameter and with reducer for different diameters.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn.

2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai, 14th edition

2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; A tul Prakasha

CO's , PO's and PSO's Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	2	2	2	2	2	1	2	2	2
CO2	3	2	2	-	-	2	2	2	2	2	1	2	1	1
CO3	3	2	2	-	-	2	2	2	2	2	1	1	2	2
CO4	3	2	2	-	-	2	2	2	2	2	1	2	1	2
CO5	3	2	2	-	-	2	2	2	2	2	1	1	2	1
	3	2	2	-	-	2	2	2	2	2	1	2	2	2

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LIST OF EXPERIMENTS

I. DEMONSTRATION

Safety practice and precautions to be observed in workshop

II. WOOD WORKING

1. Half – Lap joint
2. Mortise and Tenon joint
3. Corner Dovetail joint or Bridle joint

III. SHEET METAL WORKING

1. Tapered tray
2. Conical funnel
3. Elbow pipe
4. Brazing

IV. FITTING

1. V-fit
2. Dovetail fit
3. Semi-circular fit
4. Bicycle tire puncture and change of two wheeler tyre.

V. ELECTRICAL WIRING

1. Parallel and series
2. Two way switch
3. Go down lighting
4. Tube light
5. Three phase motor
6. Soldering of wires

VI. FOUNDRY TRADE

1. Single Piece Pattern
2. Split Piece Pattern

VII. WELDING SHOP

1. Lap Joint
2. Butt Joint

VIII. PLUMBING

1. Preparation of pipe joints with couplings using PVC pipes

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INDEX

	5. Three phase motor 6. Soldering of wires			
6	**FOUNDRY TRADE**	41-46	CO3	PO1,PO2,PO3,PO6,PO7, PO8,PO9,PO10,PO11,PO12, PSO1,PS02
	1. Single Piece Pattern 2. Split Piece Pattern			
7	**WELDING SHOP**	47-60	CO1	PO1,PO2,PO3,PO6,PO7, PO8,PO9,PO10,PO11,PO12, PSO1,PS02
	1. Lap Joint 2. Butt Joint			
8	**PLUMBING**	61-68	CO5	PO1,PO2,PO3,PO6,PO7, PO8,PO9,PO10,PO11,PO12, PSO1,PS02
	1. preparation of pipe joints with couplings using PVC pipes			

`1.Demonstration

Safety practices and precautions to be observed in workshop.

Safety precautions

1. Read the operator's manual and observe all safety precautions for all equipment.
2. Protect yourself from electric shock. ...
3. Keep all guards and shields in place.
4. Give the task your full attention.
5. Let each tool work at its own speed; do not force it.
6. Always wear appropriate personal protective clothing.

If everyone follows workshop rules, everyone will be safe and learn how to use tools and equipment properly and efficiently.

1. Always listen carefully to the teacher and follow instructions.

   The instructions given by your teacher, his / her demonstrations on the use of equipment and tools, will help you understand how to work in a workshop safely and efficiently.

2. Do not run / rush in the workshop.

   You could 'bump' into another pupil and cause an accident. You could run into a machine or bench, which could cause a serious injury.

3. Know where the emergency stop buttons are positioned in the workshop.

   If you see an accident at the other side of the workshop, you can use the emergency stop button to turn off all electrical power to the machines.

4. Always wear an apron.

   It will protect your clothes and hold loose clothing such as ties in place. This will prevent loose clothing getting caught in a machine, pulling the machine operator into the moving parts.

5. Wear good strong shoes. Training shoes are not suitable.

   Tools and equipment can have sharp edges and are usually heavy. Good shoes prevent damage to feet, if a piece of equipment or a tool, is dropped on feet.

6. Do not use a machine, if you have not been shown how to operate it safely, by your teacher.

   It is extremely dangerous (and illegal), to use a machine in the workshop, without having followed and understood, all the teacher instructions.

7. Always be patient, never rush practical work**.**

The most productive and efficient 'craftspeople / engineers', work patiently and never rush their work. Working at a safe, steady pace, is how skilled professions

complete their tasks.

8. Always use guards, when operating machines.

   The guard on a machine, protects the user, especially the users eyes, from dangerous 'debris' that is thrown out, often at high speed. The guards also ensure that hands and fingers, are not near moving parts. A good example of a machine guard, is seen in front of the chuck, of a machine drill.

9. Use hand tools carefully, keeping both hands behind the cutting edge.

   Never place a hand in front of a cutting tool (e.g. a chisel). There is always a possibility, of the tool slipping and the sharp edge slicing into the hand / fingers.

10. Keep your workbench tidy. When you have finished with a tool / piece of equipment, return it to its storage cupboard / rack.

    A bench top, crowded with tools, will eventually lead to one or more, being knocked on to the floor, or on to feet. Tools are damaged easily and people can be injured.

2.WOOD WORKING

INTRODUCTION:

Wood work or carpentry deals with making joints for a variety of applications like door frames, cabinet making furniture, packing etc.,

Timber:

Timber is a name obtained from well grown plants or trees. The timber must cut in such a way that the grains run parallel to the length. The common defects in timber are knots, wet rot, dry rot etc.

Market sizes of timber:-

Timber is sold in market in various standard shapes and sizes. They are:-

Log:-

The trunk of a tree, which is free from branches.

Balk:-

The log sawn to have roughly square cross section.

Post:-

A timber piece, round or square in cross section with more than 275 mm in width, 50 to 150 mm in thickness and 2.5 to 6.5 mm length.

Board:-

A sawn timber piece, below 175 mm in width and 30 mm to 50 mm in thickness.

Reapers:-

Sawn timber pieces of assorted and nonstandard sizes, which don't conform to the above shapes.

WORK HOLDING TOOLS:

Carpentry vice:-

It is a work holding device. When handle vice is turned in a clockwise direction, the sliding jar forces the work against the fixed sawn. The greater the force applied to the handle, the tighter to the work held.

Bar clamp:-

It is a rectangular (or) square block with V-groove on one or both sides opposite to each other. It holds cylindrical work pieces.

C-Clamp:-

This is used to hold work against an angle plate or V-block.

MARKING AND MEASURING TOOLS:

Try square:-

It is used for marking and testing the square ness of planed surfaces. It consists of a steel blade, fitted in a cast iron stock. It is also used for flatness. The size of a try square used for varies from 150 mm to 300 mm, according to the length of the blade.

It is less accurate when compared to the try square used in fitting shop.

Marking gauge:-

It is a tool used to mark lines parallel to the edges of wooden pieces. It consists of a square wooden stem with a riding wooden stock on it. A marking pin, made of steel is fitted on the stem. A mortise gauge consists of two pins. In these it is possible to adjust the distance between the pins, to draw two parallel lines on the stock.

Compass and dividers:-

This is used for marking circles, arcs, laying out perpendicular lines on the planed surface of the wood.

CUTTING TOOLS:

Hack saw:-

It is used to cross cut the grains of the stock. The teeth are so set that the saw kerfs will be wider than the blade thickness. Hard blades are used to cut hard metals. Flexible blades are having the teeth of hardened and rest of the blade is soft and flexible.

Chisels:-

These are used for removing surplus wood. Chisels are annealed, hardened and tempered to produce a tough shank and a hard cutting edge.

Rip saw:-

It is used for cutting the stock along the grains. The cutting edge of this saw makes a sleeper angle about 60o whereas that saw makes an angle of 45o with the surface of the stock.

Tenon saw:-

It is used for cutting tenons and in fine cabinet works. The blade of this saw is very thin and so it is used stiffed with back strip. Hence, this is sometimes called back saw. The teeth shapes similar to cross cut saw.

DRILLING AND BORING TOOLS:

Auger bit:-

It is the most common tool used for boring holes with hard pressure.

Gimlet:-

This is a hand tool used for boring holes with hand pressure.

Hand drill:-

Carpenters brace is used to make relatively large size holes, whereas hand drill is used for drilling small holes. A straight shank drill is used with these tools. It is small light in weight and may be conveniently used than the brace. The drill is clamped in the chuck.

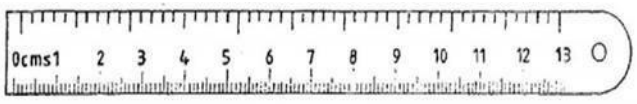


Fig : 1 steel rule

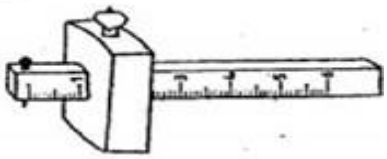


fig: 2 marking Gauge

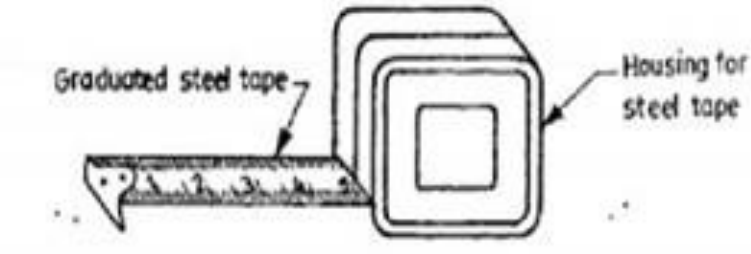


Fig: 3 steel tape

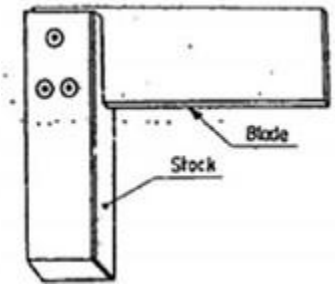


fig: 4 Try square

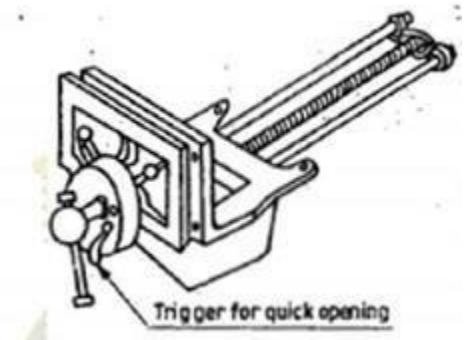


Fig: 5 carpenter vice

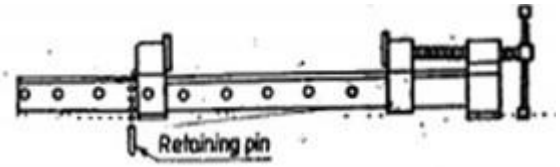


Fig: 6 Bar clamp

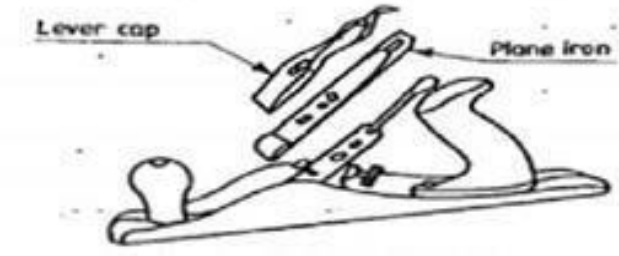


Fig: 7 metal jack plane

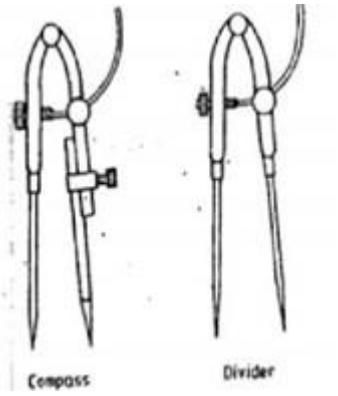


Fig: 8 compass and divider

MISCELLANEOUS TOOLS:

Ball peen hammer:-

It has a flat face, which is used for general work and a ball end is used for riveting.

Mallet:-

It is used to drive the chisel, when considerable force is to be applied, steel hammer should not be used for these purpose, as it may damage the chisel handle. Further, for better to apply a series of light taps with the mallet rather than a heavy single blow.

Claw hammer:-

It is a striking flat at one end and the claw at the others. The face issued to drive nails into wood and for other striking purpose and the claw for extracting nails out of wood.

Pinches:-

It is made of steel with a hinged and is used for pulling out small nails from wood.

Wood rasp file:-

It is a finishing tool used to make the wood smooth, remove sharp edge finishing fillets and other interior surfaces. Sharp cutting teeth are provided on its surface for the purpose. This file is exclusively used in wood work.

Fig: 9 cross cut saw

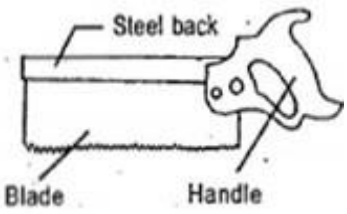


Fig: 10 Tenon saw

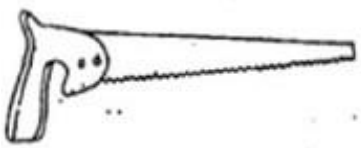


Fig: 11 compass saw

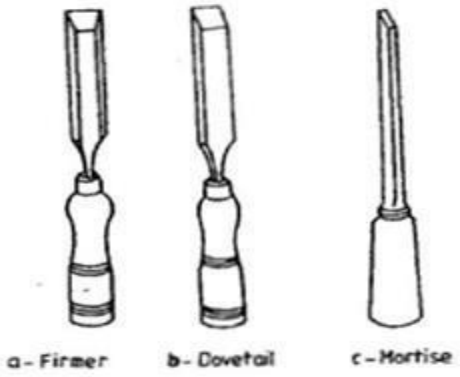


Fig: 12 Chisels

Fig: 13 Carpenter's brace

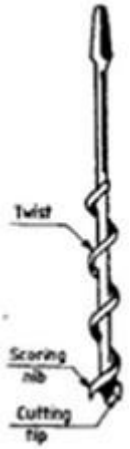


Fig: 14 Auger bit

Fig: 15 Gimlet

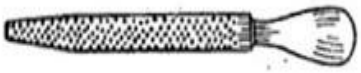


Fig: 16 wood rasp file

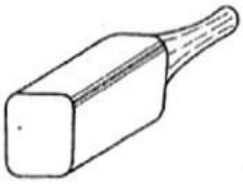


Fig: 17 Mallet

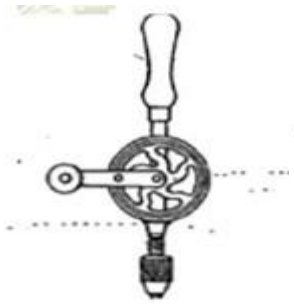


Fig: 18 Hand drill

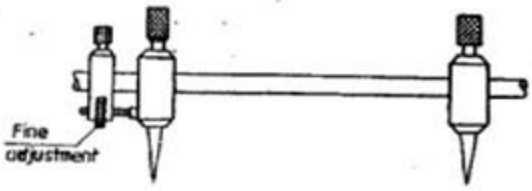


Fig: 19 Trammel

Fig: 20 Claw hammer

HALF-LAP JOINT

Experiment. No:

Aim: - To make a Half- lap joint.

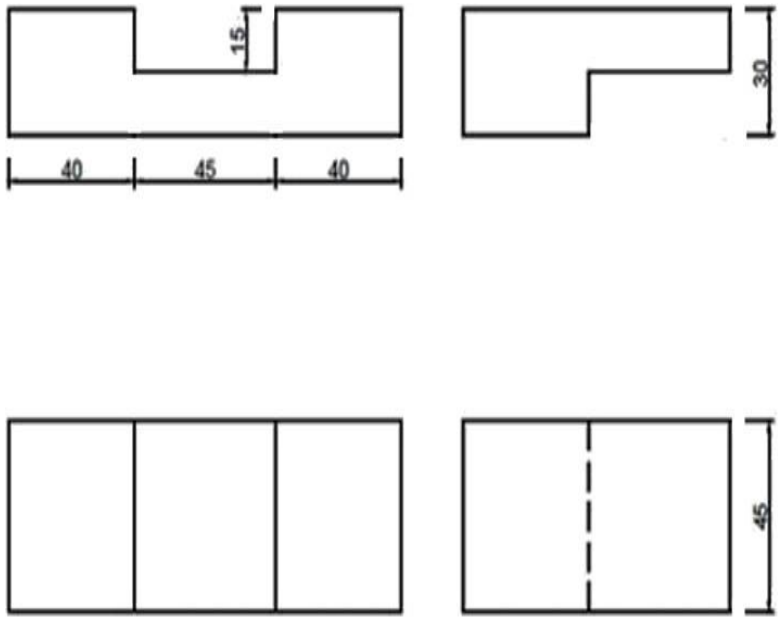
Tools required: -

1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mallet
10. Wood rasp file and smooth file

Material required: - Wooden pieces of size 225 x 50 x 35 mm–1 No.

Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for squareness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing



T-LAP JOINT

ALL DIMENTIONS ARE IN MM

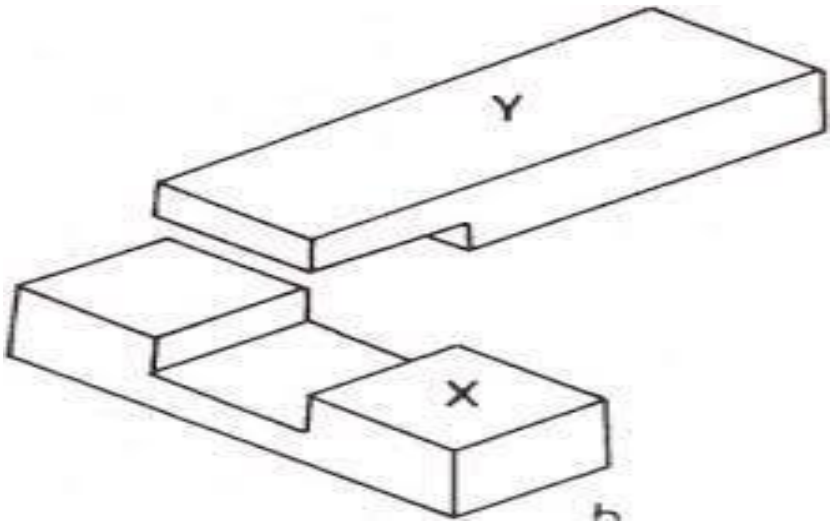


Fig. Half lap joint

Procedure: -

Safety precautions: -

Result: -

MORTISE AND TENON JOINT

Experiment. No:

Aim: - To make a Mortise and Tenon joint.

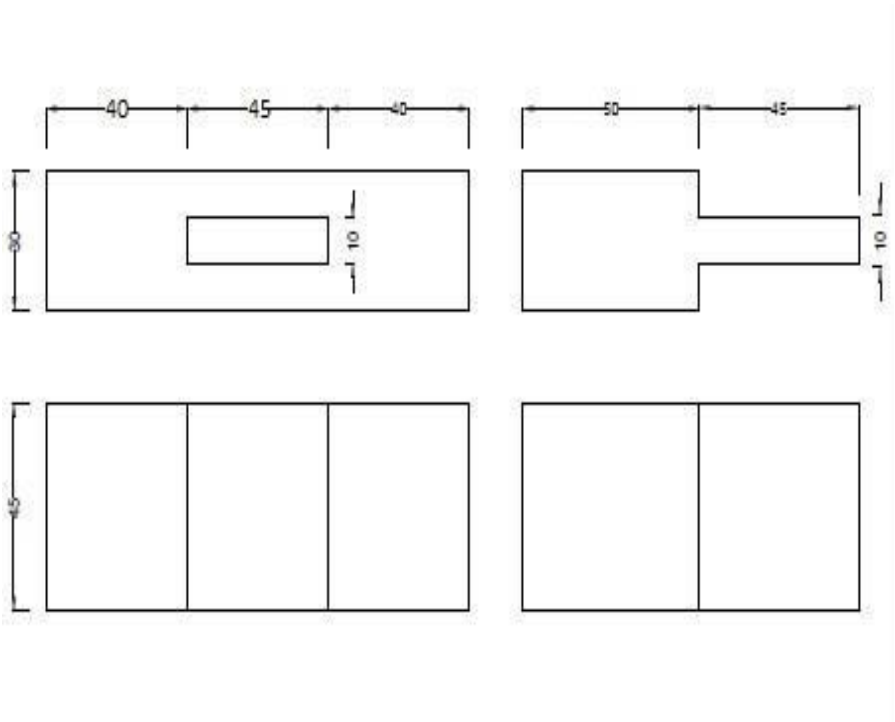
Tools required: -

1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mallet
10. Wood rasp file and smooth file

Material required: - Wooden pieces of size 225 x 50 x 35 mm–1 No.

Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for squareness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing



ALL DIMENSIONS ARE IN MM

Fig. 2D Mortise and Tenon joint

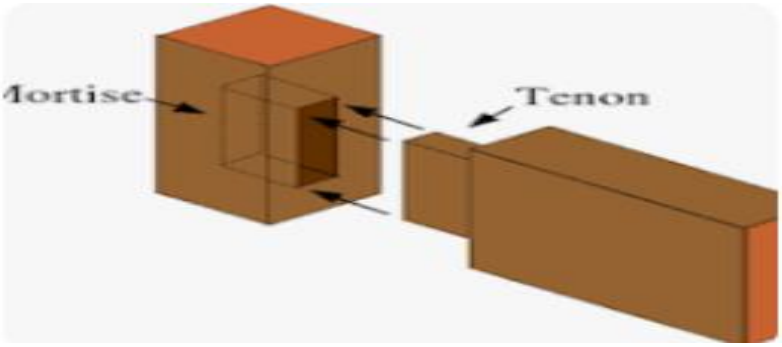


Fig. 3D Mortise and Tenon joint

Procedure: -

Safety precautions: -

Result: -

3.SHEET METAL WORKING

INTRODUCTION:

Many engineering and house hold articles such as boxes, cans, funnels, ducts etc., are made from a flat sheet of metals. These process being known as tin smithy. For this, the development of the article is first drawn on the sheet metal then cut and folded to form the required shape of the article. The edge of the articles are then secured through welding, brazing, soldering, riveting etc.

Sheet metal materials:-

A variety of metals used in a sheet metal shop such as black iron, aluminum and stainless steel. A sheet of soft steel which is coated with molten zinc is known as galvanized iron. The zinc coat forms a coating that resists rust, improves the appearance of the metal and permits it to be solderised with greater care.

Hand tools:-

The common hand tools used in sheet metals work are steel rule, usually of 60 cm length, Vise gauge, dot punch, scriber, trammels, ball peen hammer, and straight peen hammer, cross peen hammer, mallets, snips and soldering iron.

Trammels:-

Sheet metals layouts require marking of arcs and circles. This may be done by using the trammels. The length of the beam decides the maximum size of the arc that can be scribed.

Wire gauge:-

The thickness of the sheet metal is referred in numbers known as standard wire gauge (SWG). The gaps in the circumstance of the gauge are used to check the gauge number.

Bench shears:-

Sheet metal may be cut by shearing action. In this the force is applied through a compound lever, making it possible to cut sheet metal up to 4mm thick. The chopping hole can shear a mild steel rod up to 10mm diameter.

Snips:-

Snips are hand shears, varying in length from 200 mm to 600 mm. 200 mm to 250 mm being the commonly used. The straight lines are curved snips or bent snips are for trimming along inside curves.

Hammers:-

Ball peen hammer has a cylindrical slightly curved face and a ball head straight peen and similar to the cross peen, but it is positioned paralleled to the handle which can be used conveniently for certain operations of folding.

Stakes:-

Stakes are nothing but anvils, which are used as supporting tools and to form seam, bend, rivet sheet metal objects.

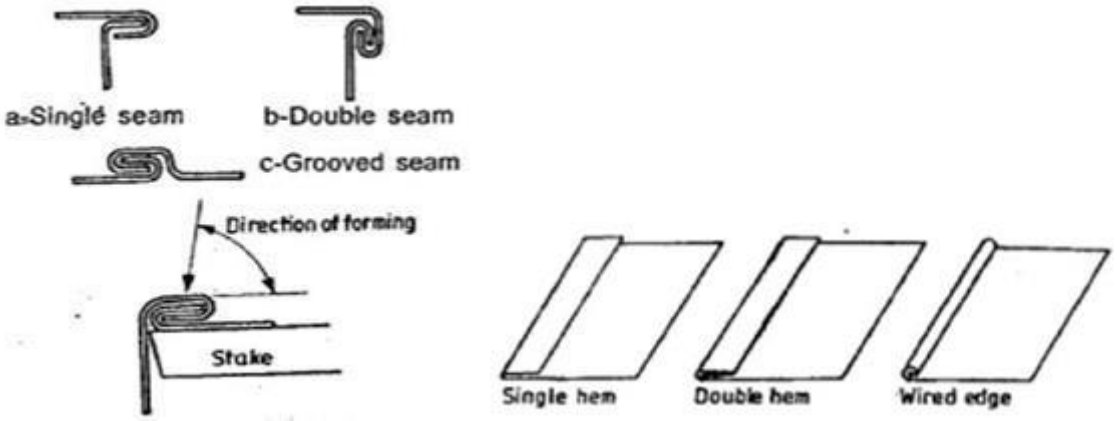
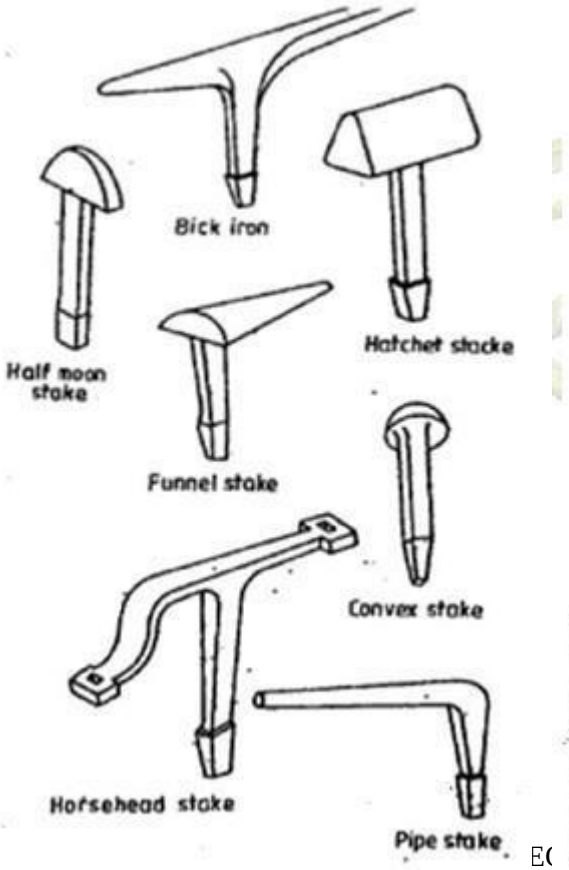


Fig: 1 Sheet metal joints

Fig: 2 Stakes



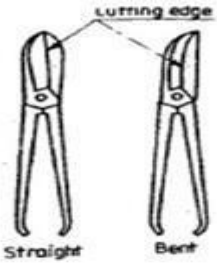


Fig. 10.4 Snips

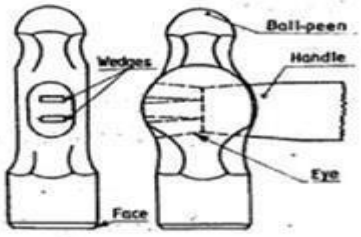


Fig. 8.34 Ball-peen hammer

Table 10.1

SWG No	Thickness, mm
10	3.20
12	2.60
14	2.30
16	1.60
20	1.00
22	0.70
24	0.65
26	0.45
30	0.30

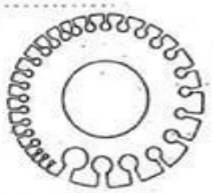


Fig. 10.2 Standard wire gauge

Snips:-

Snips are hand shears, varying in length from 200 mm to 600 mm. 200 mm to 250 mm being the commonly used. The straight lines are curved snips or bent snips are for trimming along inside curves.

Hammers:-

Ball peen hammer has a cylindrical slightly curved face and a ball head straight peen and similar to the cross peen, but it is positioned paralleled to the handle which can be used conveniently for certain operations of folding.

Stakes:-

Stakes are nothing but anvils, which are used as supporting tools and to form seam, bend, rivet sheet metal objects.

SHEET METAL JOINTS:

Various types of joints are used in sheet metal work to suit the varying requirement. These are self-secured joints, formed by joining together two pieces of sheets metal and using the metal itself to form the joints. These joints are to be used on sheets of less than1.6 mm thickness.

Riveting:-

Rivets are used to fasten two of more sheets of metal together. It is the common practice to use the rivets of the same material as that of the sheets having fastened.

Sheet metal screws:-

These are used in sheet metal work to join and install duct work for ventilation air conditioning etc. These screws are also known as self-tapping screws since they cut their own threads.

Soldering:-

Soldering is one method of joining two pieces of metal with an alloy that melts at a lower temperature than the metals to be joined for a good job. The metals to be joined must be free from dirt, grease and oxide. Solder is made of tin and lead in equal proportions. It comes either in the form of wire and bar.

Soldering iron:-

Soldering requires a source of heating. A common method of transmitting heat of the metal surfaces is by using a soldering iron.

TAPERED TRAY

Experiment. No:

Aim: - To make a tapered tray using the given G.I. Sheet.

Tools required: -

1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

Material required: - Galvanized Iron (G.I) sheet 110 x 125 mm size.

Sequence of operations:-

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding

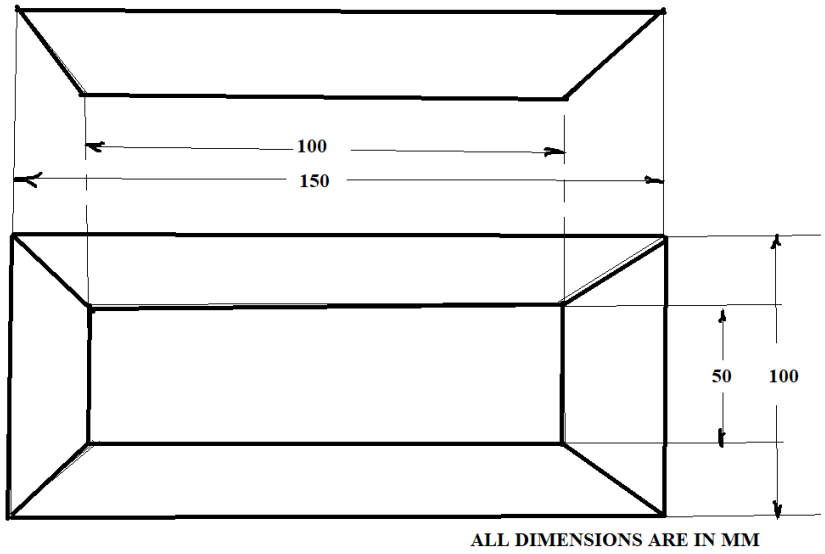


Fig: tapered tray

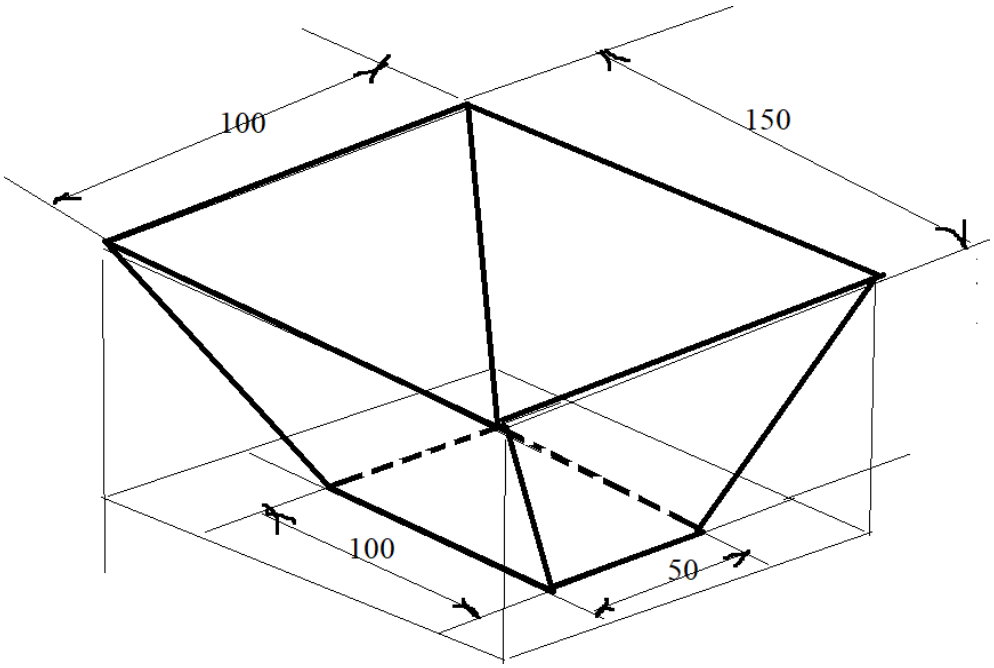


Fig: 3D tapered tray

Procedure: -

Safety precautions: -

Result:-

CONICAL FUNNEL

Experiment. No:

Aim: - To make Conical funnel using the given G.I. Sheet.

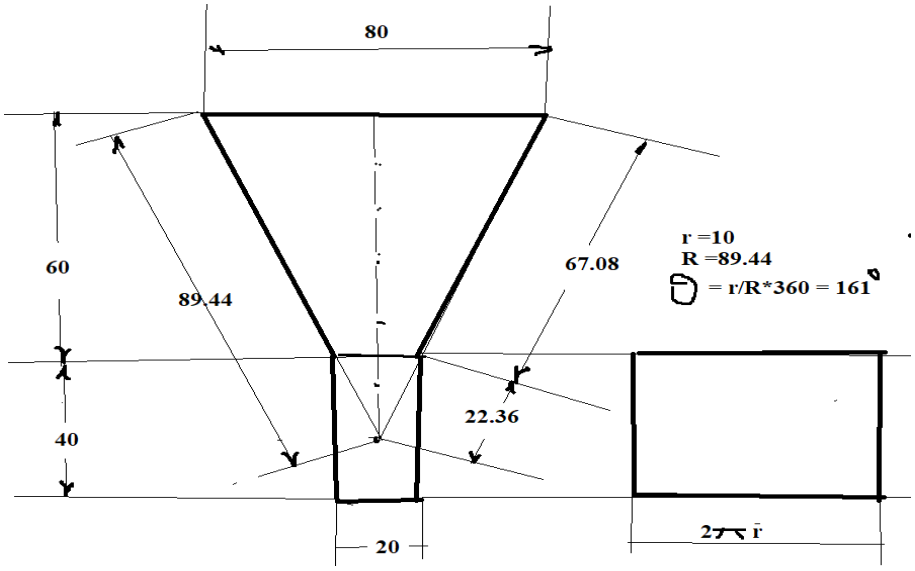
Tools required: -

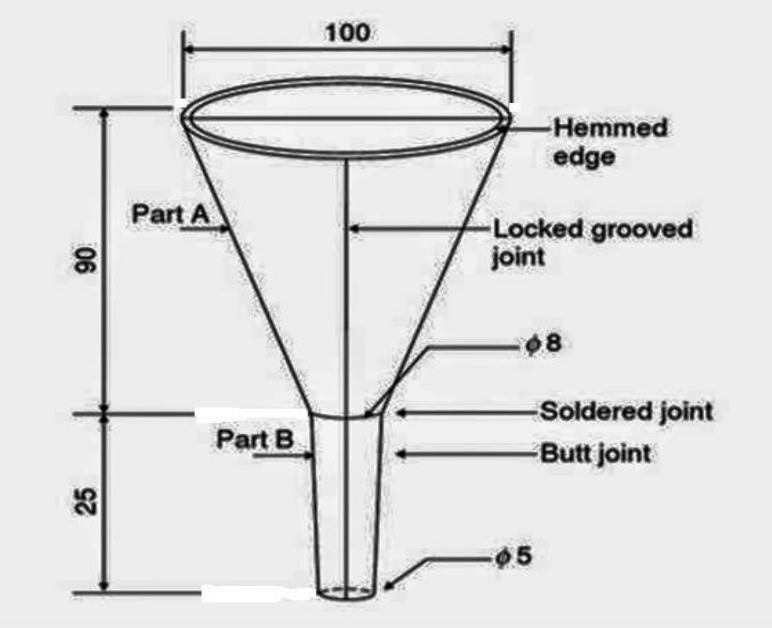
1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

Material required: - Galvanized Iron (G.I) sheet 160 x 80mm size.

Sequence of operations:-

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding





ALL DIMENSIONS ARE IN MM

Fig: Conical funnel

Procedure: -

Safety precautions: -

Result:-

4. FITTING

INTRODUCTION:

Machine tools are capable of producing work at a faster rate, but there are occasions when components are processed at a bench. Sometimes it becomes necessary to replace or repair a component that must fit accurately with one another or reassemble. This involves a certain amount of hand fitting. The assembly machine tools, jigs, gauges etc., involves certain amount of bench work.

FITTING TOOLS:

Holding tools:-

Bench vice

V-block with clamp C-clamp

Bench vice:-

It is a work holding device, when vice handle is turned in a clockwise direction the sliding jaw forces the work against the fixed jaw, the greater the force applied to the handle, the tighter is the work held.

V-block with clamp:-

It is a rectangular (or) square block with v-groove on one or both sides, opposite to each other. It holds cylindrical work pieces.

C-clamp:-

This is used to hold work against an angle plate or v-block.

MARKING AND MEASURING TOOLS:

1. Surface plate
2. Try square
3. Angle plate
4. Scriber
5. Universal scribing block
6. Odd leg caliper
7. Divider
8. Calipers
9. Dot punch
10. Vernier caliper

Surface plate:-

It is used for testing flatness of work piece, for marking out small works.

Combination cutting pliers: -

This is made of tool steel and is used for cutting as well as for ripping work.

Taps and die holders: -

Tap and wrenches are used for cutting internal threads in a drilled hole.

Dies and die holders:-

They are used for making external threads. Dies are made either solid (or) split type.

TYPES OF FILES:

Hand file:-

It is a rectangular in section tapered in thickness but parallel in width.

Flat file:-

Rectangular in section and tapered for $1/3^{rd}$ length in width and thickness.

Square file:-

Square in section and tapered for $1/3^{rd}$ length on all sides.

Half round file:-

It has one flat face, connecting by a curved (surface) face & tapered for $1/3^{rd}$ length.

Round file:-

Circular in cross section and tapered for $1/3^{rd}$ length, it has double cut teeth.

MISCELLANEOUS TOOLS:

Ball peen hammer:-

It has a flat face, which is used for general work and a ball end is used for riveting.

Screw driver:-

It is designed to turn the screws. The blade is made of steel and is available in different lengths and diameters.

Spanners:-

It is a tool for turning nu ts and bolts. It is usually made of forged steel.

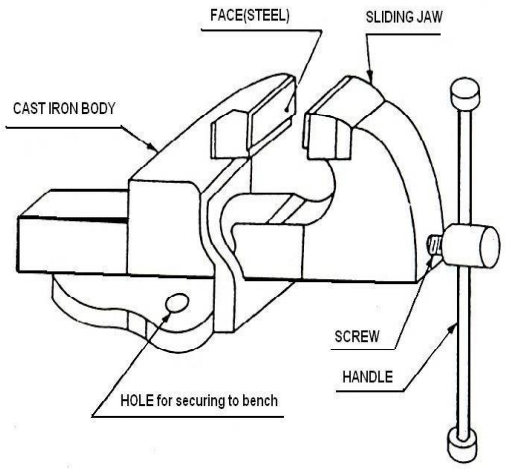


Fig: 1 Bench wise

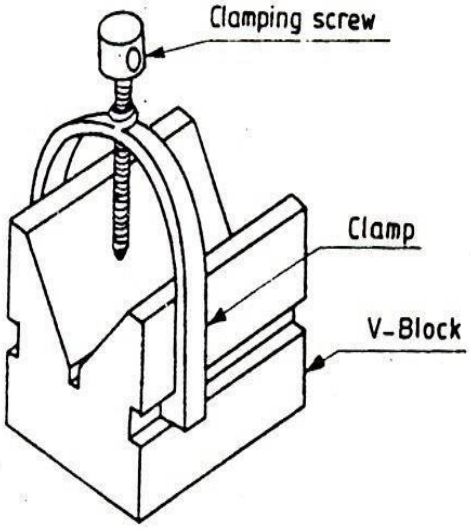


Fig: 2 V- Block

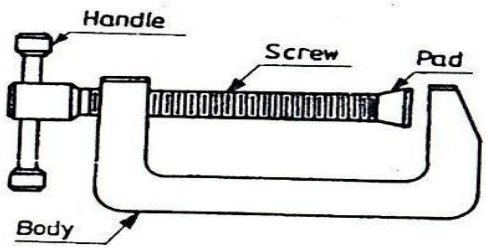


Fig: 3 C – Clamp

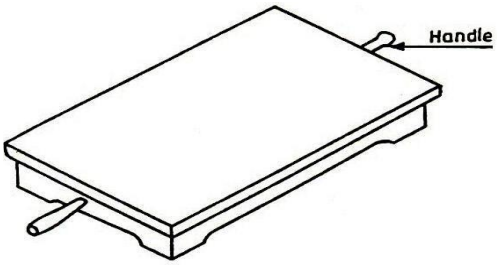


Fig: 4 Surface plate

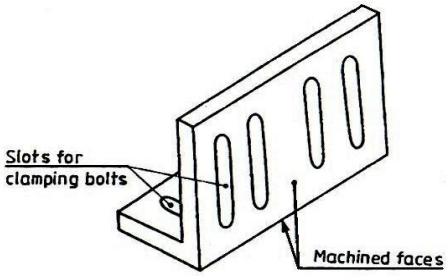


Fig: 5 Angle plate

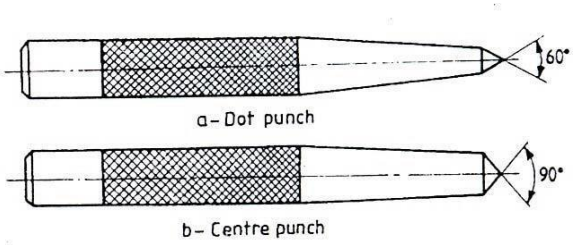


Fig: 6 Dot punch

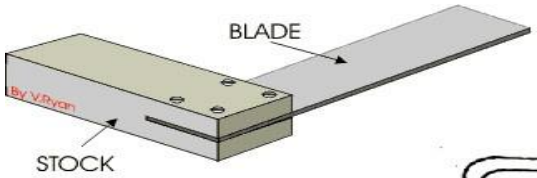


Fig: 6 try square

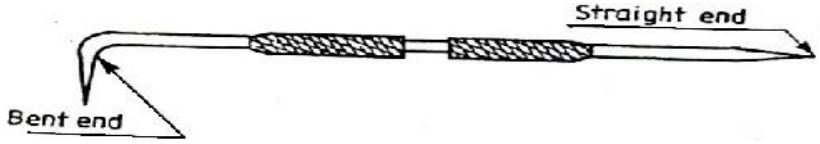


Fig: 7 scriber

FITTING OPERATIONS:

Chipping:-

Removing metal with a chisel is called chipping and is normally used where machining is not possible.

Fitting:-

1. Pinning of files:-

Soft metals cause this; the pins are removed with a file card.

2. Checking flatness and square ness:-

To check flatness across thickness of plate.

MARKING AND MEASURING:

Measurements are taken either from a center line, for visibility of the non-ferrous metals and oxide coated steels are used.

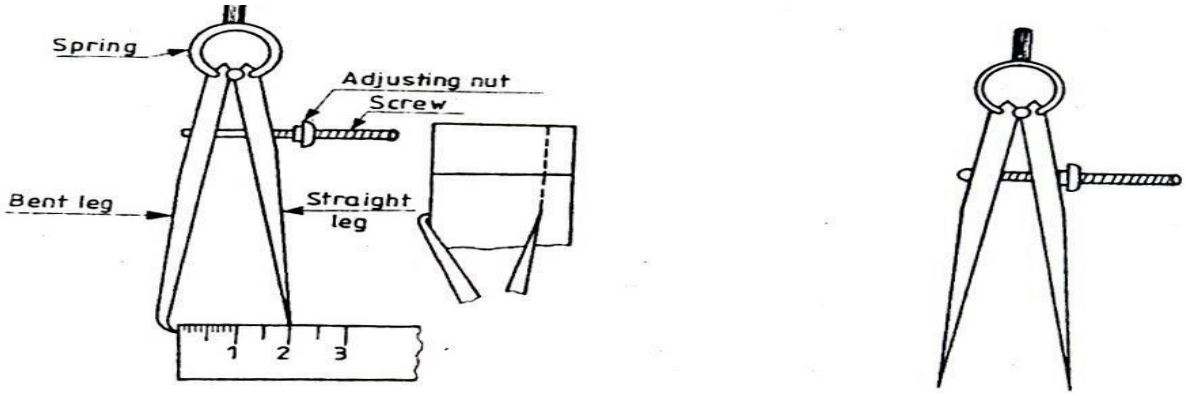


Fig: 8 odd leg clamp and divider

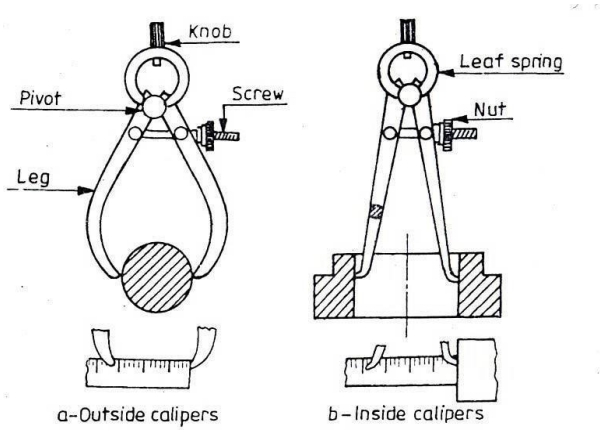


Fig: 9 calipers

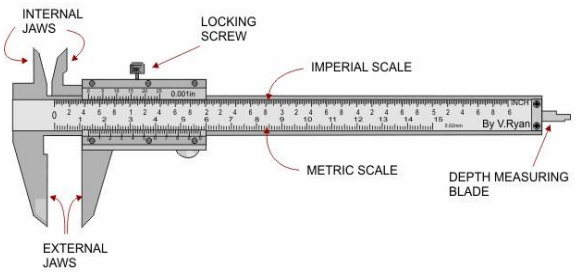


Fig: 10 Vernier caliper

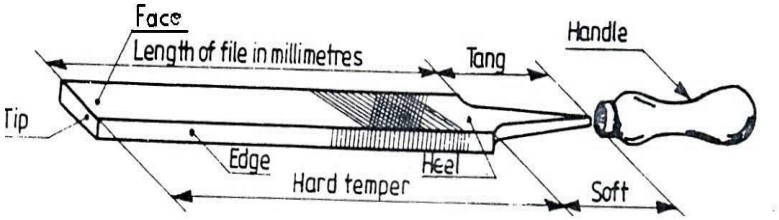


Fig: 11 Parts of hand file

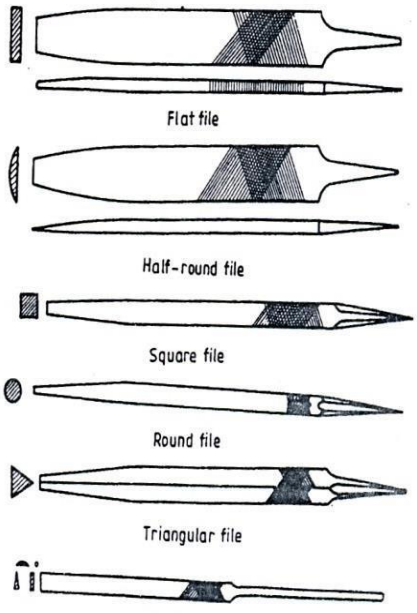


Fig: 12 Types of files

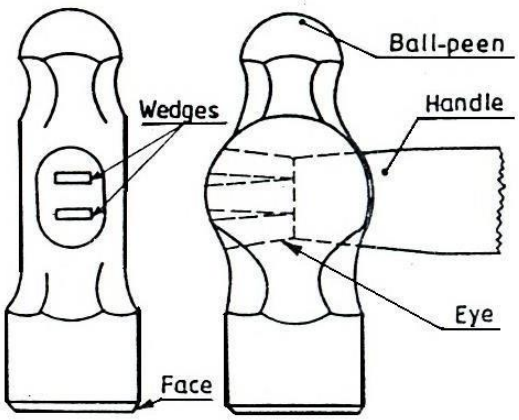


Fig: 13 ball peen hammer

V-FIT

Experiment. No:

Aim: - To make a V-fit from the given two M.S pieces.

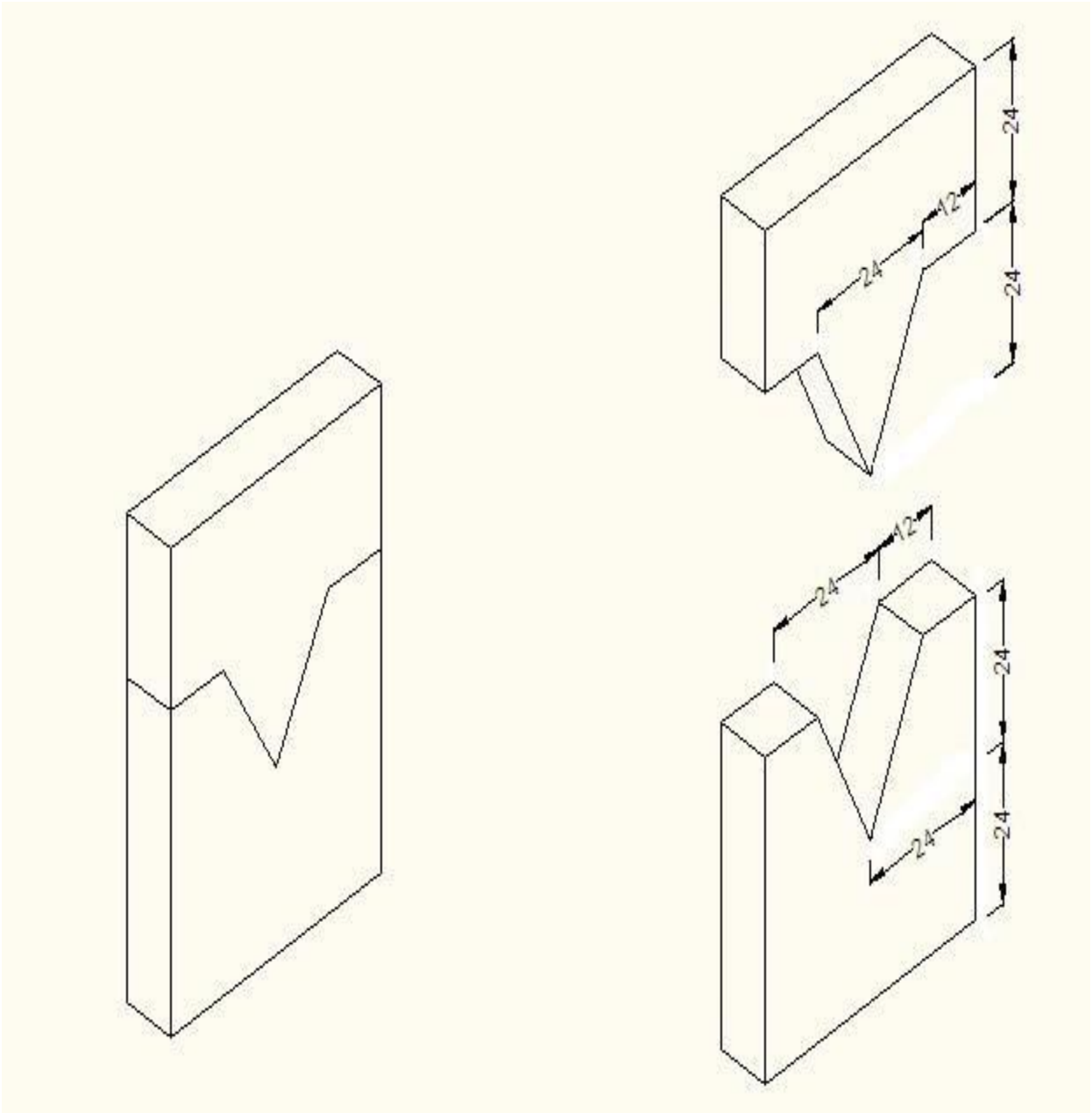
Tools required: -

1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Rough and smooth flat files
10. Flat chisel and triangular file

Material required: - Mild steel (M.S) plate of size 50 x 50 x 5mm –2 Nos.

Sequence of operations:-

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



ALL DIMENSIONS ARE IN MM

Fig: V-fit

Procedure: -

Safety precautions: -

Result: -

DOVETAIL FIT

Experiment. No:

Aim: - To make a Dovetail fit from the given two M.S pieces.

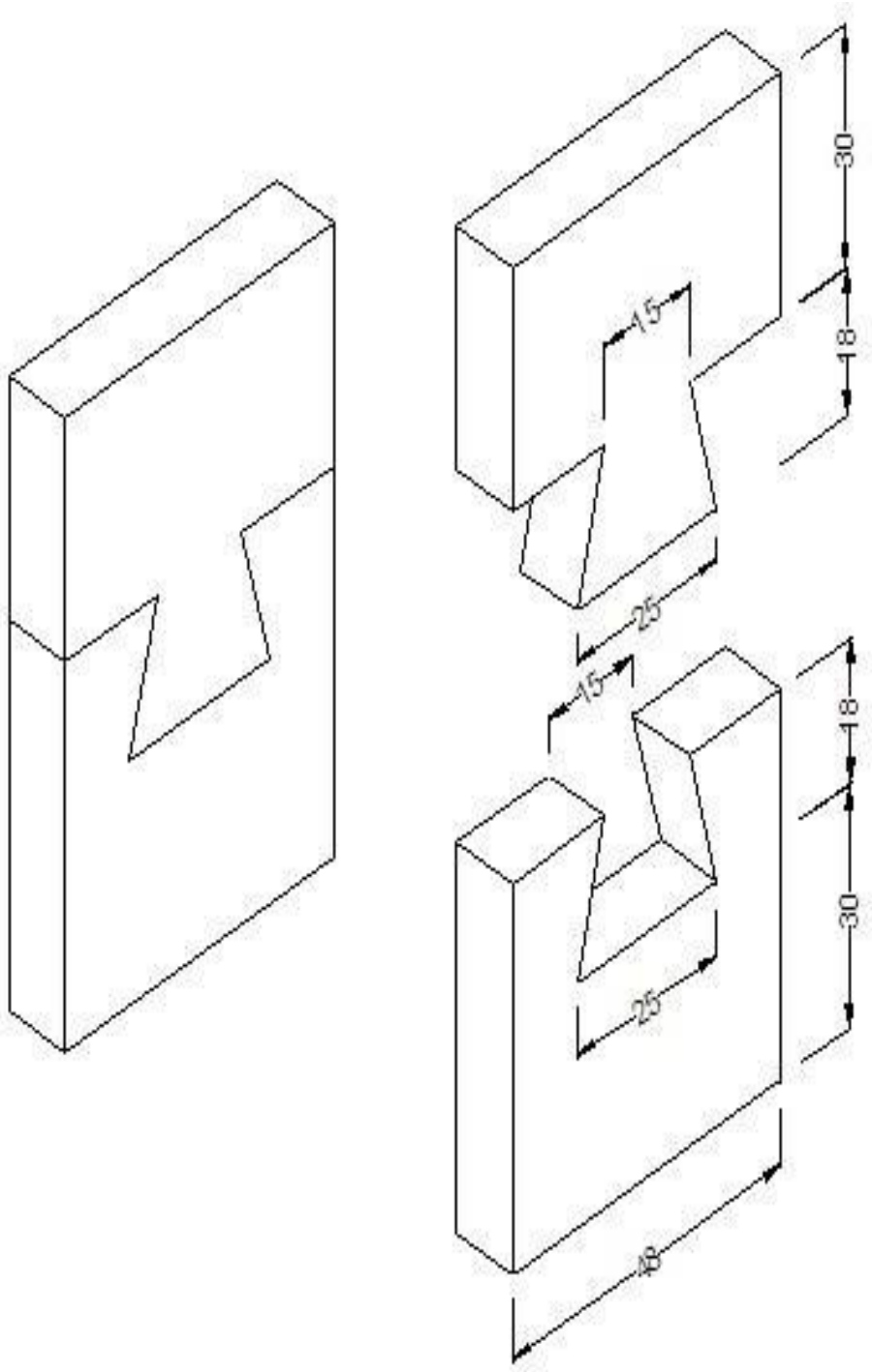
Tools required: -

1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Rough and smooth flat files
10. Flat chisel and triangular file

Material required: - Mild steel (M.S) plate of size 50 x 50 x 5 mm –2 Nos.

Sequence of operations:-

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



ALL DIMENSIONS ARE IN MM

Fig: Dovetail fit

Procedure: -

Safety precautions: -

Result: -

5.ELECTRICAL WIRING

INTRODUCTION:-

Power is supplied to domestic installations through a phase and a neutral, forming a single phase. A.C 230 V, 2- wire system for industrial establishments. Power is supplied through three phase four wire system to give 440 V. Fig. Shows the power tapping for domestic and industrial purposes. The neutral is earthed at the distribution sub-station of the supply.

When supplied to domestic utilizes power is fed to a kilowatt meter and then to a distribution panel. The panel distributes power along several circuits' breakers. The panel also serves as a main switch.

Electrical wiring is defined as a system of electrical conductors, components and apparatus for conveying electrical power from the source to the point of use. The wiring system must be designed to provide a constant voltage to the load.

ELEMENTS OF HOUSE WIRING:-

Fuses & circuit Breakers:

These are the devices to provide protection to a circuit against excess current. Open link fuses are not in safe in operations, even though they are cheaper and reliable. It consists of a thin strip of metal (or) wire.

Electric switch:

This is a device that makes and breaks or changes the course of electric circuit. It consists of 2 or more contacts mounted on an insulating structure and arranged such that they may be moved in to and out of contact with each other by a suitable operating mechanism.

Plug:

It is a device carrying 2 or 3 contact, designed for engagement with corresponding plugs pins and arranged for connection to fixed wiring and arranged for attachment to appliances such as radio, T.V, table, fan etc.,

Socket outlet:-

It is a device carrying 2 or 3 contacts, designed for engagement with corresponding plug pins and arranged for connection to fixing wiring.

Lamp holder:-

These are designed to hold lamps & connect them in the circuit. Both bay one cap and screw lamp holders are available up to 200 watts lamps.

Ceiling rose:-

A ceiling rose consists of a circular base & cover made of Bakelite. The base has 2 or 3 terminal plates. One end of the plate is connected to supply wire connected to pendent lamp, ceiling fan, exhaust fan, etc.

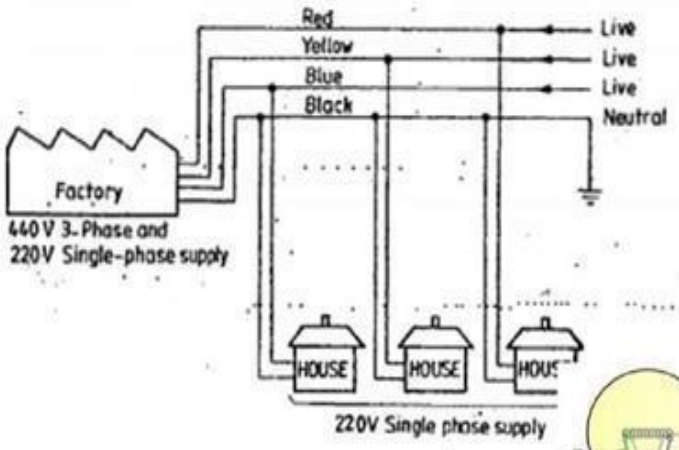
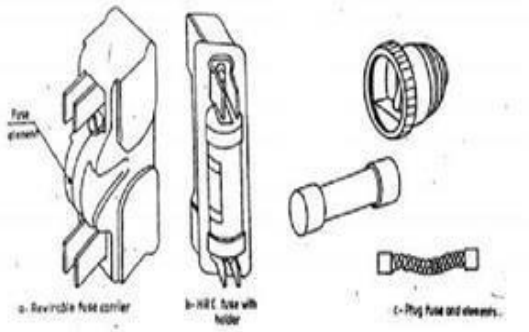


Fig. 3.1 3 phase-4 wire supply



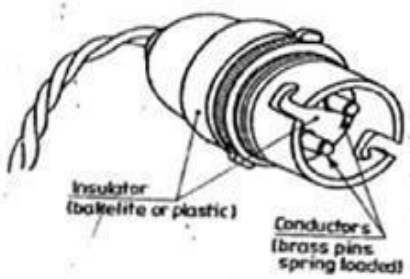
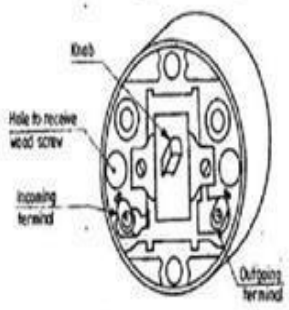


Fig. 3.6 Pendant lamp holder



One-way switch

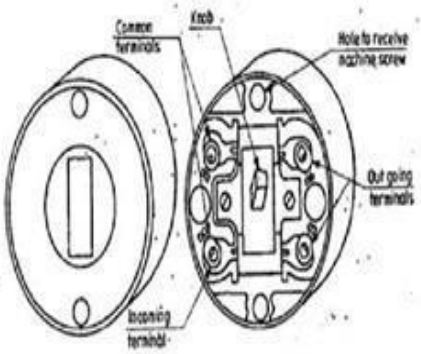


Fig. 3.4 Electric switches

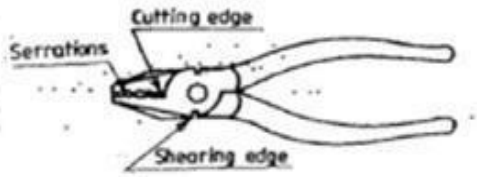


Fig. 8.22 Combination plier

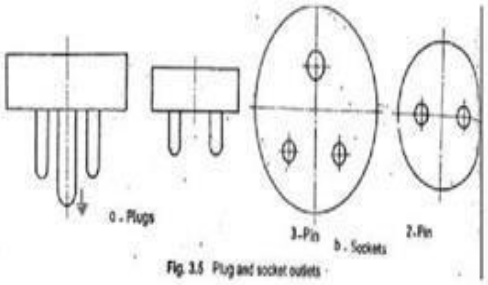


Fig. 3.5 Plug and socket outlets

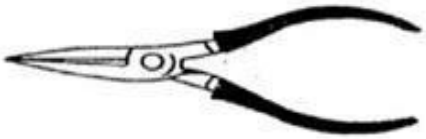


Fig. 8.23 Nose plier

NOTE: Parts of bulb
1) Glass bulb 2) Low-pressure inert gas 3) Tungsten-filament 4) Contact wire (out of stem) 5) Contact wire (into stem) 6) Support wires7) Stem Glass mount 8) Contact wire (out of stem) 9) Cap (Steeve) 10) Insulation 11) Electrical contact.

Main switch:-

This is a switch intended to connect or cut-off the supply of electrical to the whole of an installation. It is generally of metal clad type. The metal clad gives greater strength and safety. The main switch contains one or more fuses, single phase, and A.C. circuits.

Incandescent light:-

Incandescent means 'glowing at white heat'. A lamp actually works like heating elements that it gives off light by becoming white hot, the amount of power it consume is stamped on the bulb. Higher the wattage, brighter the light. The bulbs have filaments made of tungsten.

Interior wiring:-

Wires & wire sizes:- A wire is defined as a bare or insulated conductor consisting of one (or) several strands. An insulating wire consists of a conductor with insulating material made of Vulcanized Indian Rubber (VIR) (or) Poly Vinyl Chloride (PVC). The wire may consist of 1 or several twisted strands. A multi sore conductor consists of several cores insulated from one another and enclosed in a common seating. Wire sizes are specified by the diameter of the wire, using a standard wire gauge (SWG), which also gives an idea of the current carrying capacity. The specification consists of the both the number of strands and the diameter of the each wire in it.

PARALLEL AND SERIES
(WIRING FOR TWO LAMPS CONTROL BY ONE SWITCH)

Experiment. No:

Aim: - To give connection to two lamps, controlled With Independent Switch Controls with or Without Looping.

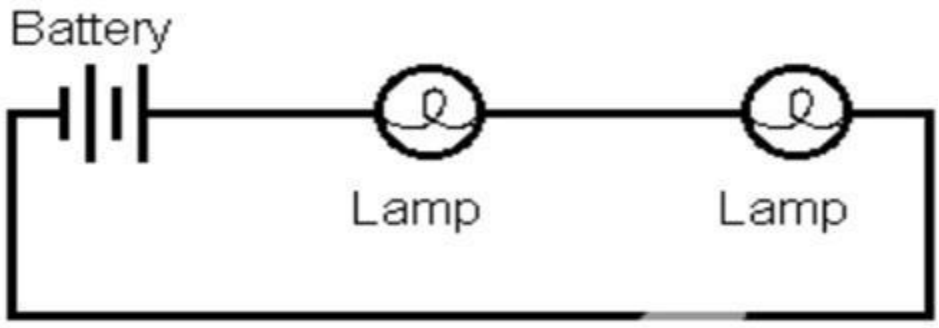
Tools required: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester

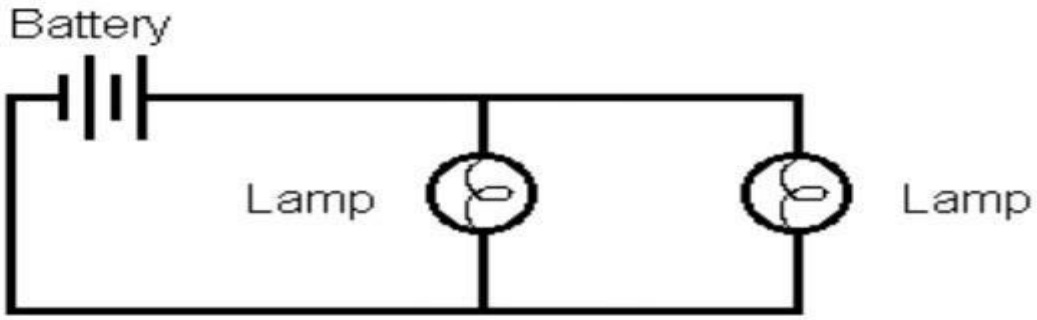
Material required: -

1	Wooden wiring board		
2	Silk wire		
3	Electrical bulb	-	2 Nos
4	Two-way switches	-	1Nos
5	Wooden round block	-	3 Nos
6	Batten lamp holder	-	1 Nos
7	Wire clips		
8	Nails		
9	Screws		

SERIES



PARALLEL



Procedure: -

Safety precautions: -

Result: -

TWO_WAY SWITCH

Experiment. No:

Aim: - To give connections to one light controlled by 2 two-way switches.

Tools required: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester
6. 2 two-way switches

Material required: -

1	Wooden wiring board		
2	Silk wire		
3	Electrical bulb	-	1 Nos
4	Two-way switches	-	2 Nos
5	Wooden round block	-	3 Nos
6	Batten lamp holder	-	1 Nos
7	Wire clips		
8	Nails		
9	Screws		

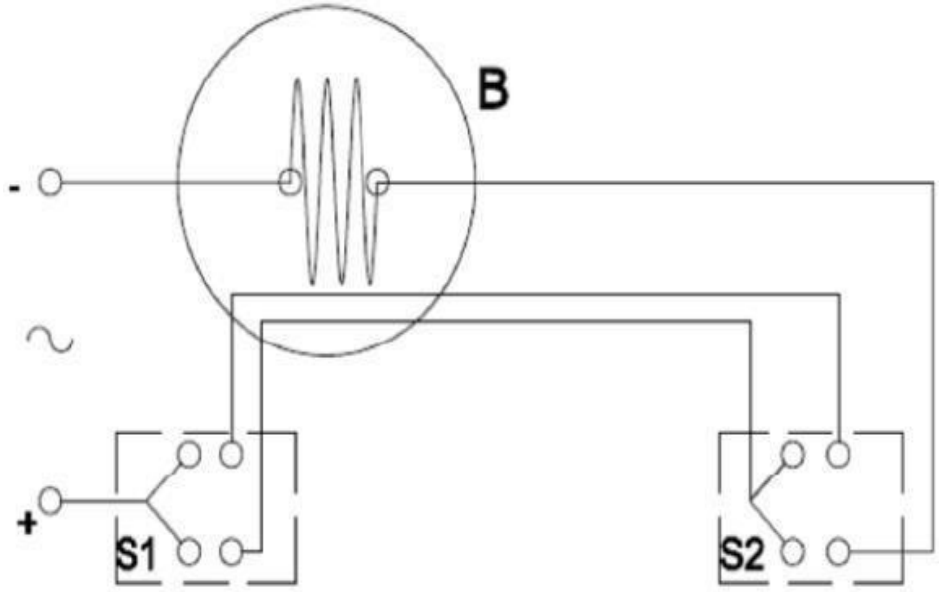


Fig: One lamp controlled by 2 two – way switches.

Procedure: -

Safety precautions: -

Result: -

6. FOUNDRY TRADE

Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns

Introduction: -

Foundry practice deals with the process of making casting in moulds, formed in either sand or other material. This is found to be the cheapest method of metal shaping. The process involves the operations of pattern making, sand preparation, molding, melting of metals, pouring in moulds, cooling, shake out, fettling, heat treatment, finishing, and inspection.

Mould is a cavity in a molding core, formed by a pattern. It is similar in shape and size that of the actual casting plus some allowance for shrinkage, machining etc., molding is the process of making molds.

Moulds are classified as: -

Temporary moulds and Permanent moulds

Temporary moulds are made of sand and other binding materials and may be produced either through hand molding (or) machine molding.

Permanent moulds are made of ferrous materials and alloys i.e., cast iron, steel etc.

Molding Sand: -

Sand is the principle material used in foundry. The principle ingredients of molding sands are

1) Silicon sand 2) Clay 3) Sand

Clay imparts the necessary bonding strength to the molding sand, moisture when added

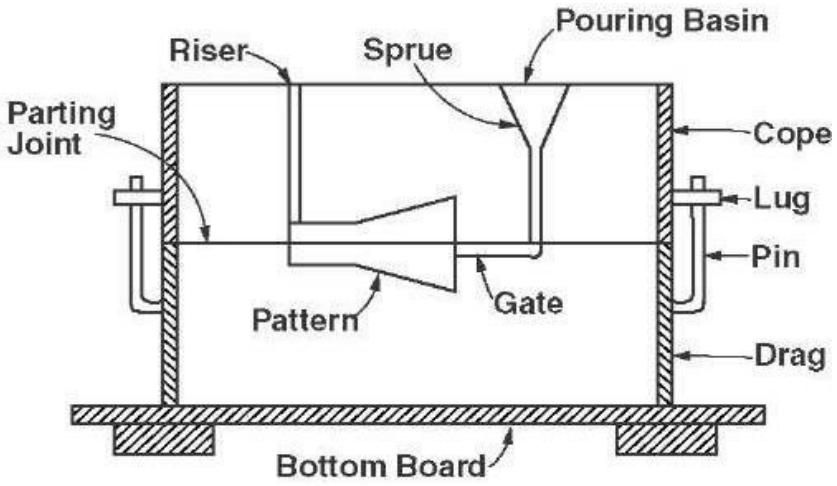
to correct preparation provides the bonding action to the clay sand can withstand high temperature and doesn't react with molten metal.

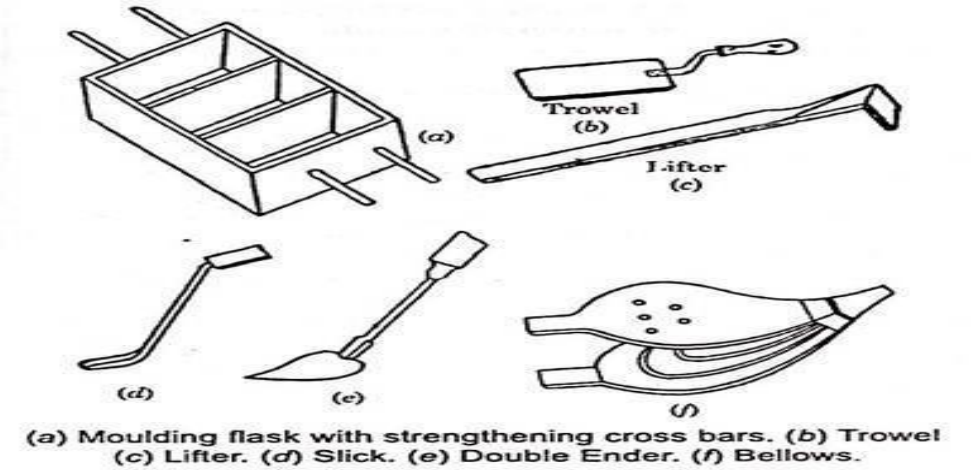
Natural molding sand is either available in river beds are dug from pits. It possesses and appreciable amount of clay and are used as received with the addition of water. Synthetic sands are prepared by adding clay. Water and other materials to silica sand so that the desirable strength and banding properties are achieved.

Most of molding is done with green sand i.e.; sand containing 6 to 8%, moisture and 10% clay content to give it sufficient bond. Green sand moulds are used for pouring the molten metal – immediately after preparing the moulds. Green sand moulds are cheaper and take less time to prepare. These are used for small and medium size casting.

Parting sand, which is clay tree, fence grained silica sand, is used to keep the green sand from sticking to the pattern and also to prevent the cope and drug from cleaning. Core sand is used for making cores.

This is silica missed with core oil and other oddities.





(a) Moulding flask with strengthening cross bars. (b) Trowel (c) Lifter. (d) Slick. (e) Double Ender. (f) Bellows.

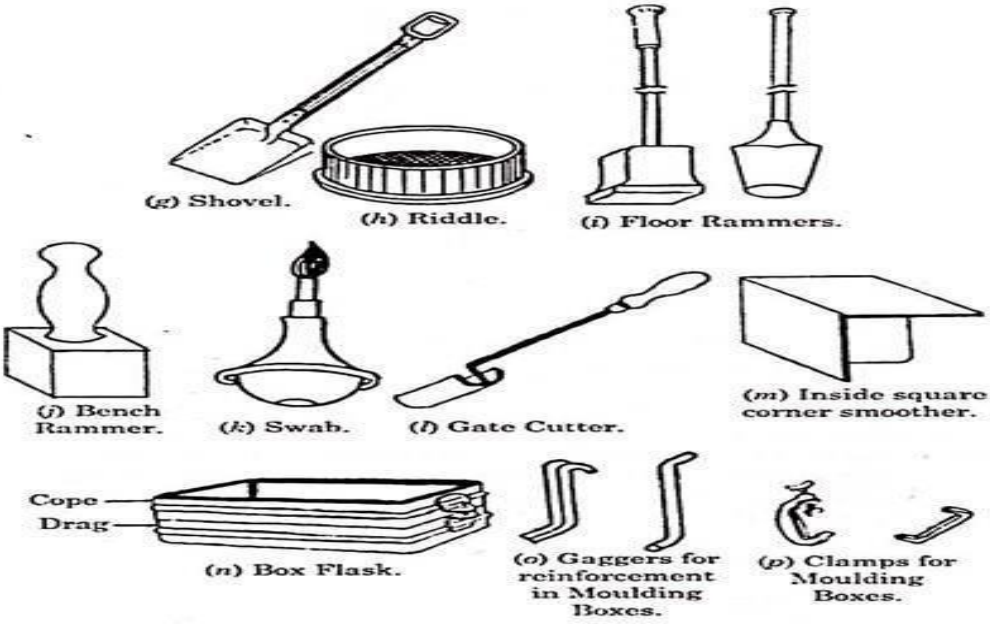


Fig: Foundry tools

Pattern; -

A pattern is the replica of the desired casting, which when packed in a suitable materials produces a cavity called mould. This cavity when filled with molten metal, produces their desired casting of the solidification.

Types of pattern; -

Wood are metal patterns are used in foundry practice, single piece, split loose piece and cored patterns are some of the common types.

Tools and equipment; -

The tools are equipment needed for molding are; -

Molding board: -

It is wooden board with smooth surfaces. It supports the flasks and the pattern, while the mould is being made.

Molding Flask: -

It is a base, made of wood or metal, open at both ends. The sand is rammed in after placing the pattern to produce a mould it is made of 2 parts; cope is the top half of the flask, having guides for the aligning paints to enter.

Shovel: -

It is used for mixing and tempering molding sand and for transferring the sand in to the flask. It is made of steel blade with a wooden handle.

Rammer: -

It is used for pocking or ramming the sand, around the pattern one of its ends called the peen end, is wedge shaped and is used for packing sand in spaces, pockets and corners in the early stages of ramming. The other end called the But – end has a surface and is used for computing the sand towards the end of molding.

Strike of edge / strike of bar: -

It is a piece of metal or wood with straight edge. It is used remove the excess sand from the mould after ramming to provide a level surface.

Spruce pin: -

It is tapered wooden pin used to make a hole in the cope sand through which the molten metal is poured into the mould.

Riser pin: -

It is tapered wooden pin used to make a hole in the cope sand over the mould cavity for the molten metal to rise and feed the casting to compassable the shrinkage that take place during solidification.

Trowel: -

It is used to smoothen the surface of the mould. It may also be used for reproducing the damaged portion of the mould. A trowel is made in many different styles and sizes each one recallable for a particular hole.

Dum-Bell (split piece pattern).

Experiment. No:

Aim: - To prepare a sand mould using given split pattern with core for a grooved pulley or Dum-Bell (split piece pattern).

Tools required: -

1. Molding board
2. Molding flask
3. Shovel
4. Riddle
5. Rammer
6. Strike-off bar or Strike Edge
7. Sprue pin
8. Riser pin
9. Trowel
10. Spike or Draw pin
11. Slick
12. Lifters
13. Gate cutter
14. Bellows
15. Vent rod

Material required: -

1. Molding sand
2. Parting sand
3. Dum-Bell

Sequence of operation: -

1. Sand preparation
2. Sand mixing
3. Pouring
4. Finishing

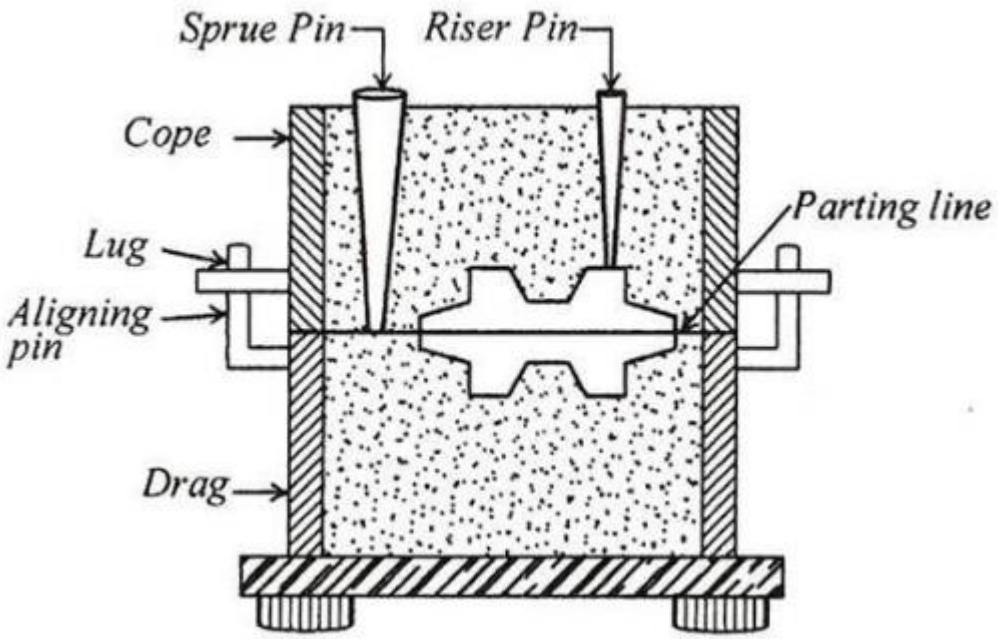


Fig: Split piece Pattern

Procedure: -

Precautions:-

Result: -

7.WELDING

INTRODUCTION:

Welding is the process of joining similar and dissimilar metals by the application of heat, with or without application of pressure or filler metal, in such a way that the joint is equivalent in composition and characteristics of the metals joined. In the beginning, welding was mainly used for repairing all kinds of worn or damaged parts. Now, it is extensively used in manufacturing industry, construction industry (construction of ships, tanks, locomotives and automobiles) and maintenance work, replacing riveting and bolting, to a greater extent.

The various welding processes are:

1. Electric arc welding,
2. Gas welding
3. Thermit welding
4. Electrical Resistance welding and
5. Friction welding

However, only electric arc welding process is discussed in the subject point of view.

Electric arc welding

Arc welding is the welding process, in which heat is generated by an electric arc struck between an electrode and the work piece. Electric arc is luminous electrical discharge between two electrodes through ionized gas.

Any arc welding method is based on an electric circuit consisting of the following parts:

a. Power supply (AC or DC);

b. Welding electrode;

c. Work piece;

d. Welding leads (electric cables) connecting the electrode and work piece to the power supply.

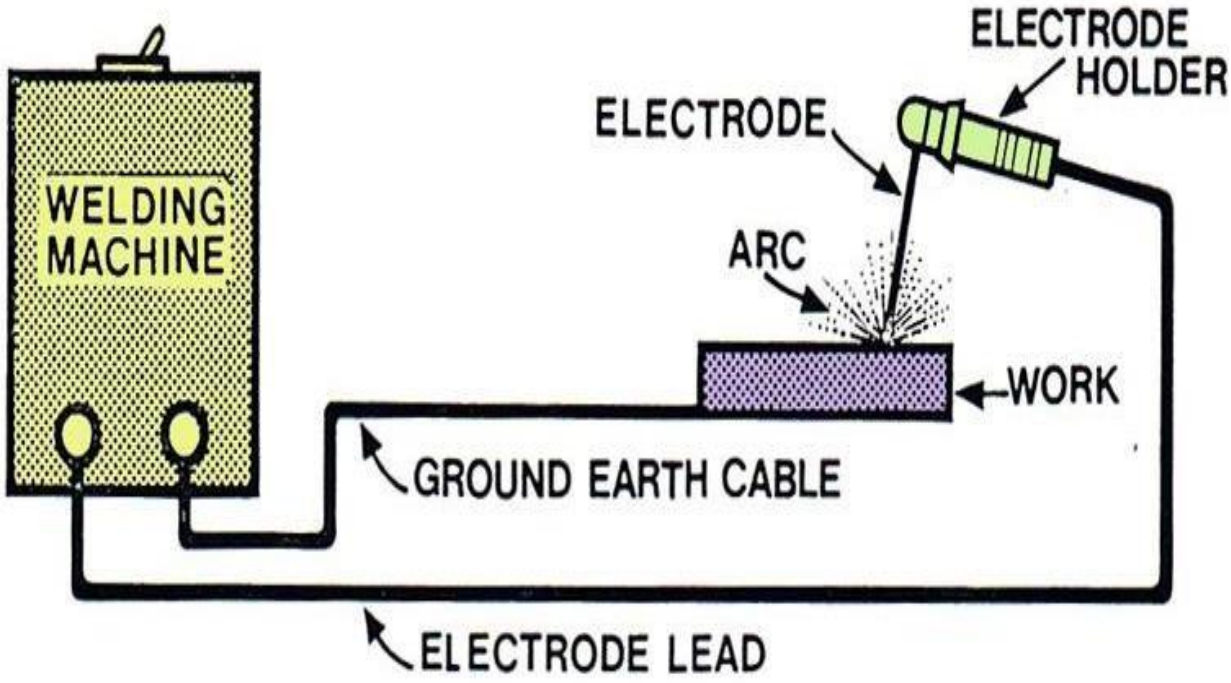


Fig:1 Arc welding set up

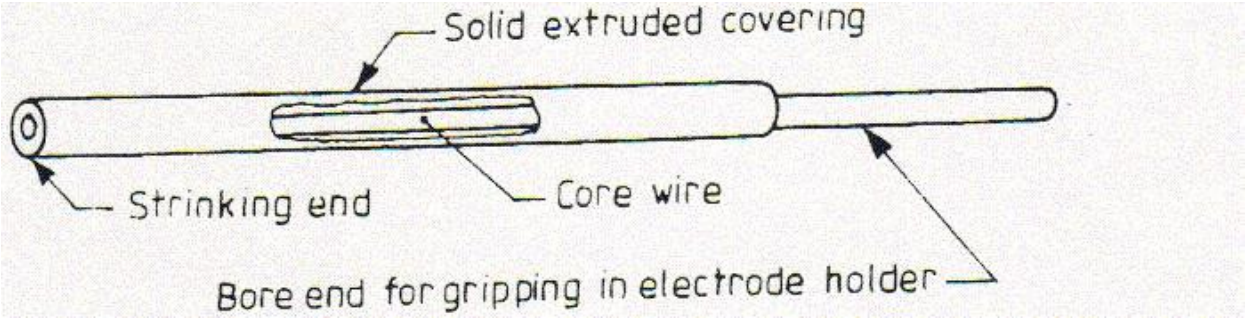


Fig :2 parts of an electrode

Electric arc between the electrode and work piece closes the electric circuit. The arc Temperature may reach 10000°F (5500°C), which is sufficient for fusion the work piece edges and joining them.

When a long joint is required the arc is moved along the joint line. The front edge of the weld pool melts the welded surfaces when the rear edge of the weld pool solidifies forming the joint.

Transformers, motor generators and rectifiers' sets are used as arc welding machines. These machines supply high electric currents at low voltage and an electrode is used to produce

the necessary arc. The electrode serves as the filler rod and the arc melts the surface so that, the metals to be joined are actually fixed together.

Sizes of welding machines are rated according to their approximate amperage capacity at 60% duty cycle, such as 150,200,250,300,400,500 and 600 amperes. This amperage is the rated current output at the working terminal.

Transformers

The transformers type of welding machine produces A.C current and is considered to be theleast expensive. It takes power directly from power supply line and transforms it to the voltage required for welding. Transformers are available in single phase and three phases in the market.

Motor generators

These are D.C generators sets, in which electric motor and alternator are mounted on the sameshaft to produce D.C power as pert the requirement for welding. These are designed to produce D.C current in either straight or reversed polarity. The polarity selected for welding depends upon the kind of electrode used and the material to be welded.

Rectifiers

These are essentially transformers, containing an electrical device which changes A.C into D.C by virtue of which the operator can use both types of power (A.C or D.C, but only one at a time).In addition to the welding machine, certain accessories are needed for carrying out the welding work.

Welding cables

Two welding cables are required, one from machine to the electrode holder and the other, from the machine to the ground clamp. Flexible cables are usually preferred because of the case of using and coiling the cables. Cables are specified by their current carrying capacity, say 300 A, 400 A, etc.

Electrodes

Filler rods are used in arc welding are called electrodes. These are made of metallic wire called

core wire, having approximately the same composition as the metal to be welded. These are coated uniformly with a protective coating called flux. While fluxing an electrode; about 20mm of length is left at one end for holding it with the electrode holder. It helps in transmitting full current from electrode holder to the front end of the electrode coating. Flux acts as an insulator of electricity. In general, electrodes are classified into five main groups; mild steel, carbon steel, special alloy steel, cast iron and non-ferrous. The greatest range of arc welding is done with electrodes in the mild steel group. Various constituents like titanium oxide, potassium oxide, cellulose, iron or manganese, Ferro silicates, carbonates, gums, clays, asbestos, etc., are used as coatings on electrodes. While welding, the coating or flux vaporizes and provides a gaseous shield to prevent atmospheric attack. The size of electrode is measured and designated by the diameter of the core wire in SWG and length, apart from the brand and code names; indicating the purpose for which there are most suitable.

Electrodes may be classified on the basis of thickness of the coated flux. As

1. Dust coated or light coated

2. Semi or medium coated and

3. Heavily coated or shielded

Electrodes are also classified on the basis of materials, as

1. Metallic and

2. Non-metallic or carbon

Metallic arc electrodes are further sub-divided into

1. Ferrous metal arc electrode (mild steel, low/medium/high carbon steel, cast iron, stainless steel, etc)

2. Non-ferrous metal arc electrodes (copper, brass, bronze, aluminum, etc).

In case of non-metallic arc electrodes, mainly carbon and graphite are used to make the electrodes.

Fig : Electrode holder

Fig : Ground Clamp

Fig :Wire brush

Fig : Chipping hammer

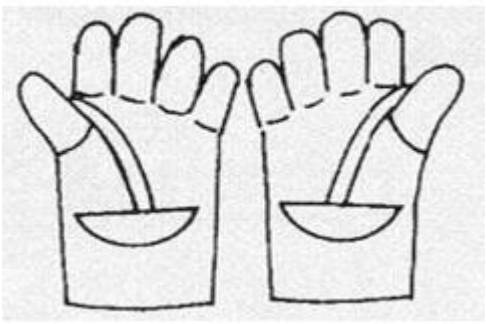


Fig : Hand gloves

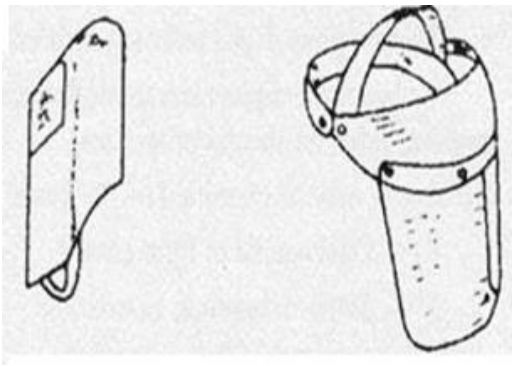


Fig : Face shield

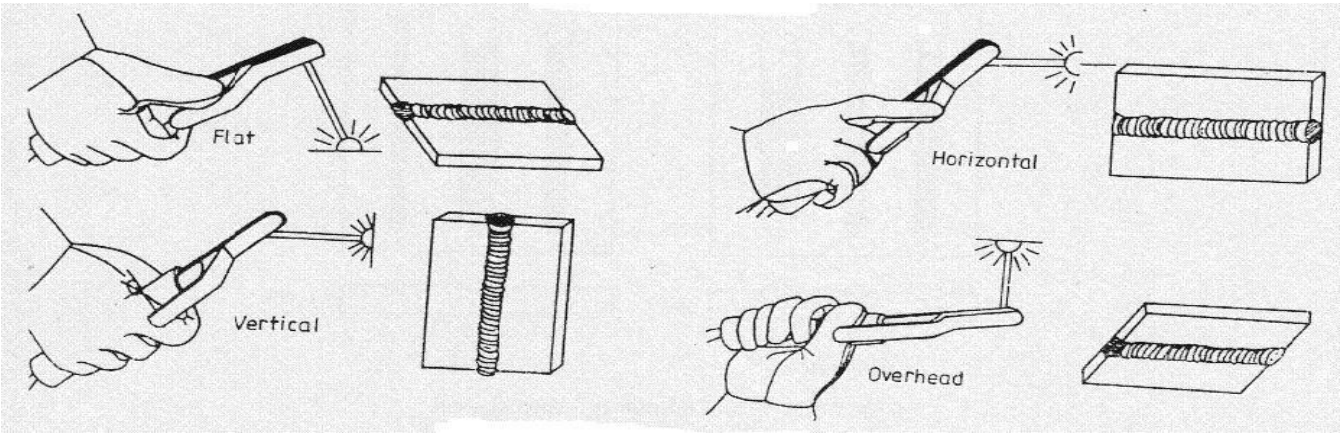


Fig: Weld positions

WELDING TOOLS

Electrode holder

The electrode holder is connected to the end of the welding cable and holds the electrode. Itshould be light, strong and easy to handle and should not become hot while in operation. Figure shows one type of electrode holder. The jaws of the holder are insulated, offering protection from electric shock.

Ground clamp

It is connected to the end of the ground cable and is clamped to the work or welding table to complete the electric circuit. It should be strong and durable and give a low resistance connection.

Wire brush and chipping hammer

A wire brush is used for cleaning and preparing the work for welding. A chipping hammer is used for removing slag formation on welds. One end of the head is sharpened like a cold chisel and the other, to a blunt, round point. It is generally made of tool steel. Molten metal dispersed around the welding heads, in the form of small drops, is known as spatter. When a flux coated electrode is used in welding process, then a layer of flux material is formed over the

welding bead which contains the impurities of weld material. This layer is known as slag. Removing the spatter and slag formed on and around the welding beads on the metal surface is known as chipping.

Welding table and cabin

It is made of steel plate and pipes. It is used for positioning the parts to be welded properly.Welding cabin is made-up by any suitable thermal resistance material, which can isolate the surrounding by the heat and light emitted during the welding process. A suitable draught should also be provided for exhausting the gas produced during welding.

Face shield

A face shield is used to protect the eyes and face from the rays of the arc and from spatter orflying particles of hot metal. It is available either in hand or helmet type. The hand type is convenient to use wherever the work can be done with one hand. The helmet type though not comfortable to wear, leaves both hands free for the work.

Shields are made of light weight non-reflecting fiber and fitted with dark glasses to filter out the Harmful rays of the arc. In some designs, a cover glass is fitted in front of the dark lens to protect it from spatter.

Hand gloves

These are used to protect the hands from electric shocks and hot spatters.

LAP JOINT

Experiment. No:

Aim:- To prepare a lap joint using arc welding process.

Material used:- Two mild steel pieces of 100X40X6 mm.

Tools and equipment used:-

1. Arc welding machine,
2. Mild steel electrodes,
3. Electrode holder,
4. Ground clamp,
5. flat nose Tong,
6. Face shield,
7. Apron,
8. Hand gloves,
9. Metallic work Table,
10. Bench vice,
11. Rough flat file,
12. Try square,
13. Steel rule,
14. Wire brush,
15. Ball peen hammer,
16. Chipping hammer.

Operations to be carried out:-

1. Cleaning the work pieces
2. Tack welding
3. Full welding
4. Cooling
5. Chipping
6. Finishing

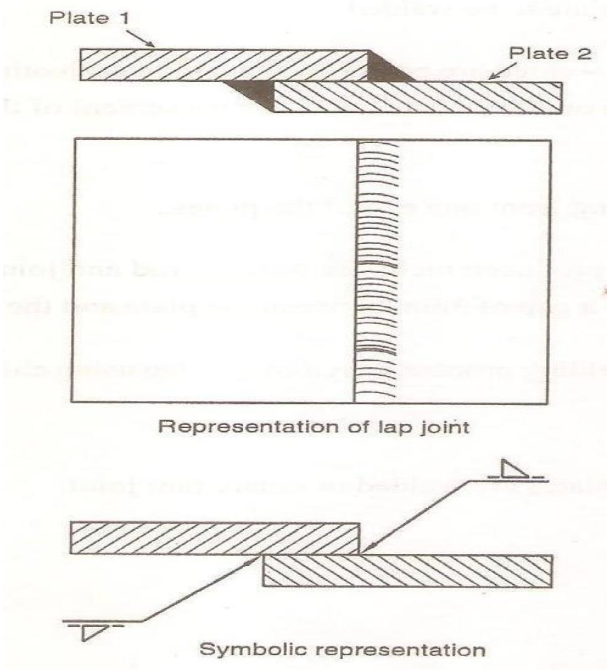


Fig: lap joint

Procedure:-

Precautions:-

Result:-

Butt Joint

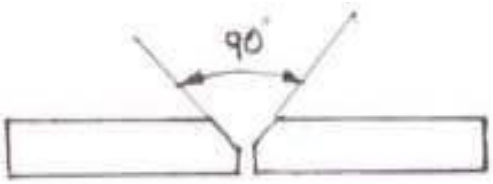
Experiment. No:

Aim:- To prepare a butt joint using arc welding process.

Material required:- 2 M.S flat pieces of given size.

Tools required:-

1. welding transformer
2. connecting cables
3. electrode holder
4. ground clamp
5. electrodes
6. hipping hammer
7. Welding shield etc.



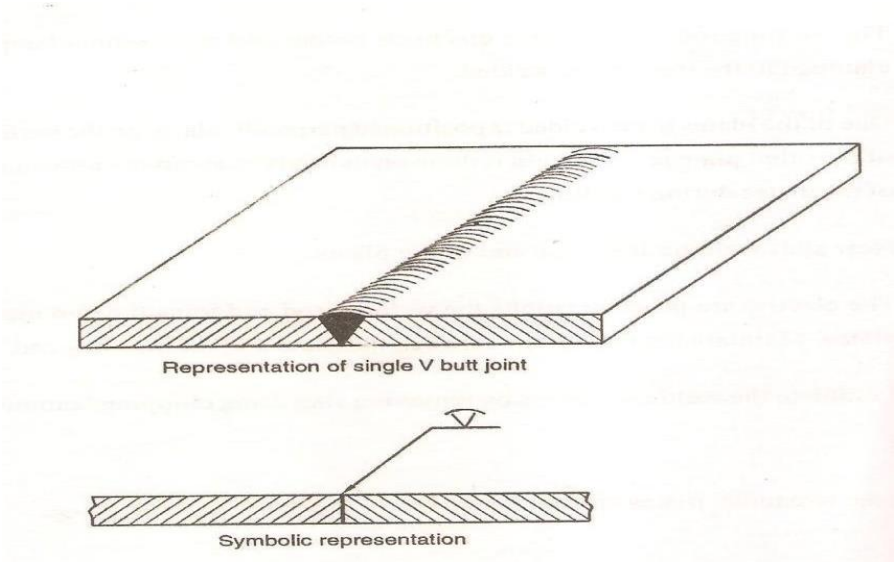


Fig: V – Butt joint

Procedure:-

Precautions:-

Result:-

GAS WELDING

Oxyacetylene flame is commonly used for gas welding. It consists of the supply of the oxygen and acetylene under pressure in cylinders, pressure regulators, a torch, hoses, and accessories like Goggles and a lighter. The oxygen and acetylene cylinders are connected to the troche through pressure regulators and hoses as shown in the figure. The regulators consist of two pressure gauges, one for indicating the pressure within the cinder and the other shows the [pressure of the gas fed in to the torch, which may be regulated. The torch mixers the two gases and the flame controlled by adjusting the oxygen and acetylene supply.

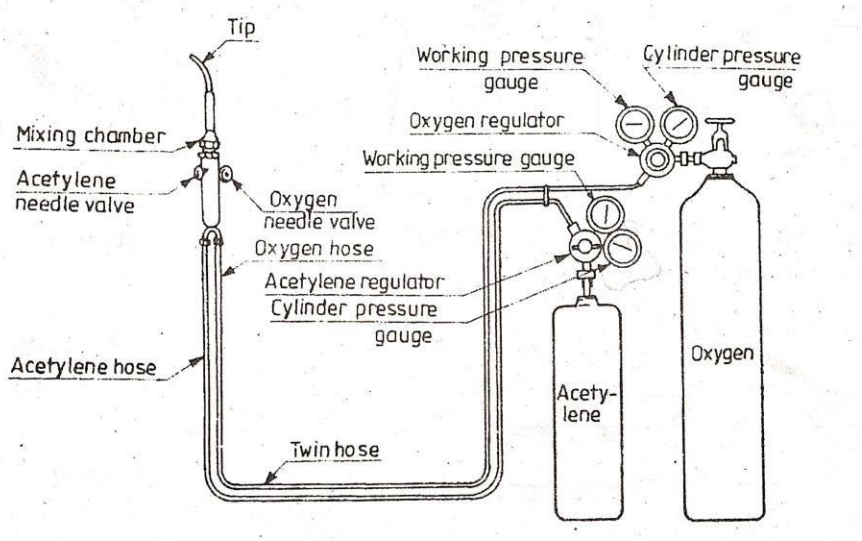


Fig: Gas welding.

LAP JOINT

Experiment. No:

Aim:- To prepare a lap joint using gas welding process.

Material required:- 2 M.S flat pieces of given size.

Tools required:-

1. Gas welding equipment.
2. Goggles, Gloves and apron
3. Filler rod

Procedure:-

Precautions:-

Result:-

8.PLUMBING

Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

INTRODUCTION

Plumbing deals with the laying of a pipeline. A craftsman may be perfectly proficient with the hammer, saw and other tools, but the faces difficulties with leaking pipes and overflowing toilets. Many people rush to a plumber on seeking a tripping pipe, but a person with a little knowledge of the sanitary system can control this problem easily, saving time and, one with help of few tools.

STUDY OF PLUMBING TOOLS

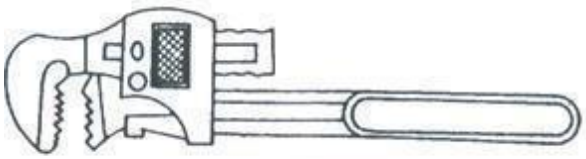
The tools used by a plumber can be classified as follows

1. Pipe wrench
2. Pipe vice
3. Pipe cutter
1. Hacksaw
5. Dies

1. Pipe wrench

A pipe wrench is used for holding and turning the pipes, rods and machine parts.

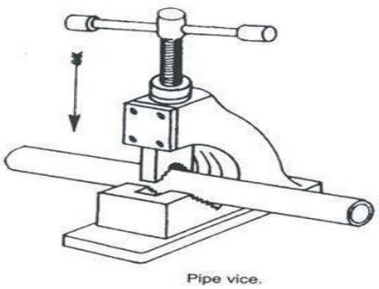
Wrenches are classified as follows. 1. Fixed wrenches 2. Adjustable wrenches.



Pipe wrench.

2. Pipe vice

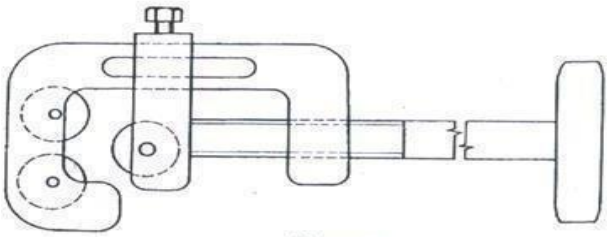
A pipe vice is fitted on the work bench. This has a set of jaws to grip the pipe and prevent it from turning while cutting, threading and fitting of bends, couplings etc. The yoke vice is commonly used in plumbing used in plumbing practice.



Pipe vice.

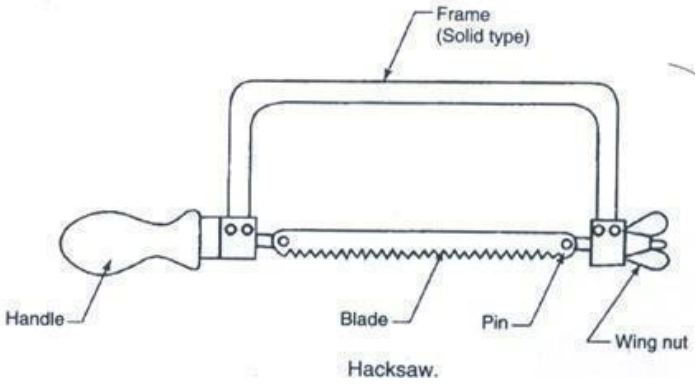
3. Pipe cutter

The pipe cutter mainly consists of three wheels which are hardened with sharp cutting edges along their periphery. Of these three wheels, one can be adjusted to any desired distance to accommodate different size of pipes. After adjusting the cutter on a pipe, it is around the pipe, so that the cutter wheels cut the pipe along a circle as shown in the figure.



Pipe cutter.

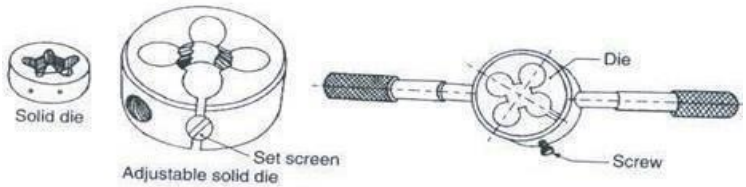
4. Hack saw A hacksaw is used for cutting metal rods, bars, pipes, etc.



Hacksaw.

5. Dies

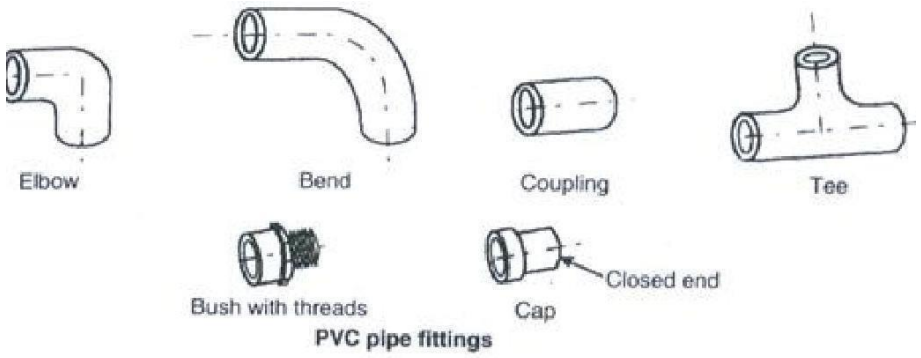
It is used for cutting external thread on pipes. Threads are produced in various shape and sizes which are used for fitting inside a handle.



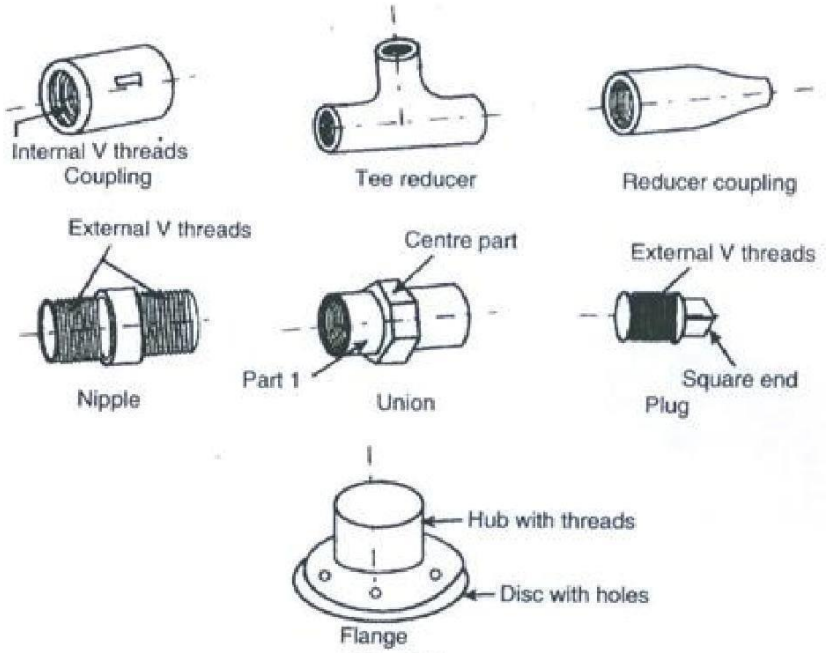
Threading dies and taps.

PIPE FITTINGS

Pipe fittings are made up of wrought iron. The size of pipe fitting is designated by the size of the pipe on which it fits. Some of the common pipe fittings are shown in figure



PVC pipe fittings



Pipe fittings.

1. Coupling

It is a short a cylindrical sleeve with internal threads throughout. A couplings is used for joining two pipes in a straight and bend where at least one pipe can be turned.

2. Union

A union is used for joining two pieces of pipes, where either can be turned. It consists of three parts, two parts joint can be screwed, in to two pipe ends, and the third on for tightening called centre part.

3. Nipple

A nipple is a short piece of pipe with external threads at both ends. It is used to make up the required length of a pipe line.

4. Elbow

An elbow is to make an angle between adjacent pipes.

5. Tee

A tee is a fitting that has one side outlet at a right angle to the run. It is used for a single outlet branch pipe.

5. Reducer

It is used to connect two different sized of pipes

6. Plug

It is used to screw on to a threaded opening, for closing it temporarily.

VALVES

Valves are used for regulating the flow of fluid through a pipe. The commonly used valves in plumbing's are

1. Gate valve
2. Globe valve
3. Plug valve
4. Check valve
5. Air relief valve.

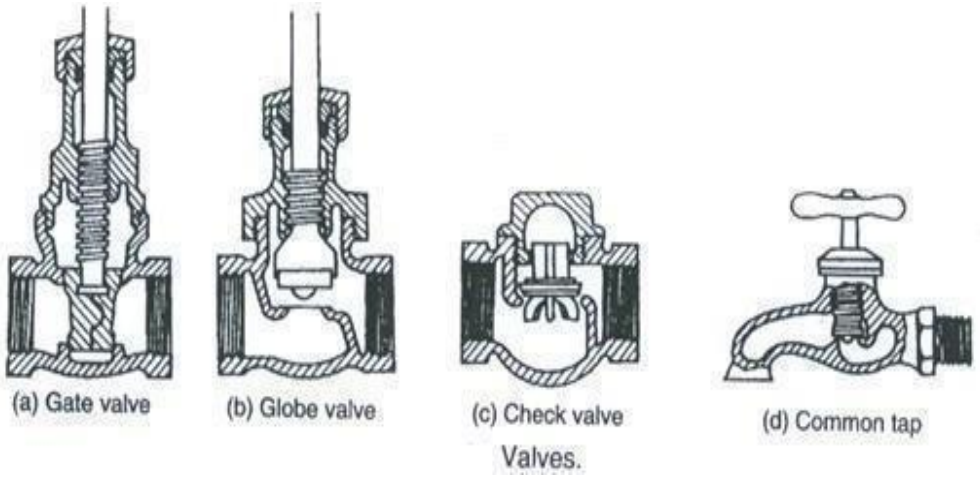
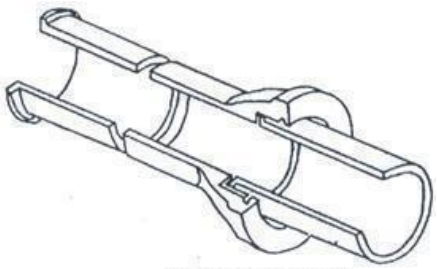


Fig : pipe valves

TYPES OF PIPE JOINTS

1. Bell and spigot joints

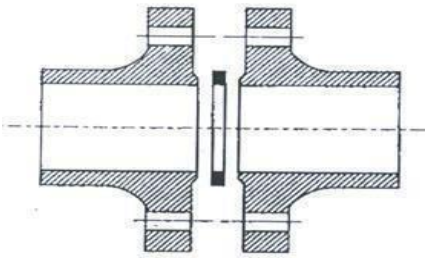
A connection between two sections of pipe i.e. the straight spigot end of one section is inserted into the flared out end of the adjoining section. The joint is sealed by a sealing component.



Bell and spigot joints.

2. Flanged joints

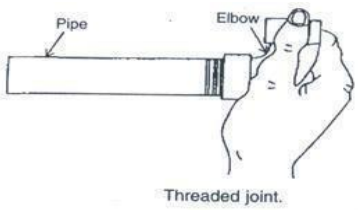
A flanged joint helps to connect and disconnect two pipes as per the need. A similar example is as shown in figure.



Flange joint.

3. Threaded joints

Threads are formed in a pipe, flange coupling to connect them with each other and these joints are called threaded joints.



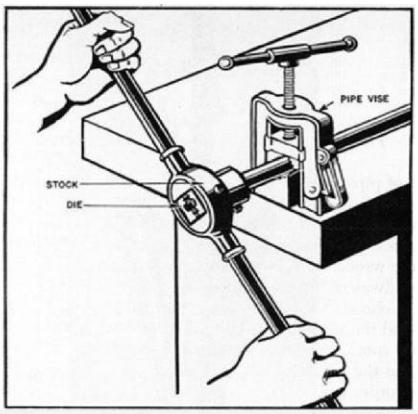
Threaded joint.

Preparation of pipe joints with couplings using PVC pipes.

Experiment. No:

Aim:-

To prepare a pipe joints with couplings using PVC pipes.



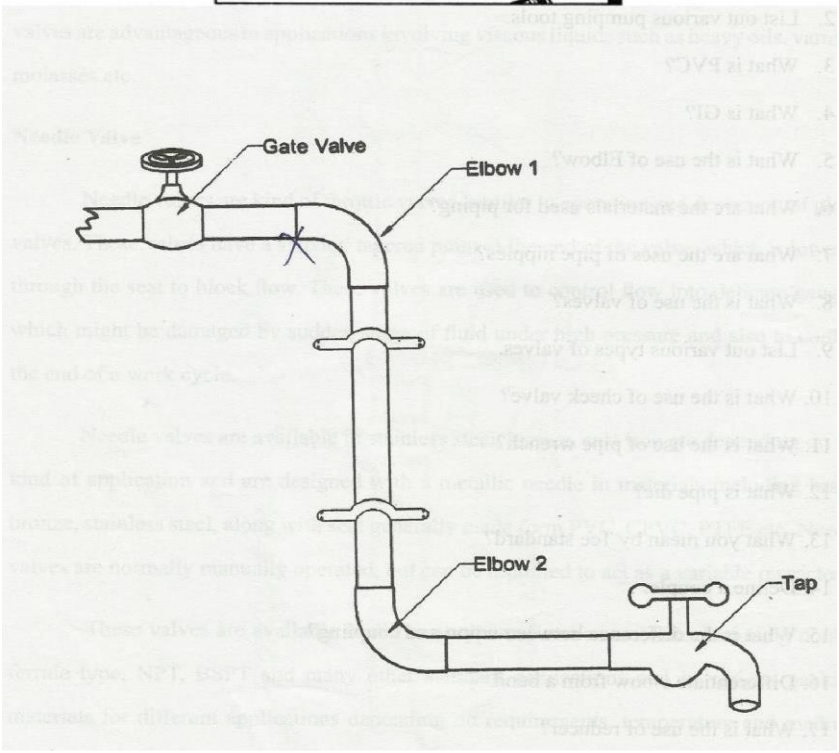


Fig: Pipe joints with couplings.

Material Required

1. PVC pipe
2. Elbows
3. Tap
4. Valve
5. Clamps

Tools Required

1. Pipe vice
2. Die
3. Die stock
4. Measuring scale

Procedure

Precautions:-

Result:-

Engineering Workshop

LAB MANUAL

DEPARTMENT OF MECHANICAL ENGINEERING

LIET-MED

Do's:

- ✓ Wear appropriate safety gear (gloves, goggles, and aprons).
- ✓ Ensure proper machine guarding before operation.
- ✓ Keep the workspace clean and free of obstructions.
- ✓ Report any spills, accidents, or damaged equipment immediately to the lab supervisor.

Don'ts:

- ✗ Do not operate machines without prior training.
- ✗ Avoid wearing loose clothing or accessories near rotating machinery.
- ✗ Never leave a running machine unattended.