Name : ……

Reg No : ……

Branch : ……

Year & Semester : ……

PLUMBING

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.

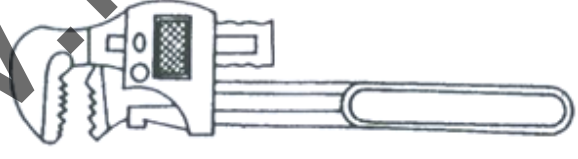
Plumbing tools

The tools used by a plumber can be classified as follows

1. Pipe wrench
2. Hacksaw
3. Plumb bob
4. Pipe vice
5. Dies
6. Pipe cutter
7. Files and Rasps

Pipe wrench

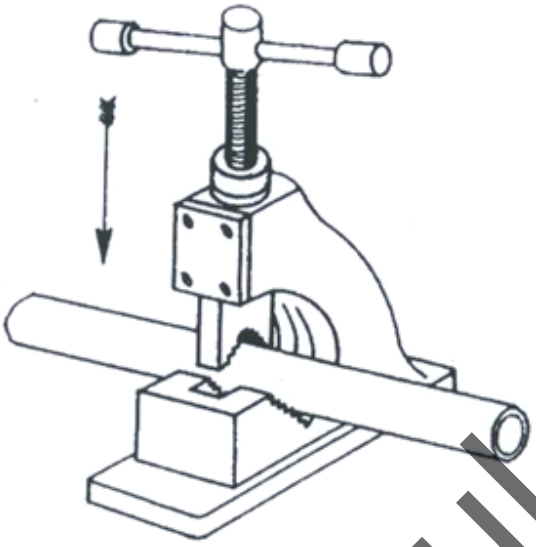
A pipe wrench is used for holding and turning the pipes, rods and machine parts. Wrenches are classified as follows.1.Fixed wrenches 2. Adjustable wrenches.



Pipe wrench.

Pipe vice

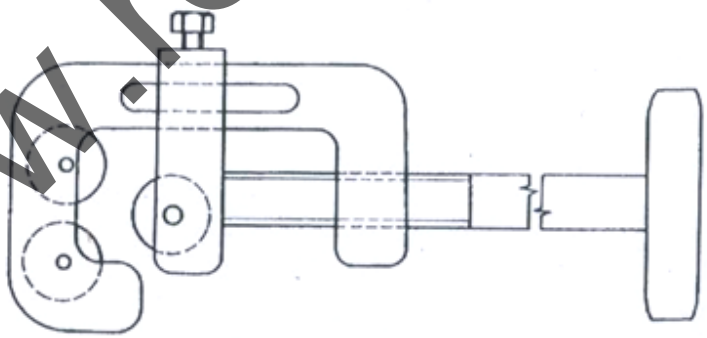
A pipe vice is fitted on the work bench. This has a set of jaws to grip the pipe and prevent it from turning while cutting, threading and fitting of bends, couplings etc. The yoke vice is commonly used in plumbing used in plumbing practice.



Pipe vice.

Pipe cutter

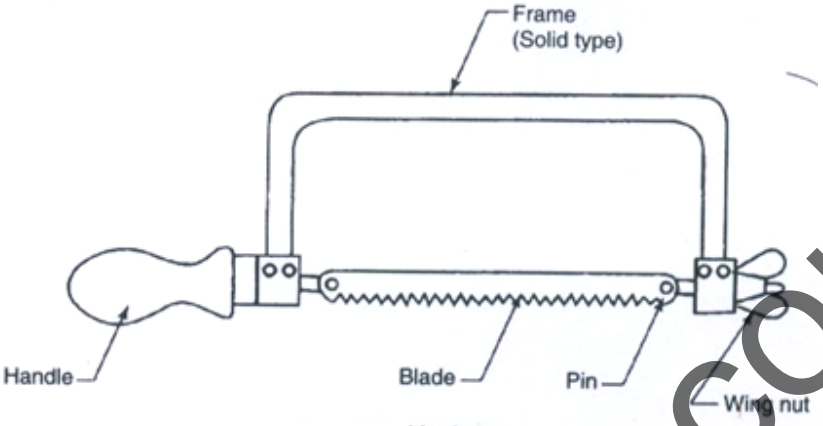
The pipe cutter mainly consists of three wheels which are hardened with sharp cutting edges along their periphery. Of these three wheels, one can be adjusted to any desired distance to accommodate different size of pipes. After adjusting the cutter on a pipe, it is around the pipe, so that the cutter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



Pipe cutter.

Hack saw

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



Hacksaw.

Threading dies and taps

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.


File and rasp

Files and rasps

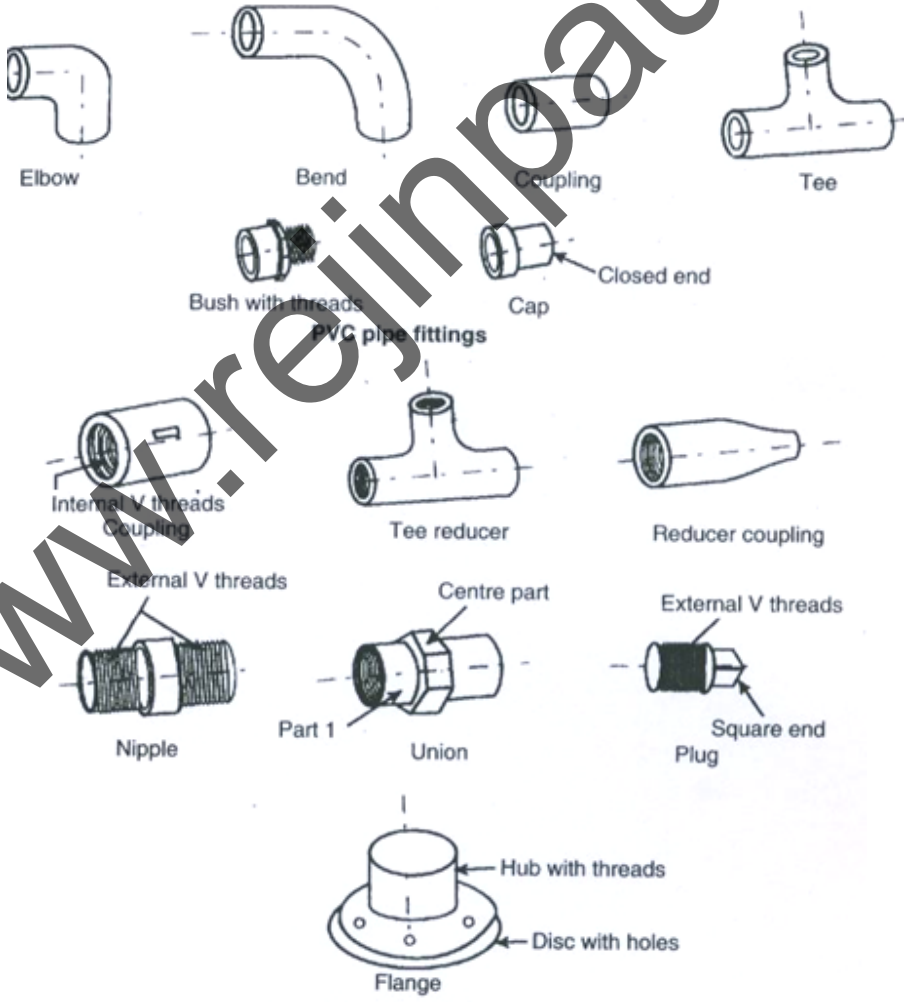
The file surface is covered with sharp edged teeth and its used for removing metal by rubbing. A rasp is used for finishing the surface of the work piece.

Plumb bob

Plumb bob.

It is used for check the vertical line and made up of steel or brass.

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 fig.

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.

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.

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.

Elbow

An elbow is to make an angle between adjacent pipes.

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.

Reducer

It is used to connect two different sized of pipes

Plug

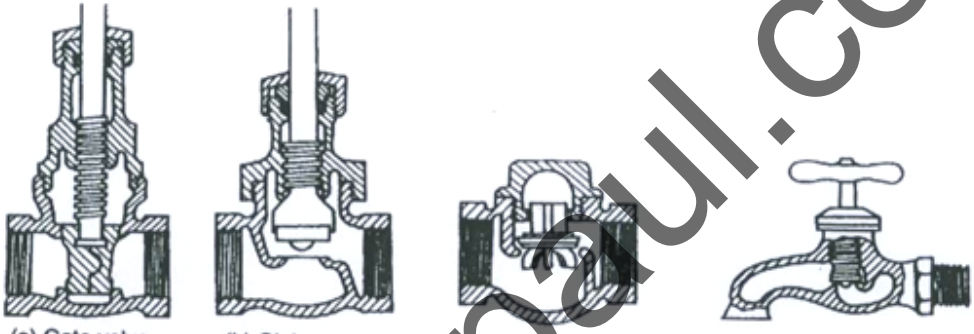
It is used to screw on to a threaded opening, for closing it temporarily.

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

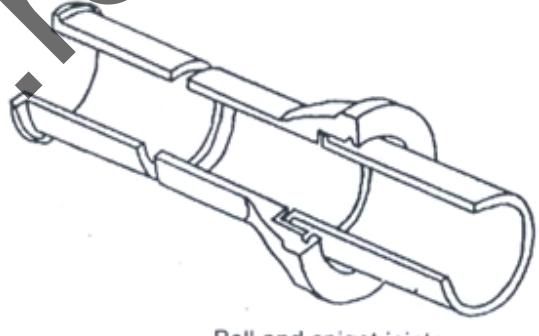
3. Plug valve 4.Check valve 5. Air relief valve.



Valves.

Types of pipe joints

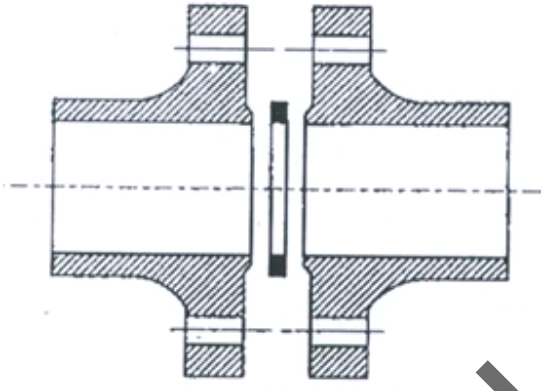
Bell and spigot joints



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.

Flanged joints



Flange joint.

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

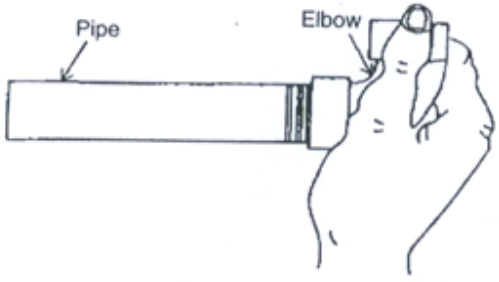
Bolted joints

Bolted joint.

The use of bolted joint is advantageous in the following circumstances

1. The component that cannot be serviced in line.
2. The components being joined that are not capable of being welded.
3. Quick field assembly is required.

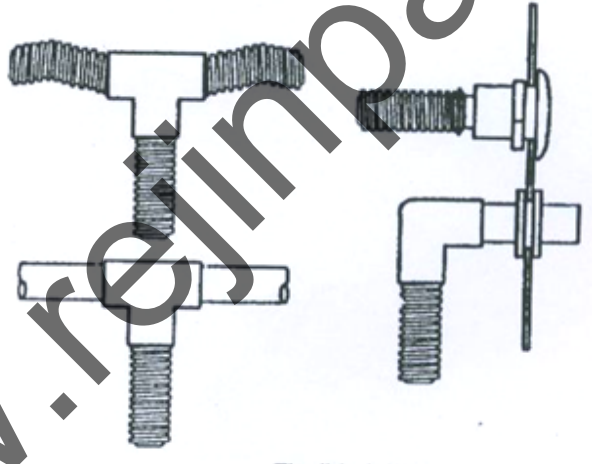
Threaded joints



Threaded joint.

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

Flexible joints



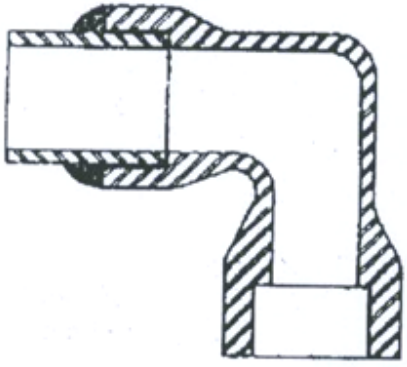
Flexible joints.

The flexible joints are generally used to connect between a washbasin and an angle valve.

Swing joints

Swing joints are special purpose joints mainly used for industrial oriented purposes where a long bend is required.

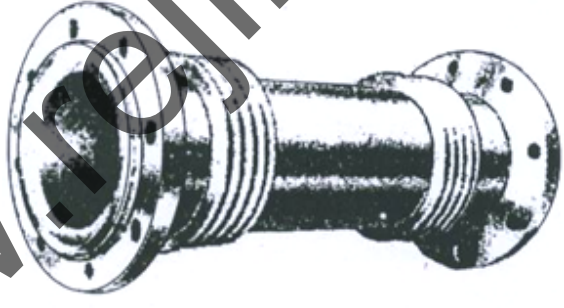
Welded and brazed joints



Welded and brazed joints

Welded and brazed joints are the most commonly used joints for joining pipe components.

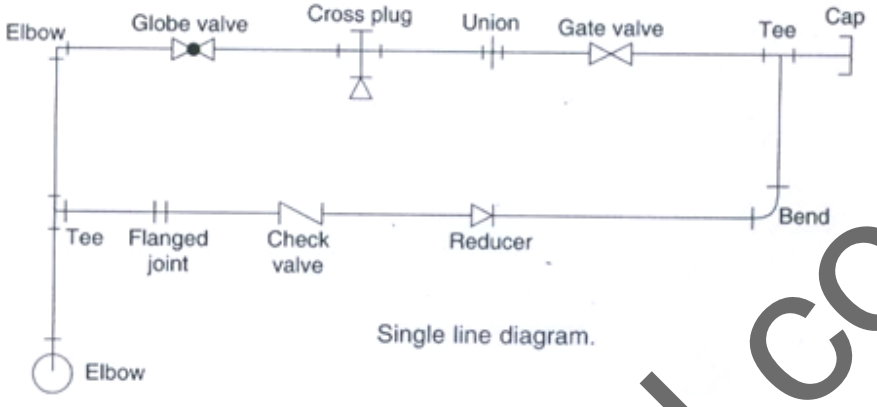
Expansion joints



Expansion joints.

Expansions joints are specially designed in pipeline where a small extension of pipe is required

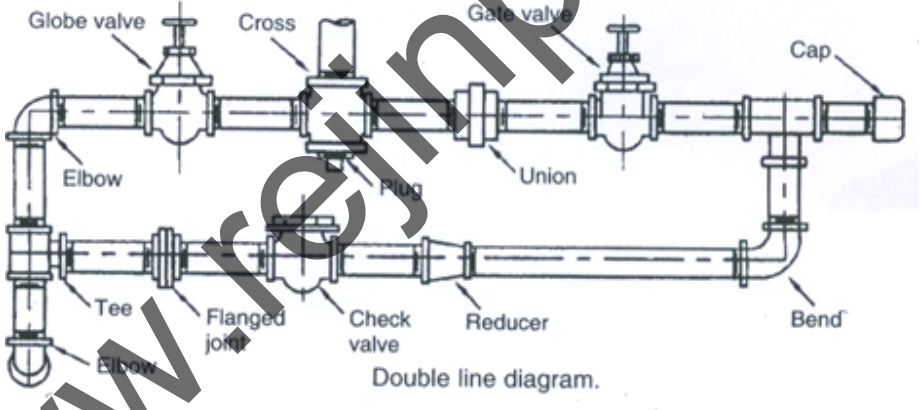
Single line diagram



Single line diagram.

Single line diagram are most commonly used in plumbing diagram. All power plants and bottling plant pipes are made by the single line piping diagram.

Double line diagram



Double line diagram.

It is used for catalogs and other applications where the visual appearance is more important.

Ex.no: **Plumping of one tap water distribution system** Date:

Aim

To construct the one tape water distribution system by using plumbing components.

Fittings required

1. PVC pipes
2. Tank fitting(GI)
3. Union(GI)
4. MTA(PVC)
5. Gate valve
6. Elbow
7. Reducer(GI)
8. Bend(PVC)
9. FTA(PVC)
10. TAP(PVC)

Procedure

1. The given PVC pipes are measured out to the required size.
2. The suitable die is selected.
3. Gate valve is connected between the two MTA.
4. 1” x ¾” reducer connected between 1” pipe and ¾” pipe.
5. 1” (GI) bend is connected between the two pipes.
6. ¾”x1/2” reducer connected between ¾” pipe and ½”.
7. ½” bend connected between ¾” and ½” pipe.
8. At the end of the pipe ½” MTA tap is connected.

Result

Thus the plumbing of one tap water distribution system was constructed.

Ex.no: **Plumping of Four tap water distribution system** Date:

Aim

To construct the one tape water distribution system by using plumbing components.

Fittings required

1. PVC pipes
2. Tank fitting(GI)
3. Union(GI)
4. MTA(PVC)
5. Gate valve
6. Elbow
7. Reducer(GI)
8. Bend(PVC)
9. FTA(PVC)
10. TAP(PVC)

Procedure

1. The given PVC pipes are measured out to the required size.
2. The suitable die is selected.
3. Gate valve is connected between the two MTA.
4. 1” x ¾” reducer connected between 1” pipe and ¾” pipe.
5. 1” (GI) bend is connected between the two pipes.
6. ¾”x1/2” reducer connected between ¾” pipe and ½”.
7. ½” bend connected between ¾” and ½” pipe.
8. Finally FTA ½” connected at four ends and then ½” tap fixed to the four ends.

Result

Thus the plumbing of Four tap water distribution system was constructed.

CARPENTRY

Introduction

Carpentry may be designed as the process of making wooden articles and components such as roots, floors, partitions, doors and windows. Carpentry involves cutting, shaping and fastening wood and other materials together to produce a finished product. Preparation of joints is one of the important operations in wood work.

Joinery denotes connecting the wooden parts using different points such as lap joints, mortise and teman joints, bridle joints, etc.

Carpentry Tools

Carpentry tools are used to produce components to an exact size.

The types of carpentry tools are as follows.

1. Marking tools	2.Measuring tools	3. Holding tools
4. Cutting tools	5.Planning tools	6.Boring tools
7. Striking tools	8.Miscellaneous tools	

Marking tools

It is used to marking lines parallel to the edges of a wooden piece. It consists of a square wooden stem with a sliding wooden stock on it. On the stem, a marking pin is attached which is made up of steel. This stem is provided with a steel nail to scratch the surface of the work. It consists of two pins; the distance between the pins is adjustable. It is used to draw parallel lines on the stock.

Measuring tools

The carpentry measuring tools are classified as follows

Steel tapes and steel rules are mainly used for measuring short and lengths in millimeters.

A try square is used for testing squareness and marking of joints.

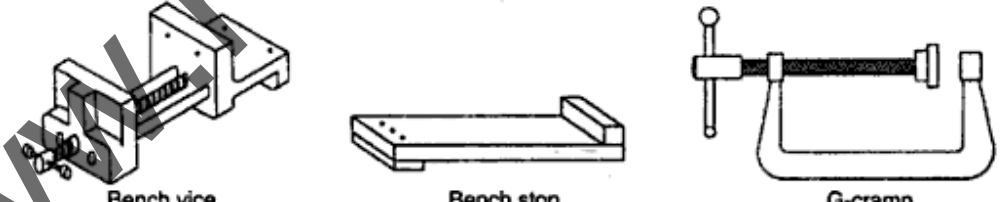
A mitre square is used for marking and measuring an angle of 45 degree.

A bevel square is used for marking and listing angles between 0 degree to 180 degree.

Calipers are used for the precision measurement of cylindrical surface. Inside calipers are used for measuring outside diameter and outside calipers are used to measure inner diameter of a pipe

Holding tools

The carpentry holding tools are shown in fig.



Holding tools.

Carpentry vice

A carpentry vice is the common work holding device. It consists of one fixed jaw and one movable jaw. Its one jaw is fixed to the side of the table while the other is movable by means of a screw and a handle.

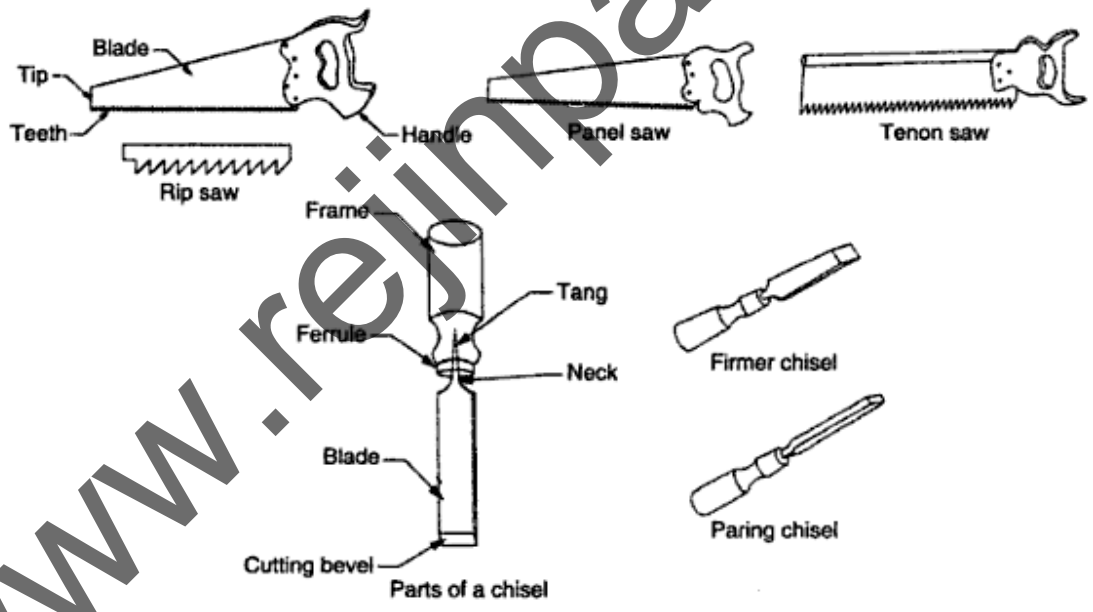
Bar clamp

The bar clamp (or) sash cramps are generally used in pairs in glueing up operations at the final assembly of joinery work. It is made up of a steel bar of T-section, wine malleable iron fittings and a steel screw.

G-cramp

G-cramp is made up of malleable iron with acme threads of high quality steel .It can be used for clamping small work when glueing up.

Cutting Tools



Saws

A saw is used to cut wood into pieces. There is different type of saws, designed to suit different purpose. A saw is specified by the length of its tooled edge. The following saws are used in the carpentry section.

Rip Saw

The blade of rip saw is either straight or skew-backed. The teeth are so set that the cutting edge of this saw makes a steeper angle about 60^0

Cross Cut saw

This is similar in shape of a rip saw. It is used to cut across the grain of the stock. The correct angle for cross cutting is 45^0.The teeth are so set that the saw kerf is wider than the blade thickness. This allows the blade to move freely in the cut without sticking.

Tenon or back saw

A tenon saw is used for fine and accurate work. It consists of a very fine blade, which is reinforced with a rigid steel back. The teeth are shaped like those of cross cut saw.

Chisels

Chisels are used for cutting and shaping wood accurately. Wood chisels are made in various blade widths, ranging from 3 to 50mm .Most of the wood chisels are made into tang type, having a steel shank which fits inside the handle.

Firmer chisels

These are general purpose chisels and are used either by hand pressure or by a mallet. The blade of a firmer chisel is flat and their sloping face is at an angle 15^0 to 52^0 .

Mortise Chisels

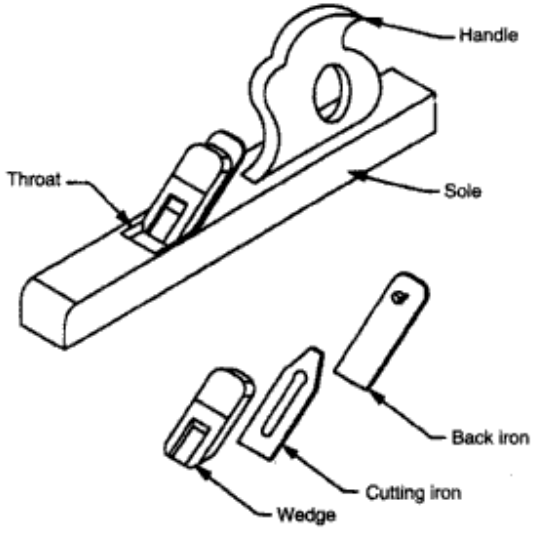
These are general purpose chisels and are used for cutting mortises above 9 mm wide. The blade of a firmer type in which they have a thicker section and a stronger neck. By means of this chisel we can apply more Leverage to remove waste wood from the mortise.

Bevel chisels

A bevel chisel is similar in construction to the firmer chisel. Its edges are bevelled to allow access to difficult corners. It has a blade with a bevelled back due to which it can enter sharp corners for finishing in dovetail joints.

Planning Tools

In general, planes are used to produce flat surfaces on wood. The cutting blade used in a place is very similar to a chisel. The blade of a plane is fitted in a wood or metallic block at an angle.



Planing tools.

Jack plane which is about 35 cm long is used for general planning. A smooth plane that is about 20 to 25cm long is used for smoothening the stock .Being short; it can follow even the slight depressions in the stock better than the jack plane. Smooth plane is used after using the jack plane.

A rebate plane is used for making a rebate .A rebate is a recess along the edge of a piece of wood which to generally used for positioning glass in frames and doors. A plough plane is used to cut grooves, which are used to fix handle in a door.

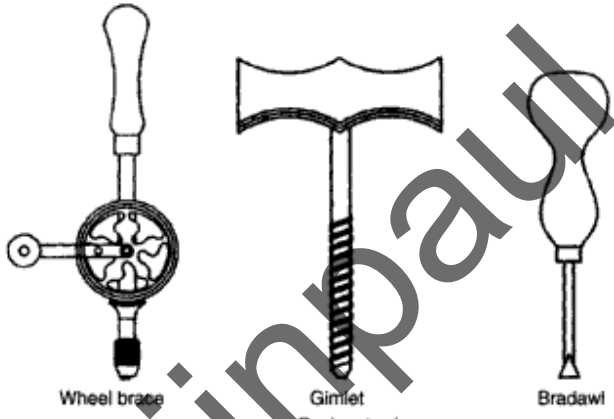
Boring Tools

Boring tools are used to make holes in wood .Common types of boring tools are as follows.

1. bradawl
2. Gimlet
3. Brace

A brace bolds and turns the bit and boring of a hole is obtained. A brace having two jaws is used for holing the bit in one end. It has two types, namely ratchet brace and wheel brace.

A bradawl and a gimlet are used for boring small holes. These tools are hand operated.



Boring tools.

Striking Tools

Striking tools.

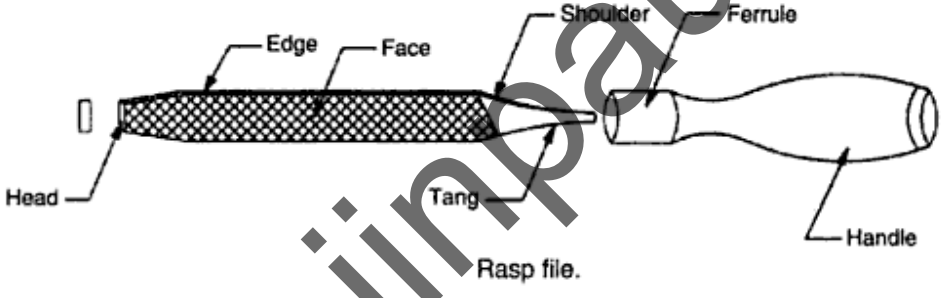
Hammers

The cross peen hammer is mostly used for positioning small nails. The head is tightly held in the handle with the help of iron wedges. The claw hammer is effective in removing very large nails and also for driving the nails using the other end of the hammer.

Mallet

A mallet is used to drive the chisel, when considerable force is to be applied, which may be the case in making deep rough cuts. A steel hammer should not be used for this purpose, as it may damage the chisel.

Rasp file



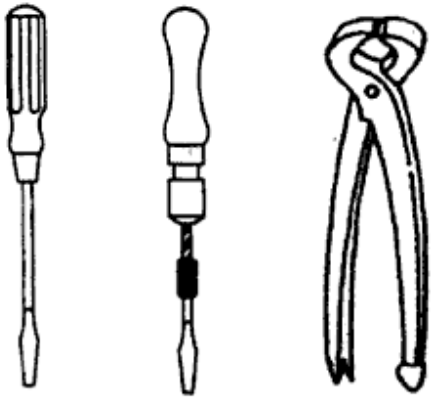
Rasp file.

A rasp file is shown in Fig. rasp is a file used for finishing the surface of wood. The rasp has sharp cutting teeth on its surface for this purpose. The file is used for removing rasp marks end finally the scratches left by the fix are removed with the scraper and glass paper.

Oil stone

This is an essential flat used for providing sharp edges on cutting tools. The oil stones may be artificial or natural stones. The carborundum is the best artificial stones where as the Arkansas are the natural stones.

Miscellaneous Tools



Miscellaneous tools.

Spirit level

The spirit level is used to check the level of the wooden surface. A narrow glass tube is fitted into a small rectangular wooden box. The glass tube contains spirit and a bubble. On placing the spirit level if bubble stays in the middle, then the surface is flat otherwise it is having a slope.

Pincers

They are made up of steel with a hinged joint and are used for pulling out small nails from wood.

Screwdrivers

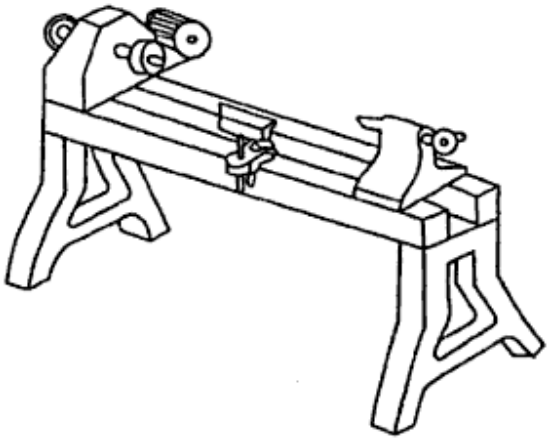
Screwdriver is used for driving wood screws into wood or unscrewing them. The screwdriver used in carpentry is different form the other common types.

CAPPENTRY MACHINES

Carpentry machines are used for large production of components. The commonly used carpentry machines are described below.

Wood Turning Lathe

A wood turning lathe is the most important machines used in a carpentry shop. It is used



Wood turning lathe.

A wood working lathe consists of a cost iron body, main motor, cone pulley system, spindle, tool post, head stock, liveanddead centers and speed control devices. In wood working lathes, the workpiece is held between the two centers. The tool is held in the tool post.

The workpiece is rotated in between the two centers whereas the cutting tool passes towards the work and removes the material and produces the desired shape and size.

Circular Saw

A circular saw is used for ripping, cross cutting, leveling, grooving and rebating,. It consists of a cast iron table, a circular cutting blade, guide ways, saw guide, elevating hand wheel, tilting handwheel,and a main motor.

In circular saws, the workpiece is held on the table. Then the work is moved against the circular saw to perform the operations. The saw hand wheel is used to adjust the height of the saw above the surface of the table.

The table can be tilted up to 45^{O} for cutting with different angles. It is an ideal machine

Band Saw

A band saw is used for cross cutting, leveling, mitering, grooving and rebating. It consists of two wheels having an equal diameter, saw guider, frame table, wheel guard, saw tension, arrangement and steel blade having teeth on it. The saw blade travels over the rims of two wheels. The blade width varies from 6 to 25 mm and the thickness is about 1 to 2 mm.

CARPENTRY PROCESSES

In a carpentry shop, a number of operations are performed to get the finished workpiece. The different types of process performed in a carpentry shop can be classified as follows.

Marking and Measuring

It is the process of setting of dimensions on wooden pieces to obtain the required shape. This is the first step for further carpentry operations. The marking operation is done with use of marking tools. Before marking, one end is planed for reference.

Sawing

Sawing is the process of cutting wood to the required shape and size such as straight, inclined or curved. Sawing can be done along the grains or across the grains.

In sawing, wooden work is fixed in a vice and wood is moved up to prevent vibrations during sawing.

Planing

Planing is an operation of obtaining, smooth, dimensionally true surface of wood by using a planer. It is done along the grains.So; smooth surface is achieved. This process can be also called facing or edging.

Chiseling

It is the process of cutting a small stock of wood to produce required shapes.

Mortising and Tenoning

Mortising is the process of producing a mortise, i.e. a rectangular or square holes and recesses in wooden pieces. A tenon is a projected piece of wood that fits into the corresponding mortise. This process is done by using mortise chisels and a mallet.

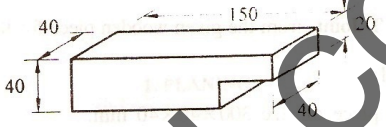
Boring

Boring is the process of producing through holes or blind holes in wooden piece. This process can be done straight or inclined according to the type of work. The small holes are produced by using bradawl and gimlet, whereas large holes are produced by using braces, drills.

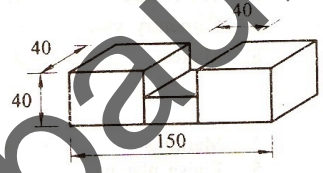
Grooving

Grooving is the process of making grooves tonguing is the process of producing corresponding projections of wood for fitting into grooves. Grooving and tonguing operation can be seen in drawing boards, floor boards and partitions. Grooving is done with a plough plane tool, and tonguing is done with a moulding plane tool.

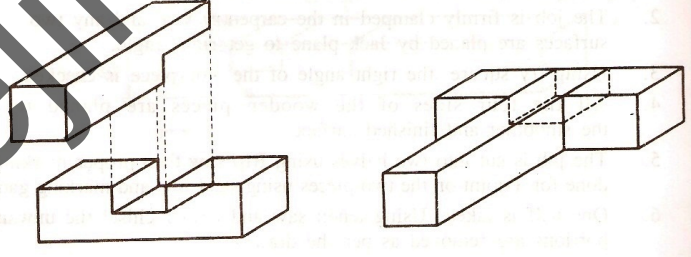
CUTTING



CHISELING



FINISHING



Ex.No: **T-Joint** Date

Aim

To make the T-joint the required dimensions from the given workpiece.

Material Required

Soft wood of size 300x50x50 mm.

Tools Required

1. Jackplane
2. Carpentry vice
3. Try square
4. Marking gauge
5. Steel rule
6. Tenon saw
7. Rip saw
8. Firmer chisel
9. Mallet

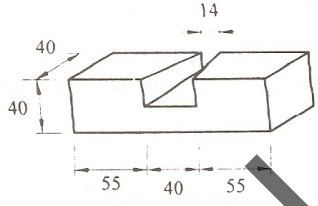
Procedure

1. The given workpiece is firmly clamped in the carpentry vice and any two adjacent surfaces are planed to get right angles using the jack plane.
2. Using the try square, the right angles of planned faces are checked.
3. Now the other two surfaces are planned to get smooth surface.
4. The workpiece is cut into two pieces by using the rip saw.
5. Using the steel rule and marking gauge, marking is done for T-joint on the two halves.
6. In one half, the unwanted portions of wood are removed by using the tenon saw and firmer chisel. The same procedure is done for the other half of workpiece.
7. Using the jack plane, the other two faces of workpiece is planned to the required size.
8. The finished two pieces are assembled to getter to form the T-joint.
9. Finally, the finished job is checked for required size and shape using the steel rule and try square.

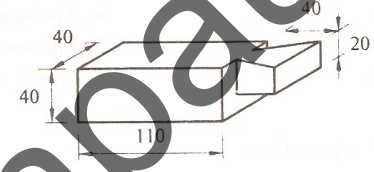
Result

Thus the required T-joint is obtained.

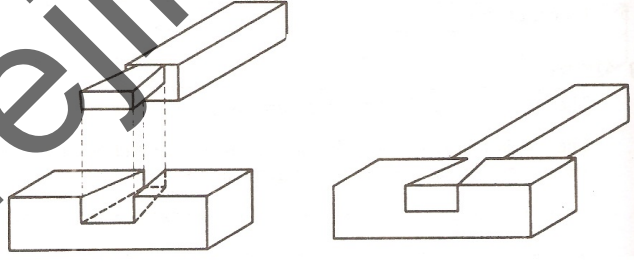
.SAWING



CHISELING



FINISHING



Ex.No: **Dovetail Joint** Date

Aim

To make the Dovetail joint the required dimensions from the given workpiece.

Material Required

Soft wood of size 300x50x50 mm.

Tools Required

1. Jackplane
2. Carpentry vice
3. Try square
4. Mortise gauge
5. Mallet
6. Firmer chiesel

Procedure

1. The given workpiece is firmly clamped in the carpentry vice and any two adjacent surfaces are planed to get right angles using the jack plane.
2. Using the try square, the right angles of planned faces are checked.
3. Now the other two surfaces are planned to get smooth surface.
4. The workpiece is cut into two pieces by using the rip saw.
5. Mark the dimensions for the dovetail joint on the two pieces using the steel rule and marking gauge.
6. Remove the unwanted portions as per the drawing and assemble to check proper fitting.

Result

Thus the desired dovetail joint is obtained.

WELDING

Introduction

Welding is metal joining process wherein localized coalescence is produced either by heating the metal to a suitable temperature, with or without the use of filler metal, with or without application of pressure.

The filler material has similar composition and melting point temperature as that of the base metal. It is used to fill gap between the joint surfaces.

Types of welding

The welding process is divided into two main sub divisions.

Plastic welding

The pieces of metal to be joined are heated to the plastic state and then forced together by external pressure without the addition of filler material.

Forge welding

The work piece are placed in a forge or other appropriate furnace and heated within the area to be joined to the plastic condition. Then parts are quickly superimposed and worked into a complete union by hand or power hammering or by pressing together.

Resistance welding

In resistance welding, a heavy electric current is passed through the metals to be joined over limited area, causing them to be locally heated to plastic state and the welding is completed by the application of pressure for the prescribed period of time.

Fusion welding

In fusion welding, the metal parts to be joined are melted and then allowed to solidify pressure is not applied and filler metals may be used for this type of welding.

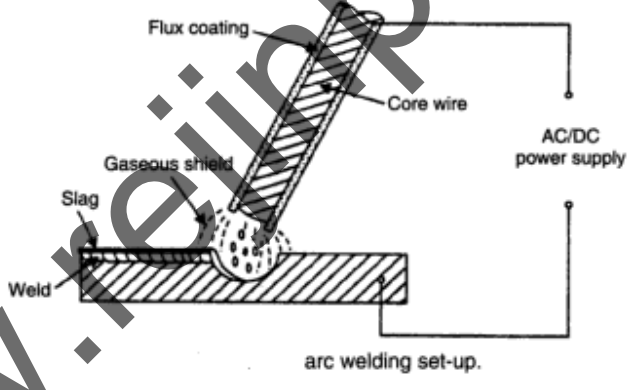
Gas welding

Gas welding is a process in which the required heat to melt the surfaces is supplied by a high temperature flame obtained by a mixture of two gases.

Usually the mixture of oxygen and acetylene is used for welding purpose.

Electric Arc welding

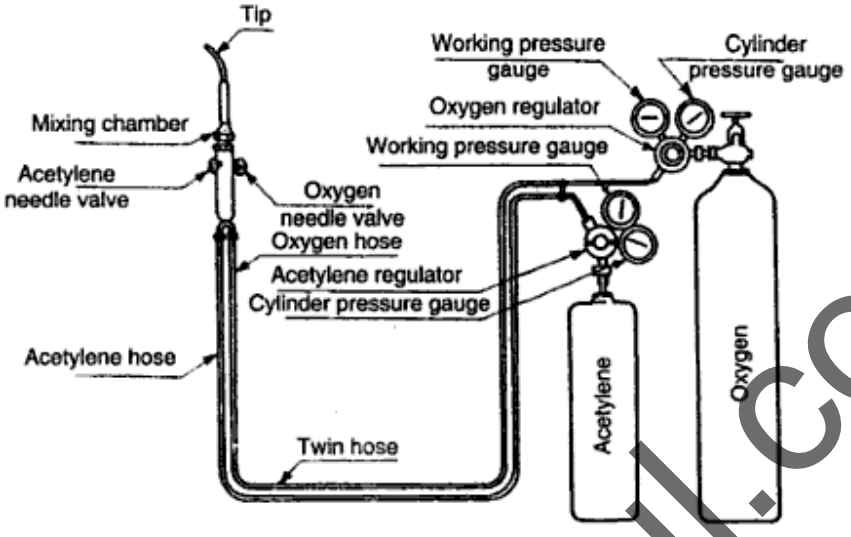
Electric arc welding is the process of joining two parts by melting their edges by an electric arc with ort without the application of pressure and with or without use of filler metals.



arc welding set-up.

Thermit welding

Thermit welding is a fusion process in which weld is effected by pouring super heated liquid thermit steel, around the parts to be united with or without the application of pressure.



oxy-acetylene gas welding.

In oxy-acetylene welding oxygen and acetylene are the two gases used for producing flame. Oxygen is mainly used for supporting the combustion intensity.

The oxygen and acetylene under high pressure in cylinders which are fitted with pressure regulator. Each cylinder is connected to the blowpipe by flexible hoses. The oxygen cylinders are painted block and acetylene cylinders are painted maroon.

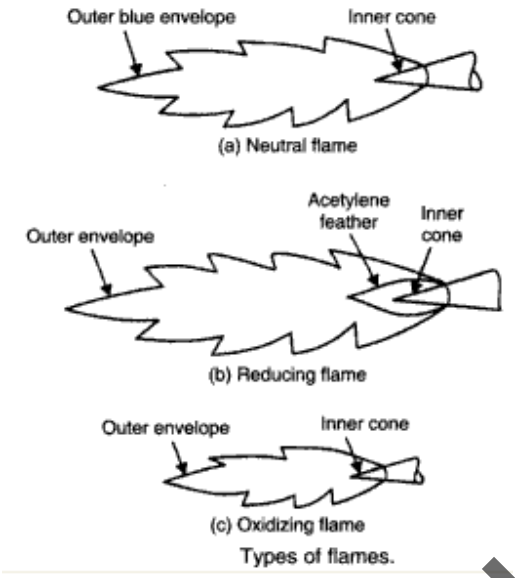
When acetylene is mixed with oxygen in correct proportions in the welding torch, ignition is takes place. The flame resulting at the tip of the torch is sufficient enough to melt and the parent material .The flame temperature is about 3200ºC.The filler metal rod is generally added to the molten metal pool to built up the seam for greater strength.

Types of flames

1. Neutral Flame (Oxygen, Acetylene in equal proportions)

2. Oxidizing Flame (excess of Oxygen)

3. Reducing Flame (excess of Acetylene)



Types of flames.

Neutral Flame

A neutral flame is produced when approximately equal volumes of oxygen and acetylene are mixed in the welding torch and burnt at the torch tip.

The temperature of the neutral flame is of the order of about 3260ºC

The flame has inner cone which is light blue in color.

The neutral flame is used for welding of mild steel, copper, aluminum, cast iron, etc.

Oxidizing Flame

If the volume of the oxygen supplied to the neutral flame is increased, then resulting flame will be oxidizing flame.

The temperature of oxidizing flame is of the order of about 3482ºC.

Normally the outer flame envelope is much shorter. It has very small white inner cone.

This flame is used to weld copper-base metals, zinc-base metals.

Reducing Flame (Carburizing Flame)

If the volume of the oxygen supplied to the neutral flame is reduced, the resulting flame

In this case, flame is recognized by acetylene feather which exists between the inner cone and outer envelope. The outer flame envelope is longer than that of the neutral flame and is usually much brighter in color.

It has an appropriate temperature of 3038ºC.

In this type, flames are used to weld the high-carbon steel, non-ferrous alloys, zinc-bearing alloys.

Flame Adjustment

Neutral flame

To get the neutral flame, add sufficient oxygen to make the white cone clear and round.

During the neutral flame, the gas mixture from the blow pipe consists of oxygen and acetylene in the ratio of 1:1:1

Oxidizing flame

To get the oxidizing flames add, more oxygen.

The white cone will becomes short and sharp.

The flame will produce a hissing sound and will have a short length.

Carburizing flame

To get the carburizing flame adds more acetylene to the neutral flame.

The white cone will become long surrounded by a feather-like portion. Flame will burn quietly and have more length.

Filler metal

It is the material that is added to the weld pool to assist in filling the gap. Filler metal forms an integral part of the weld. The filler metal is usually available in rod form. The rods are called filler rods.

Fluxes

During the welding, if the metal is heated in the air, oxygen in the air combines with the metal 5to form oxides which result in poor quality, low strength welds or in some cases may even make welding impossible. In order to avoid this problem, a flux is added during the welding. The flux prevents oxidation by preventing oxygen from contacting the weld zone.

No flux is used in the gas welding of steel.

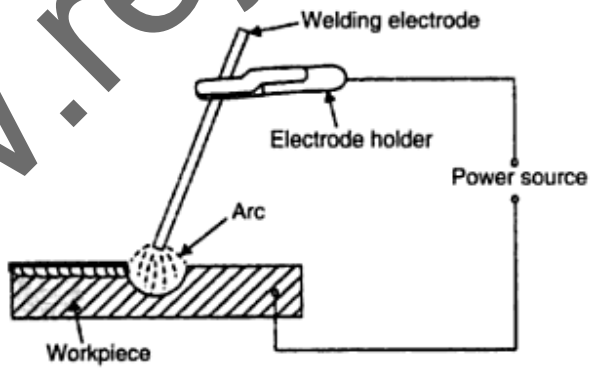
The most commonly used flux materials are boric acid, soda ash and sodium chloride.

Arc welding

In the arc welding process, the source of heat is electricity. In arc welding process, coalescence is produced by heating the work piece with an electric arc struck between electrode and the work piece. Welding may be carried out in air or in an inert atm. Filler material may or may not be used. The temperature of the arc is of the order of 3600ºC.

Principle of arc welding

Principle of operation



Arc welding set-up.

The heat required for joining the metals is obtained from an electric arc. The electric motor generator or transformer sets are used to supply high electric current and the electrodes are used to produce the necessary arc. The electrode serves as the filler rod and arc melts the surfaces so that the metals to be joined are fused together.

he transformer type welding machine produces AC current. It takes power directly

Comparison of A.C and D.C arc welding equipments

No	Alternating current(AC)	Direct current(DC)
1	It is not suitable for joining non-ferrous metals.	It is not suitable for both ferrous and non-ferrous metals.
2	Only coated electrodes can be used.	Bare electrodes can also be used.
3	Consumes less power.	Consumes more power.
4	High efficiency.	Low efficiency.
5	Cost of equipment is less.	Cost of equipment is more.
6	Noiseless operation.	It gives noise.
7	Not suitable for welding thin sections.	Suitable for welding thin sections.

Electrodes

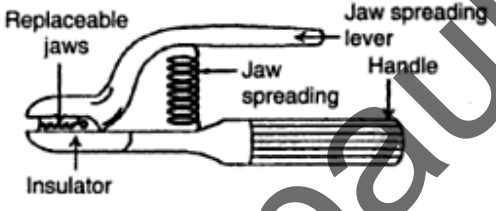
Filler rods are used in arc welding are called as electrodes. The Electrodes are made of metallic wire called core wire. It is uniformly with a protective coating called flux while fluxing an electrode about 20 mm of length is left bare at one end for holding it using electrode holder. It is used to transmit full current from electrode holder to the front end of the electrode coating.

Electrodes for Arc welding

Consumable Electrode	Non-consumable electrode
These electrodes are made up of copper,	• Electrodes made up of carbon and

	arc welding. • Tungsten electrodes used for both AC and DC welding.

Electrode Holder



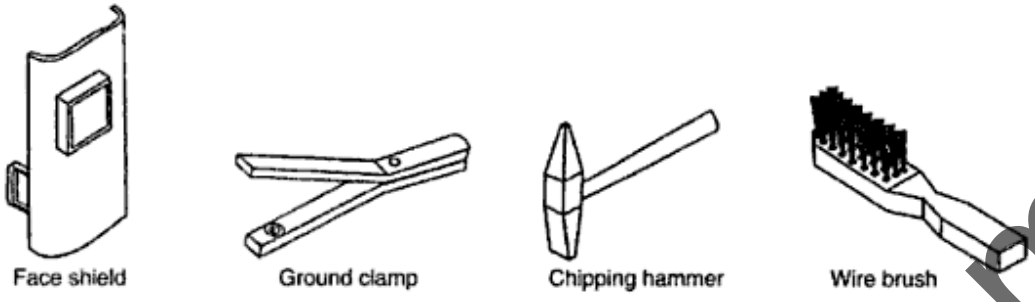
Electrode holder.

- It is a device used for mechanically holing th electrode and conducting current to it.
- Electrode holder should be light, to minimize fatigue incurred by the welder.
- Jaws are made to hold the bare end of the electrode in either at vertical or at an angular position.

Welding Cables

- Two cables are needed for welding purpose. One is used to connect the power source to electrode; another cable is connected to ground.
- The cables are well isolated with rubber.

Welding Bead cleaning accessories



Chipping hammer

A chipping hammer is chisel-shaped one and it is used to remove the slag from the weld bead.

Wire Brush

A wire brush made up of stiff steel wire, embedded in wood, removes small particles of slag from the weld bead after the chipping hammer is used.

Hand Screen

It is a protective device used in arc welding. A hand shield is held in the hand of the welder and it is fitted with a suitable fitter lens.

Helmet

It is used for shielding and protecting the face and neck of the welder and it is fitted with a suitable fitter lens.

Tongs

Tongs are used to handle the hot metal-welding job while cleaning; they are also used to hold the metal for hammering.

Goggles

Chipping goggle is used to protect the eyes while chipping the slag. They are fitted while a plain glass to see the area to be cleaned.

Hand Gloves

Hand gloves are used to protect the hands from electrical shock, arc radiation and hot spatters.

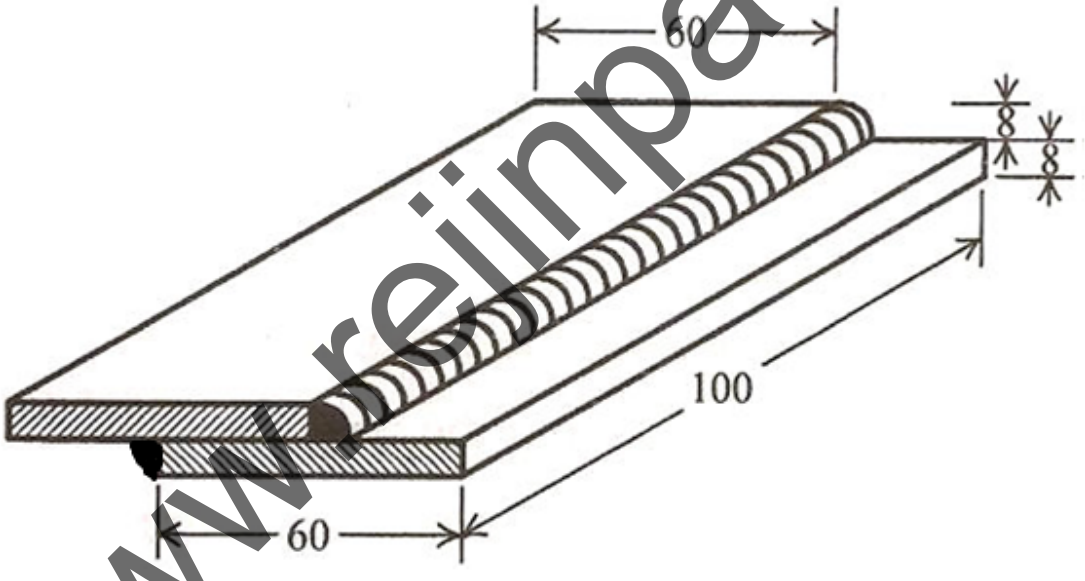
Advantages of arc welding

- Flux shielded manual metal arc welding is the simplest of all the arc welding process.
- The equipment can be portable and the cost is fairly low.
- This process finds innumerable applications, because of the availability of a wide variety of electrodes.
- A big range of metals and their alloys can be welded.

Disadvantages of arc welding

- Because of the limited length of each electrode and brittle flux coating on it, Mechanization is difficult.
- In welding long joints, as one electrode finishes, the weld is to be progressed with the next electrode. Unless properly cared, a defect may occur at the place where welding is restarted with the new electrode.
- It cannot be used to weld metal thickness less then 1.6 mm.

Ex. No : **LAP JOINT** Date :



Aim

To join the given two work pieces as a lap joint by arc welding.

Material used

Mild Steel plates.

Tools required

- Welding power supply
- Welding rod
- Electrode holder
- Gloves and apron
- Shield and goggles
- Flat file
- Chipping hammer
- Wire brush
- Earthing clamps

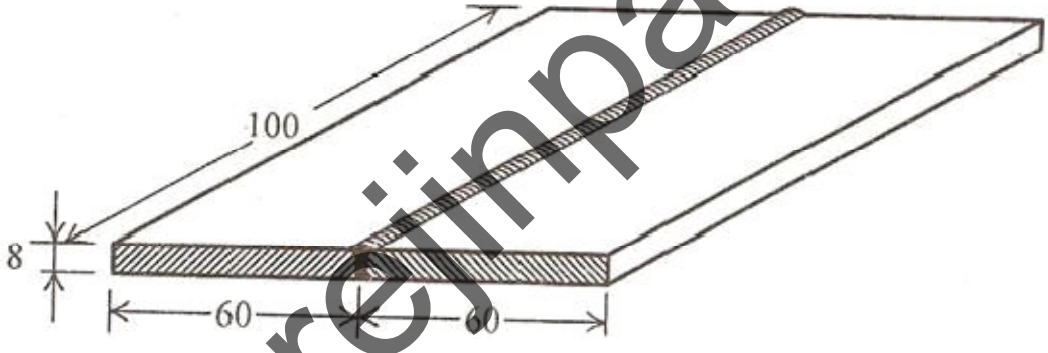
Procedure

1. First of all, the work pieces must be thoroughly cleaned to remove rust, scale and other foreign materials.
2. Then the given work pieces are placed on the table in such a way that one work piece is placed on the other work piece like the LAP joint is formed.
3. Appropriate power supply should be given to the electrode and the work pieces.
4. Now the welding current output may be adjusted.
5. When current is passed, arc is produced between the electrode and work pieces.
6. Then the welding is carried out throughout the length.
7. As soon as the welding process is finished, switch off the current supply and allow the work piece to cool.
8. Slag is removed by chipping process with the help of chipping hammer.
9. Finally using wire brush, welded portions are cleaned.

Result

Thus the given two work pieces are joined as a lap joint by arc welding.

Single V butt joint



Aim

To join the given two work pieces as a single ‘v’ butt joint by arc welding.

Material used

Mild Steel plates.

Tools required

- Welding power supply
- Welding rod
- Electrode holder
- Gloves and apron
- Shield and goggles
- Flat file
- Chipping hammer
- Wire brush
- Earthing clamps

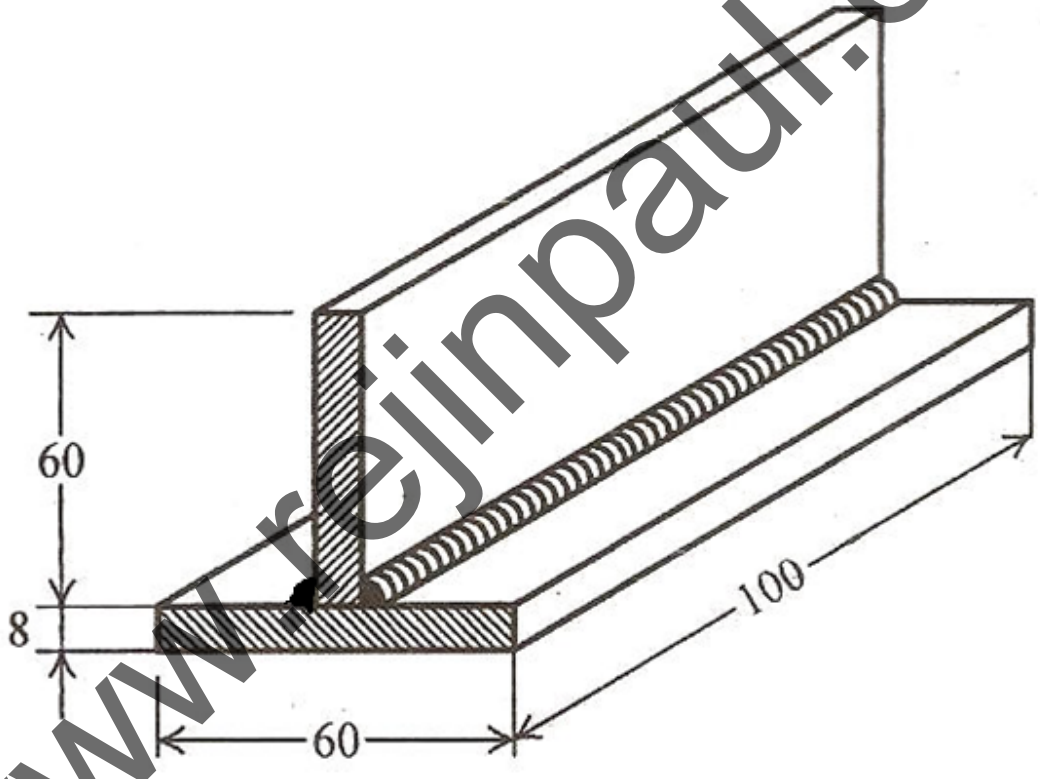
Procedure

1. First of all, the work pieces must be thoroughly cleaned to remove rust, scale and other foreign materials.
2. Then the given work pieces are placed on the table in such a way that work pieces are brought close to close to each other so that it forms a V shapes when the plates butt each other.
3. Appropriate power supply should be given to the electrode and the work pieces.
4. Now the welding current output may be adjusted.
5. When current is passed, arc is produced between the electrode and work pieces.
6. Now set the two work pieces in correct position and maintain the gap 3mm and tag at both ends of the work pieces as shown in figure.
7. Then the welding is carried out throughout the length.
8. As soon as the welding process is finished, switch off the current supply and allow the work piece to cool.
9. Slag is removed by chipping process with the help of chipping hammer.
10. Finally using wire brush, welded portions are cleaned.

Result

Thus the required ‘single V butt joint’ is made by arc welding process.

T - Joint



Aim

To join the given two work pieces as a 'T' joint by arc welding.

Material used

Mild Steel plates.

Tools required

- Welding power supply
- Welding rod
- Electrode holder
- Gloves and apron
- Shield and goggles
- Flat file
- Chipping hammer
- Wire brush
- Earthing clamps

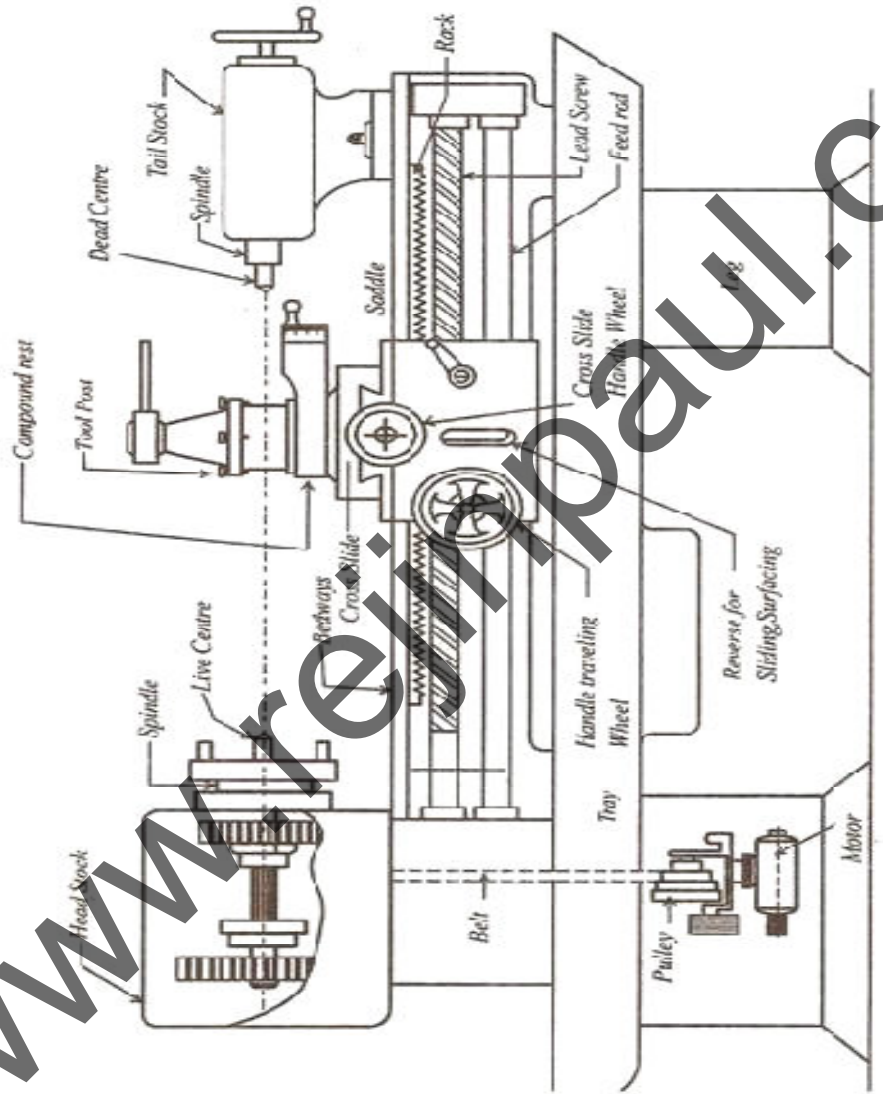
Procedure

1. First of all, the work pieces must be thoroughly cleaned to remove rust, scale and other foreign materials.
2. Now the work pieces are placed on the table in such a way that two work pieces are abroad close to each other T shapes are formed as shown in figure.
3. Appropriate power supply should be given to the electrode and the work pieces.
4. Now the welding current output may be adjusted.
5. When current is passed, arc is produced between the electrode and work pieces.
6. Now set the two work pieces in correct position like T joint and tag at both ends of the work pieces as shown in figure.
7. The joint is placed on a welding table in a flat position by keeping the tag side down.
8. Then the welding is carried out throughout the work piece.
9. As soon as the welding process is finished, switch off the current supply and allow the work piece to cool.
10. Slag is removed by chipping process with the help of chipping hammer.
11. Finally using wire brush, welded portions are cleaned.

Result

Thus the required 'T-joint' is made by arc welding process.

STUDY OF LATHE



Aim

To study about the lathe

Introduction

Lathe is called the father of machine tools. The main function of lathe is to remove metals from work piece to give a required shape and size. In the lathe the work piece is held in a chuck. The tool is moved at an angle 90_ to the axis. Various operations such as straight turning, taper turning, and chamfering, facing, knurling, grooving, thread cutting, taper turning are carried out. When the operations above set are done automatically, then the lathe is called automatic lathe.

Working principle of lathe

In a lathe, the work piece is held in chuck and rotates about its axis by means of power. A single point cutting tool is mounted in tool post. When the chuck rotated the work piece also rotated. The tool moves parallel to the axis of rotation of work piece to produce a cylindrical surface, where as the tool moves perpendicular to the work piece to produce a flat surface. The tool moves at an angle to the axis of work piece to produce a turn surface. The material is removed in the form of chip from the work piece by giving proper feed and depth of cut. So, there quire size and shape of the work is obtained.

Main parts of lathe

The lathe consists of various parts. Their parts and function are discussed below.

Bed

Bed is the base of the lathe. The headstock is mounted on the left end; the carriage is in the middle and the tailstock at the right end of bed. The bed is made up of cast iron, alloyed with nickel, chromium. The bed is made up of cast iron to observe shock and vibration created during machining. The guide ways of the bed may be flatter inverted 'V' shape.

Headstock

It is mounted on the left end of the bed. It carries a hollow spindle. The live center can be attached in the spindle. The spindle nose is threaded. In chuck faceplates can be attached to the spindle. The headstock may be back threaded type. The headstock has two types of driving mechanism

Tailstock

It is located on the bed at the right end. It is used for supports right end of work and also for holding drills, reamer tools for drilling, reaming and such other operations. The tailstock can be moved along the bed and clamped at any position, to support the different length work.

Carriage

Carriage is used for giving various feed to the tool by hand or by power. The carriage is attached with the saddle.

Saddle

It is a H shaped casting fitted on the bed and moves along the guide ways. It carries the cross slide, compound rest and a tool post.

i) Cross slide

It is attached to the upper side of saddle and carries compound slide and tool post. The cross slide can be moved cross wise by hand or power. The micrometer dial is mounted on the cross slide hand wheel, with an accuracy of 0.05mm.

ii) Compound Rest

It is attached over the cross slide. It is used during the taper turning opening operations to set the tool for angular cuts. Here the micrometer dial is mounted to show the depth of cut.

iii) Tool post

The tool is clamped over the tool post. It is fixed over the compound rest. There are four types of tool post

a. Single screw tool post
b. Open side tool post
c. Four bolt tool post
d. Four way tool post

Apron

Apron is attached to the saddle and hangs in front of the bed. It has gears, levers, clutchesfor moving the carriage automatically. A split nut is attached for engaging and disengaging thecarriage from the lead screw. It is used in thread cutting work.

Lead Screw

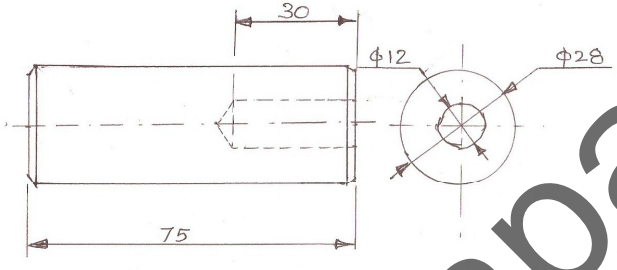
It is a longer screw with standard ACME square threads and used for transmitting power

Feed rod

The feed rod is the long shaft used for the movement of carriage along the axis of bed. Itis used for operations like facing, turning and boring.

Result

Thus the lathe was studied.



FACING, PLAIN TURNING AND DRILLING.

Aim

To perform turning, facing and chamfering on a cylindrical work piece.

Material used

Mild steel rod.

Tools required

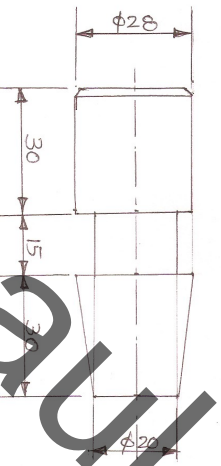
- Lathe
- Three-jaw chuck
- Chuck key
- Vernier caliper
- Single-point cutting tool

Procedure

1. First loosen the jaw in the chuck key to position the work piece, and then tighten the Jaws.
2. Fix the cutting tool in the tool post.
3. Switch on the lathe and move the carriage near to the work piece. Give it a small cross feed, and then move carriage longitudinally to the required length slowly.
4. Bring the carriage to the original position, give a small cross feed and move carriage Longitudinally. Repeat this step until required diameter is obtained.
5. To get smooth surface give a very small feed when the diameter is nearing the required value.
6. To face the end surface of the work piece, move the carriage to make the tool touch the end surface of the work piece.
7. Give a small feed in longitudinal direction, and then move the tool towards the axis of the work piece using the cross slide to complete the work piece.
8. Using the proper drill pit to the required length make a blind hole.

Result

Thus the required shape and size is obtained by Facing, plain turning and drilling.



FACING, PLAIN TURNING AND TAPER TURNING

Aim

To perform turning, facing and chamfering on a cylindrical work piece.

Material used

Mild steel rod.

Tools required

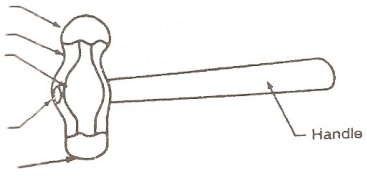
- Lathe
- Three-jaw chuck
- Chuck key
- Vernier caliper
- Single-point cutting tool

Procedure

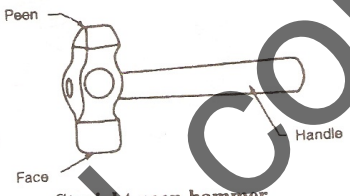
1. First loosen the jaw in the chuck key to position the work piece, and then tighten the Jaws.
2. Fix the cutting tool in the tool post.
3. Switch on the lathe and move the carriage near to the work piece. Give it a small cross feed, and then move carriage longitudinally to the required length slowly.
4. Bring the carriage to the original position, give a small cross feed and move carriage Longitudinally. Repeat this step until required diameter is obtained.
5. To get smooth surface give a very small feed when the diameter is nearing the required value.
6. To face the end surface of the work piece, move the carriage to make the tool touch the end surface of the work piece.
7. Give a small feed in longitudinal direction, and then move the tool towards the axis of the work piece using the cross slide to complete the work piece.
8. The turning operation is done with cutting tool to reduce the diameter up to the required dimension for the two steps of various diameters.
9. The work piece is removed from the chuck and the dimensions of work piece are checked for the requirements.

Result

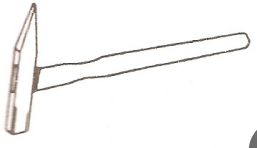
Thus the required shape and size is obtained by Facing, plain turning and taper turning.



Ball peen hammer



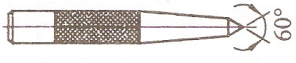
Straight peen hammer



Riveting hammer

Mallet

Dot punch



Centre punch

SHEET METAL

INTRODUCTION

Sheet metal works deals with working on the metal of 16-30 gauge ,with hand tools and simple Machines. It is one of the major applications in engineering industry. It has its own significance as useful trade in engineering work. Sheet works such as making a tray, box , funnel, chimney, air duct, fabricate boiler shells and pipe joints from thin or thick plates, etc. are few examples of its application. For successful working in the trade, one should have a thorough knowledge of projective geometry and development of surfaces.

SHEET METAL TOOLS

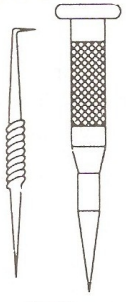
STEEL RULE: It is used to measure and mark dimensions. It is graduated on both sides in ***millimeters*** and ***centimeters*** or ***inches.***

DIVIDER: It is used in sheet metal jobs for circle making. With the divider we can also do making the parts of the job.

Steel Square*:* It is used for checking the right angle of the jobs.

Trammel: It is used to draw large circles and arcs. This is also a marking tool

Wire Gauge: The thickness of sheet metal is referred in numbers known as **S**tandard **W**ire **G**auge (**SWG**). The gaps in the circumference of the gauge are used to check the gauge number



Scriber

Divider

Trammel

Bench Shear:

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 4 mm thick.

Snips:

This tool is used for cutting thin metal sheets, before or after marking, according to the jobs, is called snips. The straight snip is used for cutting along outside curves and straight lines and curved snip or bent snip is for trimming along inside curves.

Hammers:

Light weight hammers and mallets are used in sheet metal work. Ball-peen Hammer has a cylindrical slightly curved face and a ball head. It is a general purpose hammer used mostly for riveting in sheet metal work. The cross-peen hammer and straight peen hammers are used for folding the sheet and to work in the corners of the object.

Mallet:

Mallet is used for bending and folding work. It is called as soft hammer. Generally, it is made of wood.

Stakes:

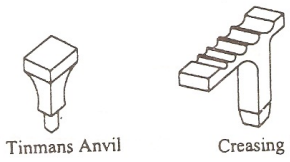
Stakes are nothing but anvils, which are used as supporting tools and to form, seam, bend or rivet, sheet metal objects. They are made from wrought iron, faced with steel.

Scriber:

This tool is used for making sheet metal jobs.

Punch:

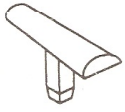
Punch is used in sheet metal jobs for punching or deep marking.



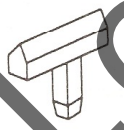
Tinmans Anvil

Creasing iron

Round bottom stake

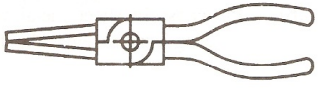


Funnel stake



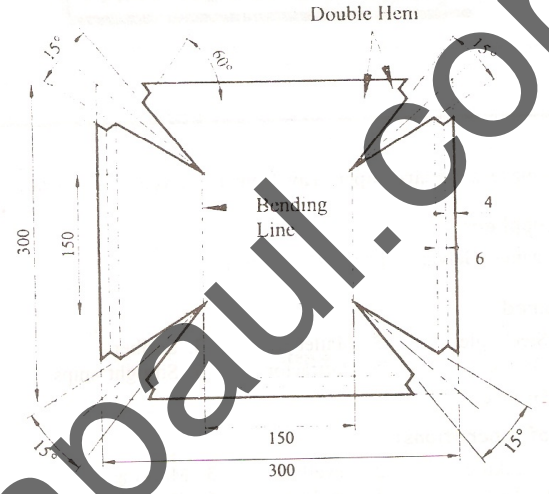
Hatchet stake

Pipe Pliers

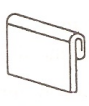


Round - Nose Pliers

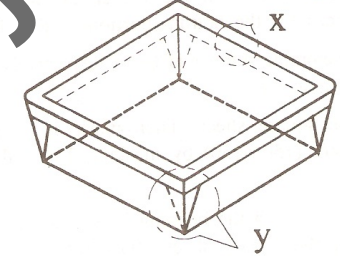
Steel Rule



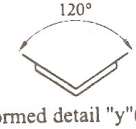
Developed view



Detail x



Developed detail "y"



Formed detail "y"(top)

Ex. No : **SHEET METAL TRAY** Date :

Aim

To make a rectangular tray from the given sheet metal.

Material Required

G.I Sheet

Tools required

- Steel rule
- Mallet
- Scriber
- Divider
- Protractor
- Snips
- Stakes
- Ball peen hammer

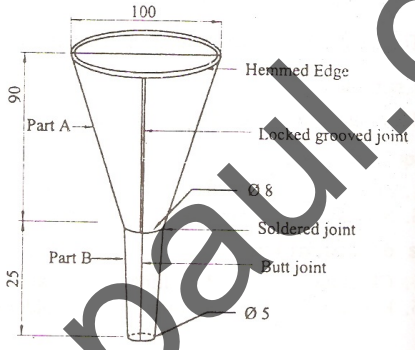
Procedure

1. The size of the given sheet is checked for its dimension using steel rule.
2. Then the sheet is leveled on the leveling plate using a mallet.
3. The development procedure is followed the same as the square taper tray.
4. The dimensions are marked as shown in figure.
5. The sheet is cut as per the marked dimensions by straight snips.
6. Then a single hemming is made on the four sides of the tray as shown in figure.
7. The four sides of the tray bent to 90_using the stakes anvil.
8. Finally all the corners of the tray are joined by riveting.

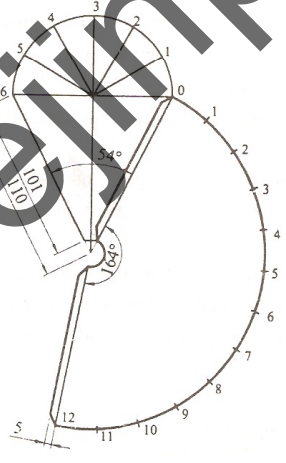
Result

Thus desired rectangular tray is made from the given sheet metal.

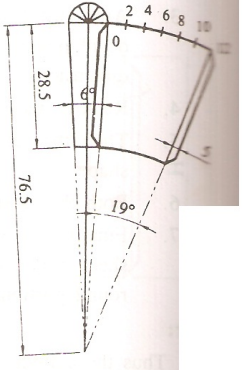
5. FUNNEL



Develeped view of Part A



Develeped view of Part B



Ex. No : **MAKING OF A FUNNEL** Date :

Aim

To make a funnel from the given sheet metal.

Tools required

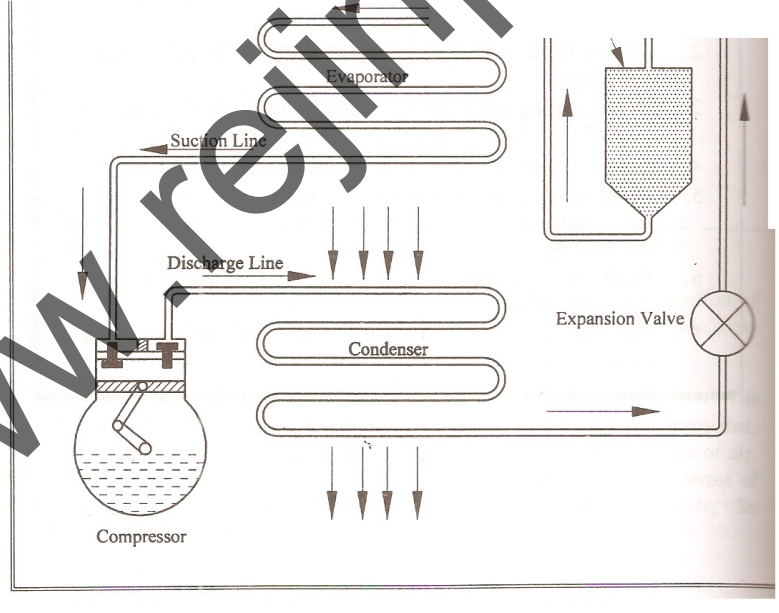
- Steel rule
- Mallet
- Scriber
- Divider
- Protractor
- Snips
- Stakes
- Ball peen hammer
- Solder

Procedure

1. The size of the given sheet is checked for its dimension using steel rule.
2. The required development of surface is being made on the white paper which is overlapped on the sheet metal.
3. The marking is done on the sheet metal as per the development being done on the paper.
4. Now using straight snips, unwanted material are removed.
5. Now fold and bend the workpiece to make the funnel shape and joint is made on the workpieces.
6. Then using a groove, a locked grooved joint is made for about 5mm. also; hemming is done in the bottom of the funnel.
7. In between top face and bottom face, a butt joint is made using a solder.
8. Finally, trimming and finishing operations are carried out.

Result

Thus desired funnel is made from the given sheet metal.



Ex.no: Studying the working principle of Air conditioner Date:

Aim

The study of the window type air conditioner by dismantling and assembling the parts sequentially.

Tools required

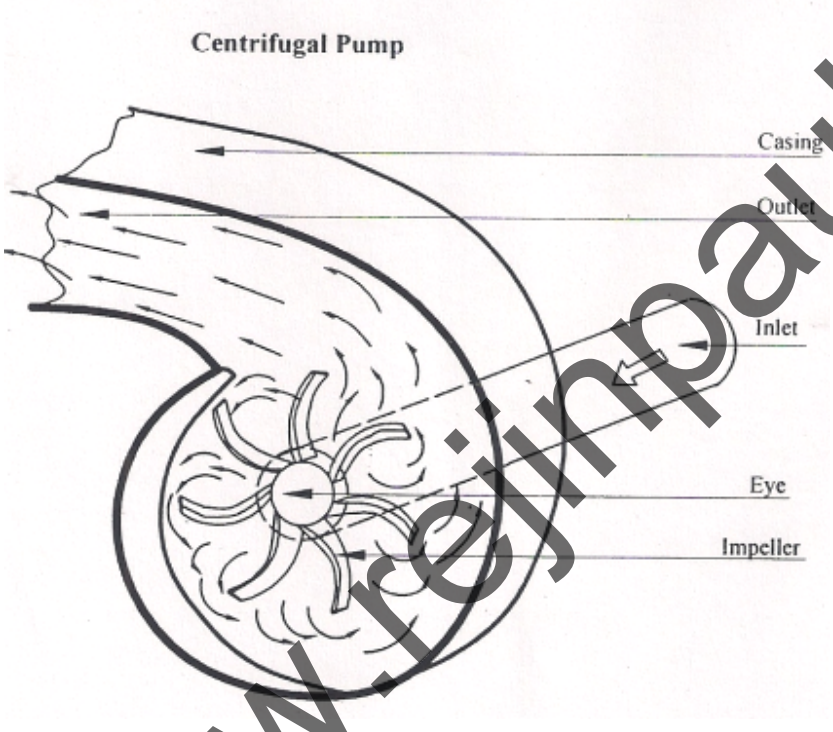
Spanner set

Procedure

1. Switch of the power supply and isolate the electrical connection from the system.
2. Remove the filter and grill from the system and place it on the work bench.
3. After checking and testing disconnect the circuit terminals from the operating control systems such as thermostat, relay, capacitor, motor, selector switch and compressor terminals.
4. Remove the evaporator and condenser cover and dismantle the condenser and blower fan from the motor from the motor shaft by the help of Allen key.
5. Remove the motor plates, clamps and clean the evaporator Condenser etc., with help of brush and air blower.
6. Check the electrical parts and repair it if necessary.
7. Clean the motor and fix the fan and blower assembly properly to the motor.
8. Connect the electrical parts as per the circuit noted before and assemble all the parts.
9. Clean the outer cover of the Air conditioner and place it on the proper place.
10. Fix the grill& filter, and test the functioning of the air conditioner.

Result

Thus the air conditioner is studied by dismantling and assembling the parts sequentially.



Ex.no: **Date:**

STUDYING THE WORKING PRINCIPLE OF CENTRIFUGAL PUMP

Aim

To study the centrifugal pump by dismantling and assembling the parts sequentially.

Tools Required

1. Die spanner set 2.Box spanner set
3. Bearing puller 4.Sledge hammer
5. Ball peen hammer 6.Tongs

Procedure

1. Remove the motor from the base plate by removing the pulley bolt and nut.
2. Remove the ump from base plate by unscrewing the base plate nut.
3. Remove the pulley by striking it with the hammer & dismantle the stuffing box flange.
4. Remove the outer cover of the vane by unscrewing the fasteners as well as the cotter pin.
5. Remove the vane mounted shaft by striking the shaft on the pulley side.
6. Remove the vane from the shaft by unscrewing the brass lock nut.
7. Remove the ball bearing from the bearing seat.
8. Clean all the removed parts.
9. Check the warned parts and replace it with new one.
10. Assemble the parts as per the above sequence in reverse direction.

Result

Thus the centrifugal pump is studied by dismantling and assembling the parts sequentially.