Course Code	20MC21P	**Semester**	II
Course Title	**MECHANICAL WORKSHOP PRACTICE-I**	**Course Group**	Core
No. of Credits	4	**Type of Course**	Lecture& Practice
Course Category	PC	**Total Contact Hours**	6 Hrs Per Week
			78 Hrs Per Semester
Prerequisites	Drawing/Creativity	**Teaching Scheme**	(L: T:P)-1:0:2
CIE Marks	60	**SEE Marks**	40

1. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identifiedcompetency through various teaching learning experiences

Perform Repairing Work of Utility Jobs in the Mechanical Engineering Workshops

CO1	Select hand tools and Machinery in different shops according to job
CO2	Understand job drawing and complete jobs as per specifications in allotted time.
CO3	Inspect the job for the desired quality and dimensions and position
CO4	Operate, control different machines and equipment's adopting safety practices.

Introduction to Fitter shop, carpentry shop and welding shop

- Elementary First Aid.

- What is basic 1st aid?
- First aid refers to **medical attention that is usually administered immediately after the injury occurs and at the location where it occurred**. It often consists of a one-time, short-term treatment and requires little technology or training to administer.

5 Types of Basic First Aid

- Cardiopulmonary Resuscitation. Those trained in cardiopulmonary resuscitation (CPR) can help a victim of cardiac arrest to start breathing again. ...
- Bleeding. It's important to stop a wound from bleeding to prevent the loss of too much blood. ...
- Burns. ...
- Choking. ...
- Broken Bones.

the Golden Rules of First Aid: Essential Knowledge for Every Individual

- Personal safety comes first.
- Assess the situation and victim.
- Call for help.
- Control bleeding.
- Treat for shock.
- Be mindful of head and spinal injuries.
- Attend to burns.

Workshop safety

Look around your workshop

- Is the work area as free from hazards as possible?
- Is the area equipped to handle emergency situations; for example, with fire extinguishers, properly equipped first aid kits?
- Is the workshop managed to keep it safe?
- Are tools and equipment properly guarded?
- Do workers use tools and equipment in a safe manner?
- Do workers use appropriate personal protective equipment?

Safety precautions

- Read the operator’s manual and observe all safety precautions for all equipment.
- Protect yourself from electric shock. Check power tools before use. Fit a residual current device (RCD or safety switch) to the electrical circuit to prevent electrical shock or electrocution. If an RCD is not fitted, use a portable RCD.
- Keep all guards and shields in place.
- Give the task your full attention.
- Let each tool work at its own speed; do not force it.
- Always wear appropriate personal protective clothing.
- Maintain secure footing and balance at all times.
- Keep tools clean and sharp.

- Turn the switch off immediately if the power tool stalls or jams.
- Wherever possible, use clamps or a vice to hold your work.
- Provide enough light so you can see what you are doing.
- Store power tools safely to prevent damage to the tool and cord, and to prevent unauthorised use.
- Maintain power tools in good working order. Replace or repair worn or faulty equipment

Hand tools

The main causes of injury with hand tools include:

- using the wrong tool
- using a tool in poor condition
- using a tool the wrong way
- keeping tools in unsafe places.

So prevent injury by following these safe practices when using tools.

- Use tools of an appropriate size and shape for the job.
- Wipe oil, grease and dirt from tools with a clean rag before starting a job.
- Clean tools and keep in trays or boxes when not in use.
- Shut off machines before adjusting them.
- Wear safety glasses when using punches, chisels, hammers or grinding devices.
- Use safety equipment when removing and installing heavy parts.
- Hold safety meetings to teach workers about the care and safe use of tools.
- Keep a first aid kit and a doctor's name, address and phone number handy for emergencies.
- Don't use homemade or re-worked tools, or tools not designed for the job.
- Don't use pipe extensions or other 'cheaters' or wrenches too light for the job.
- Don't place tools where they can fall and strike someone.
- Don't carry pointed or sharp tools in your pockets.
- Don't throw tools — hand them. Use a rope or cord to raise or lower tools and equipment

Wrenches

- Always pull on a wrench, never push.
- Always face wrench jaw openings in direction of pull.
- When pulling on a wrench, brace against a backward fall by placing one foot behind the other.
- Inspect ratchet wrenches periodically and replace worn or defective parts.
- Keep moving parts of adjustable wrenches clean and lubricated.
- Don't try to work with a wrench in a cocked position.
- Use angle connections so that the wrench will fit flat and square on the nut or bolt head.
- Don't use wrenches with spread-out jaw openings or sockets with battered or rounded walls.
- Don't use a wrench as a hammer.
- Don't pound on a wrench to loosen a frozen nut; use penetrating oil, a heavier wrench or one designed for impact work.

Screwdrivers

- Use the right length screwdriver so that it can be applied at right angles to the screw head.
- Use the largest-sized screwdriver that will fit snugly into the screw slot.
- Use a screwdriver with an insulated handle for electrical work.
- Don't use a screwdriver with a worn or broken tip.
- Don't use a screwdriver as a punch, chisel or pry-bar.
- Don't hold a small part in your hand while working on it with a screwdriver — put it into a vice.

Pliers

- Point the inside of plier cutting jaws away from your face to prevent injury from flying cuttings.
- Don’t use pliers with smoothly worn gripping sections or with loose rivets or nut and bolt assemblies.
- Don’t use pliers for bolt turning — they are designed for gripping and cutting only.
- Don’t overload cutting pliers. If wire can’t be cut with one hand squeezing pliers, use a larger pair of pliers.
- Check the insulation on pliers — a pin hole can be fatal.

Chisels and punches

- Use a chisel with a cutting edge of the same width or wider than the area to be cut.
- Use the largest punch to fit the job without binding.
- Hold chisels and punches loosely with the palm up, or use a tool holder.
- Don’t use chisels and punches with ‘mushroomed’ heads — metal may chip off and cause injury.
- Don’t use a chisel, punch or pry bar to remove gears, wheels or bearings from a shaft — use a pulling tool.

Hammers

- Use a hammer heavy enough for the job.
- Don’t use a hammer with a cracked head or handle.
- Don’t use a hammer with a ‘mushroomed’ or battered and rounded striking face.
- When spalling rock with a heavy hammer, wear eye protection.

Files Fit the sharp end with a handle.

- Place small objects in a vice for filing.
- Don’t hit a file with a hammer.
- Don’t use a file to pry, chisel or punch.

Electric/pneumatic tools

- Frequently inspect the condition of switches, control valves, electric cord and hose connections. Store electric cords loosely coiled in a clean, dry place.
- Always use a portable residual current device (RCD or safety switch) where a fixed RCD is not available.
- Keep electric tools away from oil, hot surfaces and chemicals.
- Ground electric tools to prevent possible electric shock.
- Don’t patch damaged cords — shorten or replace them.
- Don’t hang a cord over a nail or sharp edge or allow it to kink.
- Don’t leave a cord where it can be run over or damaged.
- Don’t use electrical tools in wet areas or where flammable gases or vapours are present

Importance of carpentry

Carpenters **build frameworks and structures by cutting and shaping wood and other construction materials**. One of construction's most iconic roles, carpenters are involved throughout the building process, from basic layout to the finishing touches on a home, school or office

Carpenters **prepare timber components for construction, installing them on roofs, walls, floors or other timber-framed structures**. They construct skirting boards, doors, architraves and other household additions. Carpenters may perform work that involves preparing shuttering, stairs, installing doors or window frames

What is the importance of carpentry trade in engineering?
Carpentry is a skilled trade that involves cutting, shaping, and installing wooden materials for various applications. In engineering, carpentry has several applications, including: **Structural framing**: Carpenters are responsible for constructing the framing system of buildings, which includes walls, floors, and roofs

Engineering plays a significant role in carpentry in several ways. For example, engineers are involved in designing and creating the tools and machinery used in carpentry, such as saws, drills, and sanders. They also contribute to the development of new construction materials and techniques, as well as the design and structural integrity of buildings and furniture. Additionally, engineers may be involved in the planning and design of carpentry projects, ensuring that they meet safety, structural, and environmental standards. Overall, engineering and carpentry are closely intertwined, with engineering principles and expertise contributing to the advancement and innovation within the field of carpentry.

Carpentry operations; -

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 T- joints, bridle joints, etc.

What are the 6 carpentry processes?
perform all carpentry operations such as **marking, planing, cutting, chiseling, and finishing**, make various types of joints, and make different types of wooden patterns used for foundrylmoulding. Timber is the name given to the wood obtained from well grown trees.

What is carpentry operation sequence?
SEQUENCE OF OPERATIONS: **Planing, cutting, marking, sawing, chiseling, joining**.

What are applications of carpentry?
Applications of Carpentry

Building wooden furniture. Constructing wooden cabinets. Installing wooden flooring. Framing walls and roofs

Types of Carpentry Tools and their Uses

The different types of carpentry tools, including:

- Mortise gauge
- Holding tools
- Measuring tools
- Cutting tools
- Boring tool
- Planing tool
- Striking tool
- Miscellaneous Tools

Marking tool:

marking Gauge:

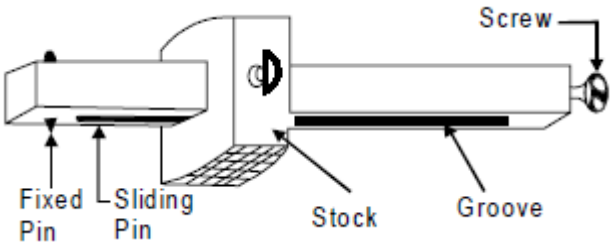


Fig 1: Marking Gauge

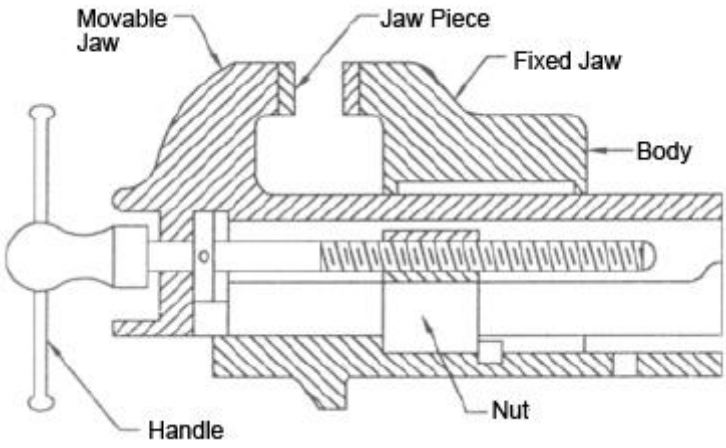
As depicted in the figure provided, the mortise gauge is an essential tool in carpentry. It is primarily employed for marking lines parallel to the edge of a wooden workpiece. This tool consists of a square wooden stem with a sliding wooden stock. The stem is equipped with a steel marking pin for scratching the wood surface, and it has two adjustable pins that determine the distance between parallel lines on the stock. Mortise gauges play a crucial role in ensuring precise and uniform woodworking.

holding Tools:

Within carpentry, holding tools are indispensable for securing workpieces during various tasks. There are several types of holding tools, including:

Holding devices;

1. Bench Vice:



Bench Vice

A bench vice is a dependable device used to grip workpieces firmly. It features one fixed jaw attached to the workbench and one movable jaw controlled by a screw and handle, making it versatile for clamping various sizes and shapes of wood.

. Bar Clamp:

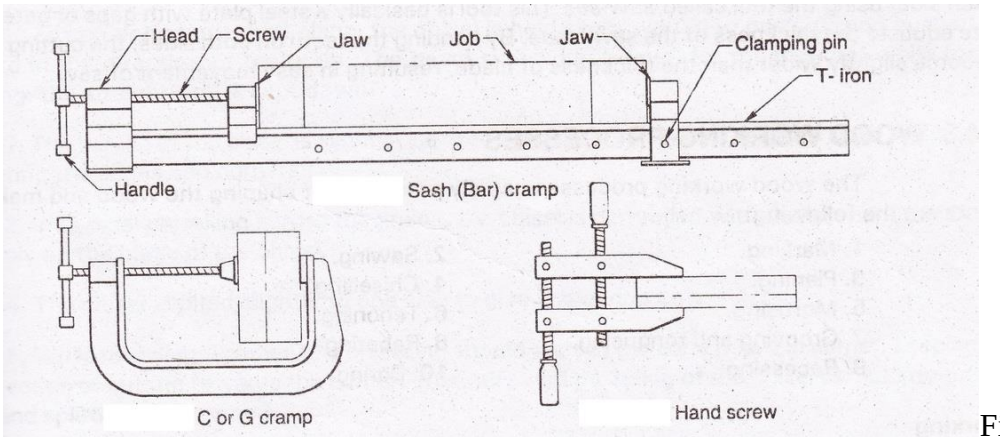


Fig 3: Bar Clamp

Bar clamps are versatile tools with two jaws, one fixed and one movable. They are used to secure workpieces and are especially useful for projects requiring a strong, even hold. Bar clamps offer efficiency and reliability in woodworking.

3. C-Clamp or G-Clamp:

C-clamps, also known as G-clamps, are crafted from durable materials such as malleable iron with high-quality acme threads. These clamps are vital for clamping smaller workpieces when drilling or using chisels, ensuring stability and safety during precision tasks.

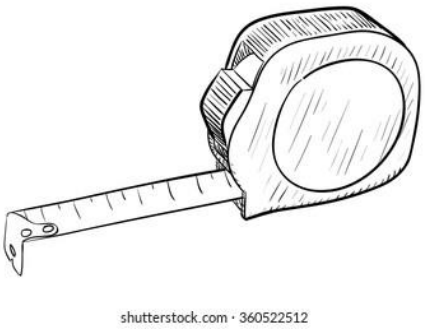
Measuring Tools:

Accurate measurement is a fundamental aspect of carpentry, and the following measuring tools are commonly employed:

Measuring devicesl

1. Steel Tapes and Steel Rules:

Fig 5: Steel Tapes and Steel Rules



Steel tapes and rules are vital for measuring short and long lengths in millimetres, centimetres, and inches, providing the precision necessary for crafting woodwork.

. Try Square:

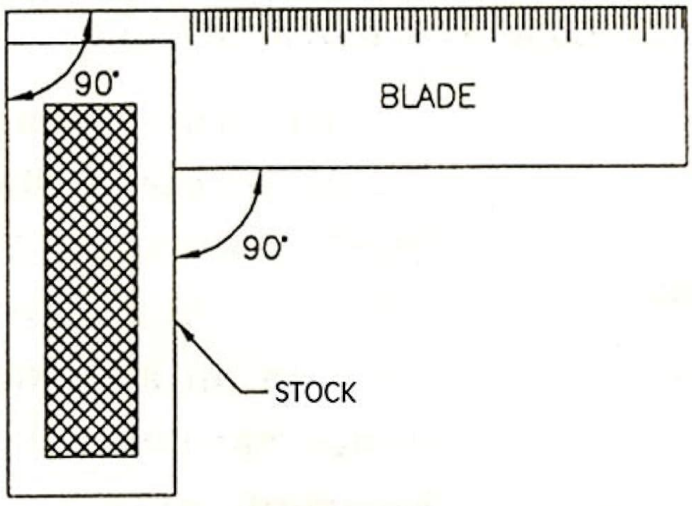
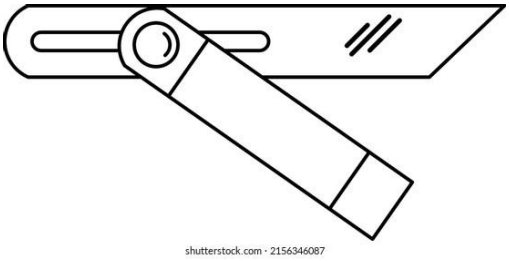


Fig 6: Try Square

Try squares are used to inspect squareness and mark joints accurately, contributing to the overall quality of carpentry projects.

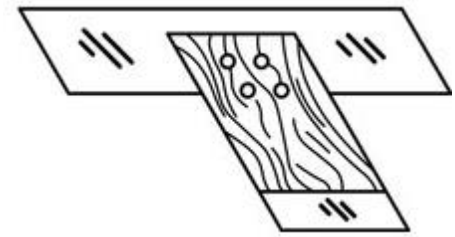
3. Bevel Square :



Bevel Square

Bevel squares are designed to mark and measure angles from 0 to 180 degrees. Their rotating blade allows for versatile angle adjustments, making them invaluable for various angle-related tasks.

4. Miter Square:



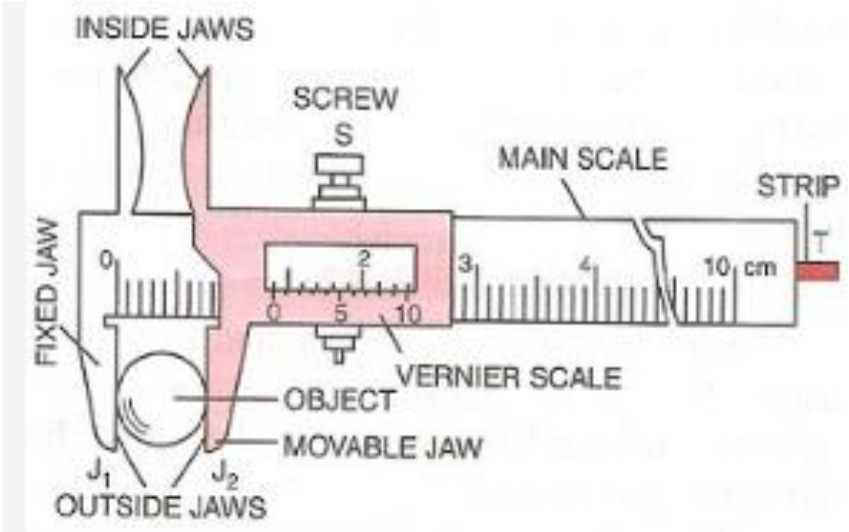
Miter Square

Miter squares are essential for marking and checking angles other than 90 degrees, aiding carpenters in achieving precise and customised angles for their woodworking projects.

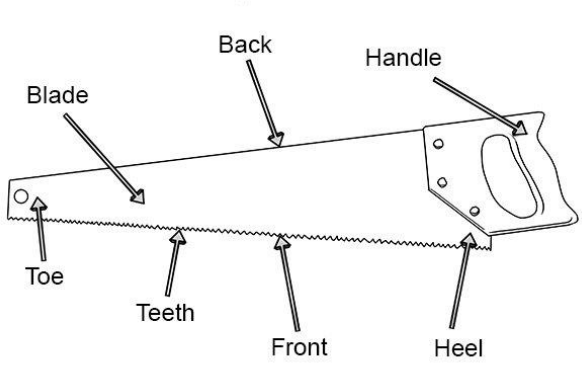
5. Calipers:

Fig 9: Calipers

Callipers are employed for highly precise measurements, particularly for cylindrical surfaces. They are used to measure both the inner and outer diameters of cylindrical objects, ensuring accuracy in carpentry projects.



Cutting Tools:



Carpentry relies heavily on cutting tools, and two significant categories of cutting tools are saws and chisels.

Saws:

Hand Saws

Saws come in various types tailored to specific purposes. The three primary types of saws used in carpentry are:

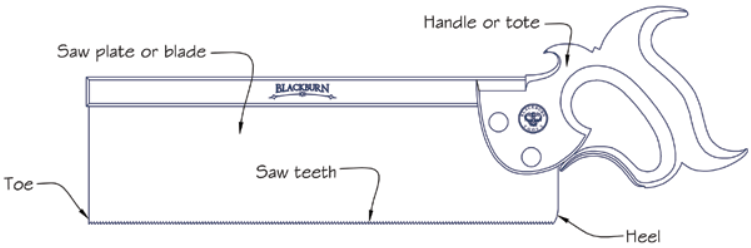
1. Rip Saw:

Rip saws have teeth that make a steeper angle of about 60 degrees, ideal for cutting wood along the grain.

2. Cross Cut Saw:

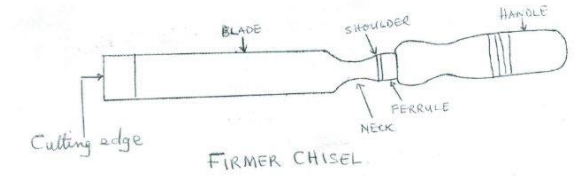
Cross cut saws are designed for cutting across the grain, with teeth allowing for smooth, efficient cutting at a 45-degree angle.

3. Tenon or Back Saw:



Tenon saws, renowned for their precision, feature fine blades reinforced with steel backs and are used for accurate carpentry work.

Chisels:



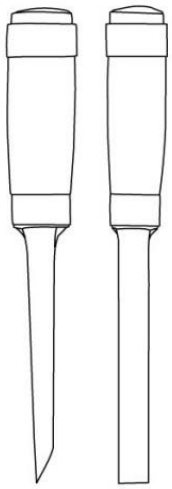


Fig 11: Chisels

Chisels are crucial for precise wood cutting and shaping. They come in various blade widths, with specific chisels for distinct tasks. Notable types include mortise chisels, firmer chisels, and bevel chisels, each serving unique functions in carpentry.

Mortise chisel : - it is used to cut and create the grooves normally half or quarter inch in the wood

Boring Tools:

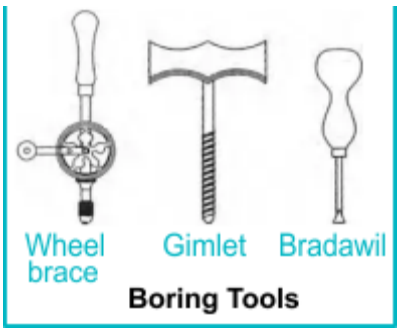
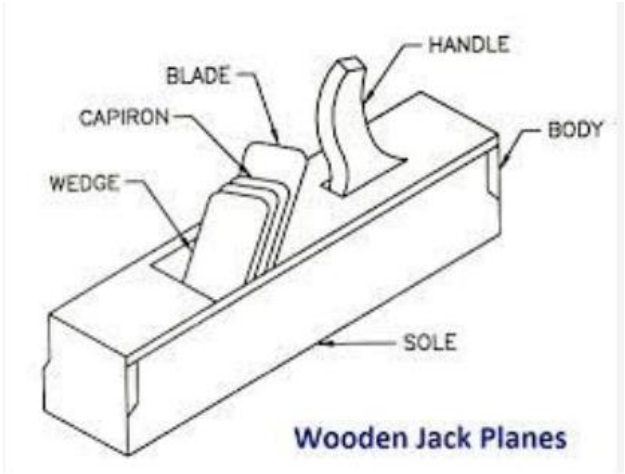


Fig 12: Boring Tools

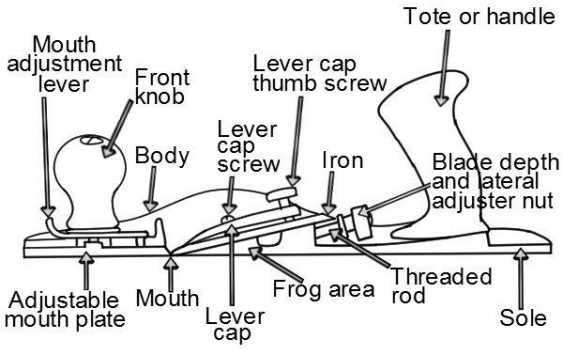
Boring tools are employed to create holes in woodwork. Various types of boring tools facilitate tasks like drilling and creating holes for screws, dowels, and other fasteners.

Planing Tools:

Fig 13: Planing Tools



Planes are indispensable for shaping and flattening wood surfaces, with jack planes and smooth planes serving specific roles in the carpentry process. Jack planes are suitable for general planing, while smooth planes provide a polished finish.



Striking Tools:

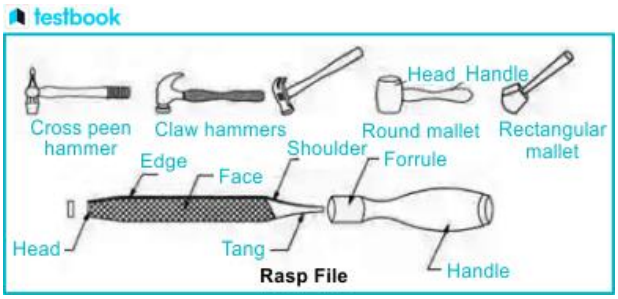


Fig 14: Striking Tools

Striking tools, including hammers, mallets, and rasp files, are essential for shaping and finishing wood surfaces. Each tool has a unique function, from positioning nails with a cross-peen hammer to delicately driving chisels with a mallet.

Miscellaneous Tools:

Miscellaneous Tools

Additional tools in carpentry include spirit levels for checking surface levels, pincers for nail removal, and specialised screwdrivers for wood screws. These tools contribute to the precision and quality of carpentry work.

Applications of Carpentry

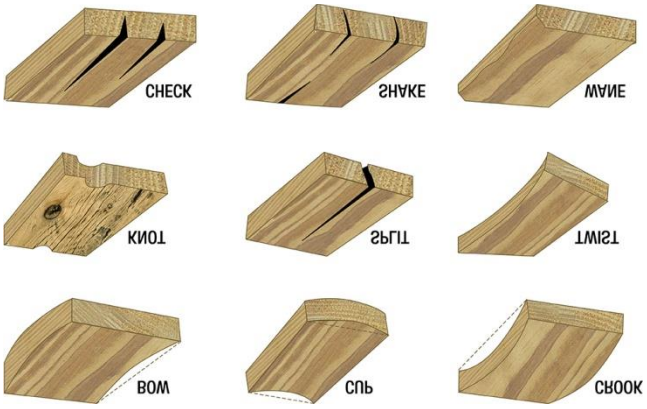
The various applications of Carpentry are:

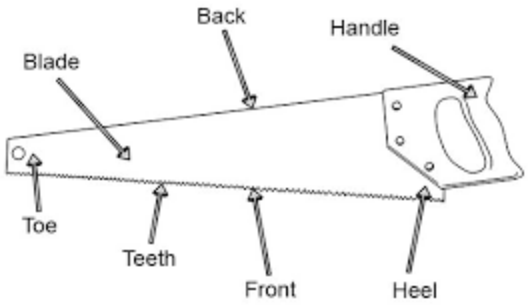
- Building wooden furniture.
- Constructing wooden cabinets.
- Installing wooden flooring.
- Framing walls and roofs.
- Creating custom woodwork designs.
- Crafting wooden doors and windows.
- Repairing and restoring wooden structures.
- Building outdoor decks and fences.
- Crafting wooden sculptures and artwork.
- Making wooden toys and crafts.

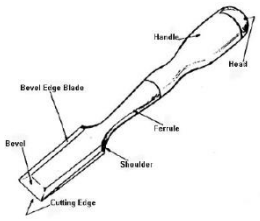
Trees yielding the timber in india

1. Teak
2. Matthi
3. Sal
4. Arikere
5. Nandi
6. Jack fruit
7. Mango
8. Neem
9. Arkaliform
10. Jungle wood
11. Mahogany
12. Rosewood

Types of Timber Defects Caused by Natural Forces. A large number of timber defects might occur due to natural forces, including **wind cracks, shakes, upsets, burls, chemical stains, twisted fibers, water stains, knots** and more

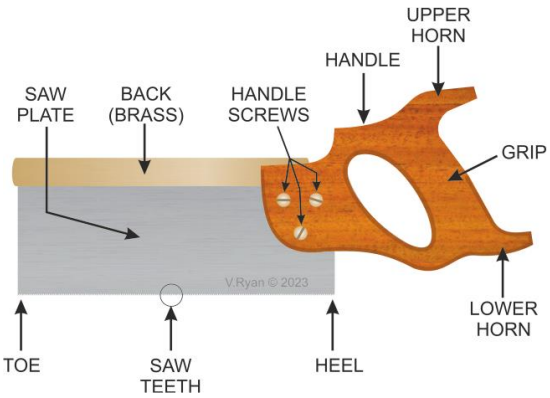






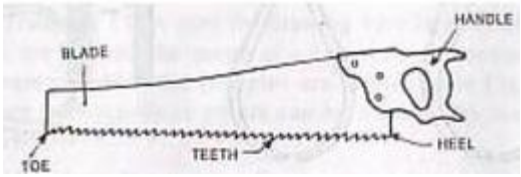
There are many different types of saw, but most have the same basic parts. These include the handle, heel, front, back, teeth, blade and toe. Read our full guide to the parts of a saw below along with what each part does.

Tennon saw



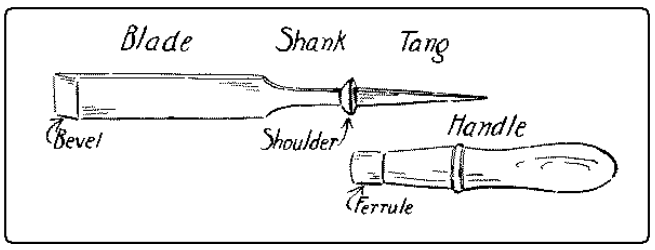
Firmer chisel

Rip saw



- Paring- using the chisel to remove thin strips of wood without applying the mallet.
- Chopping- striking the chisel with a mallet or hammer to remove chunks of wood.

mortise chisel



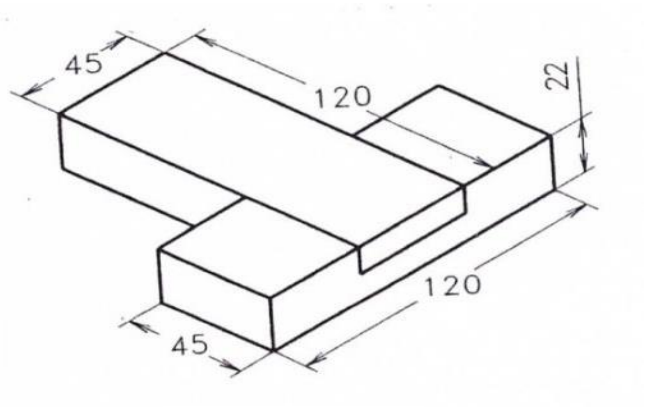
Practice session -1 – **TEE HALVED JOINT**

Aim: - To prepare the Tee halved joint as per the dimensions and join

Material required: two pieces of dimension 120 X 45 X 22

Operations performed; -

1. Measuring
2. Cutting off
3. Plaining
4. Marking
5. Sawing
6. Chiselling
7. Fitting and finishing



Tee halved joint

Tools required: -

1. Steel rule
2. Measuring tape
3. Iron jack plane
4. Try square
5. Hand saw
6. Firmer chisel

Procedure: -

two pieces of dimensions 120 X 45 X 22 MM are cut with the help of hand saw from a lengthy reaper. They are marked for the cutting as per dimension using hand saw for half the depth. Later with the help of firmer chisel the portion (half the height) is cut and removed on the male part.

Later the female part is measured with the help of steel rule and marked with the help of try square to create the slot in the middle for the recess of 45mm

Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished.

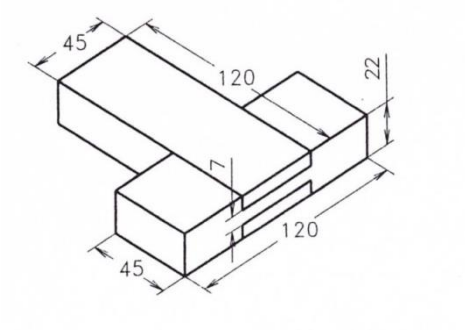
Practice session -2 – BIRDLE JOINT

Aim: - To prepare the birdle joint as per the dimensions and join

Material required: two pieces of dimension 120 X 45 X 22

Operations performed; -

1.Measuring
2. Cutting off
3.Planing
4.Marking
5.Sawing
6.Chiselling
7.Fitting and finishing



Tools required: -

1.Steel rule

2.Measuring tape
3.Iron jack plane
4.Trysquare
5.Hand saw
6.Firmer chisel

Procedure: -

two pieces of dimensions 120 X 45 X 22 MM are cut with the help of hand saw from a lengthy reaper. They are marked for the cutting as per dimension using hand saw for depth OF 45MM . Later with the help of firmer chisel the portion is cut and removed on the male part.

Later the female part is measured with the help of steel rule and marked with the help of try squre to create the slot in the middle for the recess of 45mm with 7mm thickness

Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished.

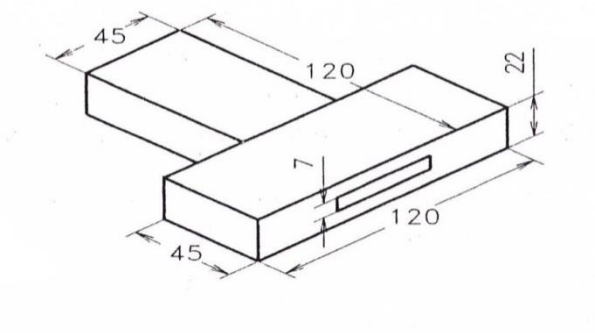
Practice session -3 TENON JOINT

Aim: - To prepare the Tenon joint as per the dimensions and join

Material required: two pieces of dimension 120 X 45 X 22

Operations performed; -

1.Measuring
2. Cutting off
3.Planing
4.Marking
5.Sawing
6.Chiselling
7.Fitting and finishing



Tools required: -

1.Steel rule

2.Measuring tape
3.Iron jack plane
4.Trysquare
5.Hand saw
6.Firmer chisel

Procedure: -

two pieces of dimensions 120 X 45 X 22 MM are cut with the help of hand saw from a lengthy reaper. They are marked for the cutting as per dimension using hand saw for depth OF 45MM . Later with the help of firmer chisel the portion is cut and removed on the male part.

Later the female part is measured with the help of steel rule and marked with the help of try squre to create the slot in the middle for the recess of 45mm with 7mm thickness

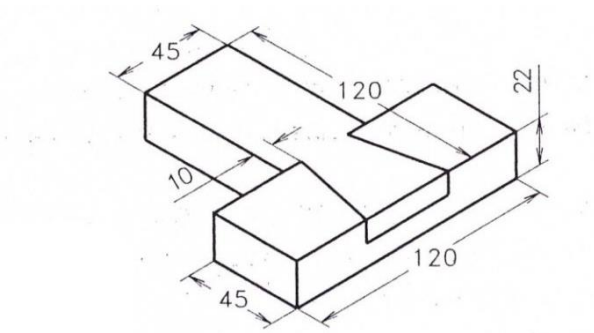
Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished.

Practice session -4. **DOVE TAIL HALVED JOINT**

Aim: - To prepare the DOVE TAIL JALVED joint as per the dimensions and join

Material required: two pieces of dimension 120 X 45 X 22

Operations performed; -



1.Measuring
2. Cutting off
3.Planing
4.Marking
5.Sawing
6.Chiselling
7.Fitting and finishing

Tools required: -

1.Steel rule

2.Measuring tape
3.Iron jack plane
4.Trysquare
5.Hand saw
6.Firmer chisel

Procedure: -

two pieces of dimensions 120 X 45 X 22 MM are cut with the help of hand saw from a lengthy reaper. They are marked for the cutting as per dimension using hand saw for depth OF 22 MM . Later with the help of firmer chisel the portion is cut and removed on the male part.

Later the female part is measured with the help of steel rule and marked with the help of try square to create the slot in the middle for the recess of 45mm with 7mm thickness

Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished.

Fitter shop

Shop fitting is **a skilled trade that involves the fitting out of retail and commercial spaces**. Shop fitters are professional tradespeople who specialized in planning, designing and installing spaces, such as shops, offices and other public areas.

The attention of a fitter is required at various stages of manufacture starting from marking to assembling and testing the finished goods. Working on components with hand tools and instruments, mostly on work benches is generally referred to as 'Fitting work'

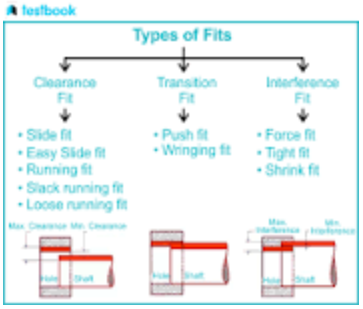
What are the five important fitting operations?
Fitting Shop: Fitting Shop involves a large number of hand operations to finish the work to desired shape, size and accuracy. The various operations performed are **marking, chipping, sawing, filing, scraping, drilling, tap (Internal threading) and die (External threading)**.

What is the use of fitting?

A fitting or adapter is used in pipe systems to connect sections of pipe (designated by nominal size, with greater tolerances of variance) or tube (designated by actual size, with lower tolerance for variance), adapt to different sizes or shapes, and for other purposes such as regulating (or measuring) fluid flow.

What are the procedures in fitting workshop?
The hand operations in fitting shop include **marking, filing, sawing, scraping, drilling, tapping, grinding**, etc.,using hand tools or power operated portable tools. Measuring and inspection of components and maintenance of equipment is also considered as important work of fitting shop technicians

What is fitting and its types?
There are different kinds of pipe fittings used in piping systems. The main and most commonly sought are: **elbows, tees, reducers, unions, couplings, crosses, caps, swage nipples, plugs, bushings, adapters, outlets, valves & flanges**.
What is fitting and types of fitting?



The three main types of fits are **Clearance Fit, Interference Fit, and Transition Fit**, each offering distinct advantages and applications. This article elaborates on the different types of fit

What are the 3 types of fits?
The Three Types Of Fit

- Clearance Fit. Clearance fits allow for loose mating, where free movement is important and a certain amount of play is desired. ...
- Interference Fit. An interference fit will be much tighter than a clearance fit. ...
- Transition Fit. A transition fit would fall between a clearance and interference fit

What are the tools required for fitting?

- FITTING TOOLS:

  All types of work require the use of large number of tools involving a number of operations such as **filing, chipping, scraping, sawing, tapping**, etc. to finish the work to the desired shape and size.

operations performed on fitting in workshop

Fitting Shop: Fitting Shop involves a large number of hand operations to finish the work to desired shape, size and accuracy. The various operations performed are **marking, chipping, sawing, filing, scraping, drilling, tap (Internal threading) and die (External threading)**.

Tools used in bench and fitting shop are classified as under.

1. Marking tools

2. Measuring devices

3. Measuring instruments

4. Supporting tools

5. Holding tools

6. Striking tools

7. Cutting tools

8. Tightening tools, and

9. Miscellaneous tools

The above mentioned tools are further classified and discussed as under.

1. Marking Tools

These are sub classified as steel rule, circumference rule, straight edge, flat steel square, scriber, semi-circular protractor, divider, trammel, prick punch, centre punch, try square, bevel square, vernier protractor, combination set and surface gauge.

2. Measuring Devices

Commonly used measuring devices and instruments used in bench and fitting shop are fillet and radius gauge, screw pitch gauge, surface plate, try square, dial gauge, feeler gauge, plate gauge and wire gauge.

3. Measuring Instruments

Line measuring and end measuring devices. While using line measuring device, the ends of a dimension being measured are aligned with the graduations of the scale from which the length is read directly such as scales or steel rules. Whereas, with end measuring device, the measurement is taken between two ends as in a micrometer, vernier calipers and gauge block, etc. End measuring devices are commonly used for measuring accurate and precision dimensions of components. Some measuring instruments are employed for measuring linear dimensions and others are suitable for determining angular or geometric dimensions.

Few measuring instruments are also kept for reference purposes as standards of comparison. The main measuring instruments are listed as under.

(i) Linear measurements

(A) Non-precision instruments

1. Steel rule
2. Calipers
3. Dividers
4. Telescopic gauge
5. Depth gauge

(B) Precision instruments

1. Micrometers
2. Vernier calipers
3. Vernier depth gauges
4. Vernier height gauges
5. Slip gauges

(C) Comparators

(D) Coordinate measuring machines

(ii) Angular measurements

(A) Non-precision instruments

1. Protector
2. Engineers square
3. Adjustable bevel
4. Combination set

(B) Precision instruments

1. Bevel protector
2. Angle gauges
3. Sine bar
4. Clinometers

5. Autocollimators

6. Sprit level

(iii) Surface measurement

1. Straight edge

2. Surface gauge

3. Surface table

4. Optical flat

5. Profilo-meter

4. Supporting Tools

These are vee-block, marking table, surface plate, and angle plate.

5. Holding Tools

These are vices and clamps. Various types of vices are used for different purposes. They include hand vice, bench vice, leg vice, pipe vice, and pin vice. The clamps are also of different types such as c or g clamp, plane slot, goose neck, double end finger, u-clamp, parallel jaw, and clamping block.

6. Strking Tools

These are various types of hammers such as ball peen hammer; straight peen hammer; cross-peen hammer; double face hammer; soft face hammer.

7. Cutting Tools

These involve various types of files, scrapers, chisels, drills, reamers, taps, snip or shear and hacksaws.

Files. There are different types of files such as flat, square, round, triangular, knife, pillar, needle and mill.

Scrapers. These are flat, hook, triangular, half round types.
Chisels. There are different types of chisels used in fitting work such as flat chisel, cross cut chisel, diamond point chisel, half round chisel, cow mouth chisel and side cutting chisel.

The other cutting tools are drills, reamers, taps, snips, hacksaws (hand hacksaw and power hacksaw) etc.

8. Tightening Tools

These are pliers and wrenches, which are sub classified as under.

Pliers. These are namely ordinary, needle nose, and special type.

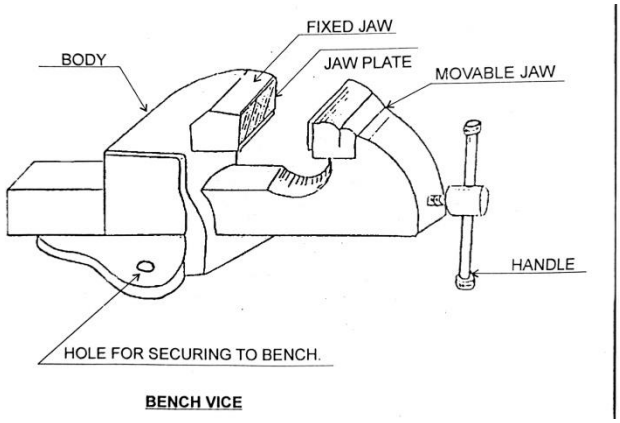
Wrench. These are open single ended, open double ended, closed ended adjustable, ring spanner, offset socket, t- socket, box wrench, pipe wrench and allen wrench.

9. Miscellaneous Tools

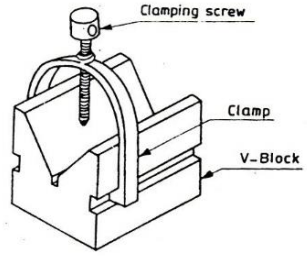
These are die, drifts, counter sink tools, counter boring tools, spot facing bit and drill press. Some of above mentioned important tools are discussed as under. Source A Textbook of Basic Manufacturing Processes and Workshop Technology by Rajender Singh.

1. Bench vice

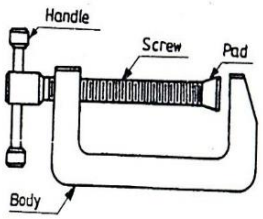
It is the maain holding or gripping deviice used to hold the job:-
the bench vice is a work holding device. It is the most commonly used vice in a fitting shop. The bench vice is shown in Figure 1.1.



BENCH VICE



2. V-block is rectangular or square block with a V-groove on one or both sides opposite to each other. The angle of the 'V' is usually 900. V-block with a clamp is used to hold cylindrical work securely, during layout of measurement, for measuring operations or for drilling for this the bar is faced longitudinally in the V-Groove and the screw of V-clamp is tightened. This grip the rod is firm with its axis parallel to the axis of the v-groove.



3 C-Clamp

This is used to hold work against an angle plate or v-block or any other surface, when gripping is required. Its fixed jaw is shaped like English alphabet 'C' and the movable jaw is round in shape and directly fitted to the threaded screw at the end .The working principle of this clamp is the same as that of the bench vice

1.3 MARKING AND MEASURING TOOLS

1.3.1 Surface plate

The surface plate is machined to fine limits and is used for testing the flatness of the work piece. It is also used for marking out small box and is more precious than the marking table. The degree of the finished depends upon whether it is designed for bench work in a fitting shop or for using in an inspection room; the surface plate is made of Cast Iron, hardened Steel or Granite stone. It is specified by length, width, height and grade. Handles are provided on two opposite sides, to carry it while shifting from one place to another.

Figure 1.4: Surface plate Figure 1.5: Angle plate

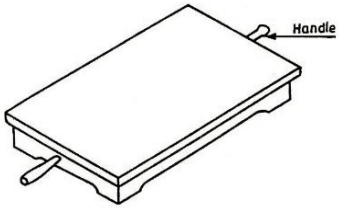


Figure 1.4: Surface plate

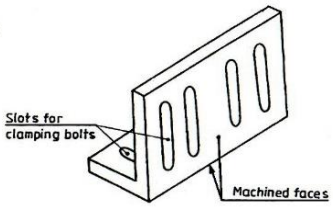


Figure 1.5: Angle plate

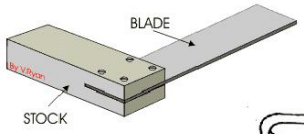


Figure 1.6: Try square

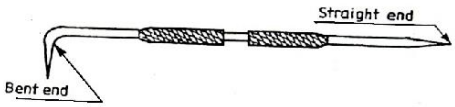


Figure 1.7: Scriber

1.3.2 Try square

It is measuring and marking tool for 900 angle .In practice, it is used for checking the squareness of many types of small works when extreme accuracy is not required .The blade of the Try square is made of hardened steel and the stock of cast Iron or steel. The size of the Try square is specified by the length of the blade.

1.3.3 Scribe r

A Scriber is a slender steel tool, used to scribe or mark lines on metal work pieces. It is made of hardened and tempered High Carbon Steel. The Tip of the scriber is generally ground at 12oto 15o . It is generally available in lengths, ranging from 125mm to 250mm .It has two pointed ends the bent end is used for marking lines where the straight end cannot reach.

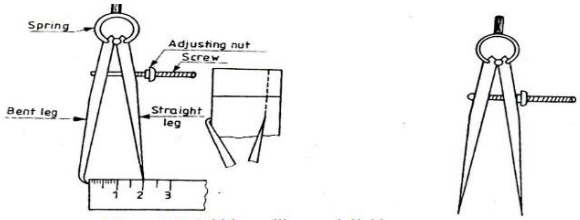
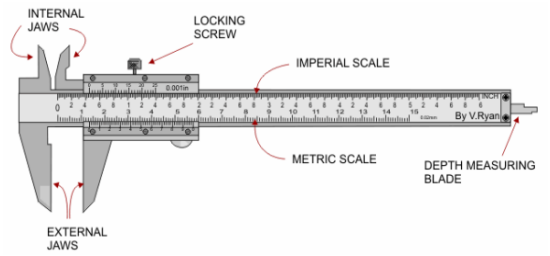


Figure 1.8: Odd leg calliper and divider

1.3.5 Divide r

It is basically similar to the calipers except that its legs are kept straight and pointed at the measuring edge. This is used for marking circles, arcs laying out perpendicular lines, by setting lines. It is made of case hardened mild steel or hardened and tempered low carbon steel. Its size is specified by the length of the leg

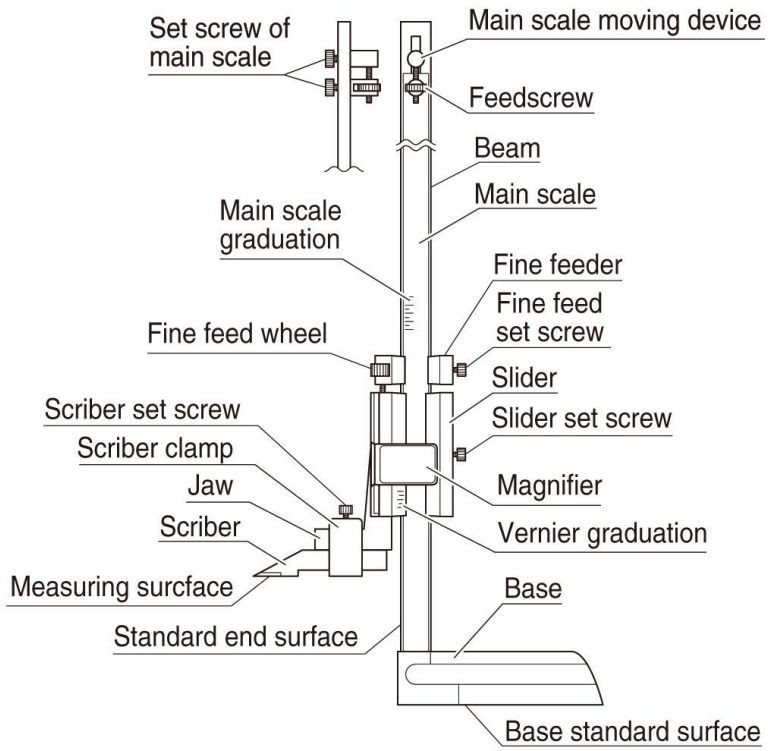
1.3.9 Vernier Calipers



These are used for measuring outside as well as inside dimensions accurately. It may also be

used as a depth gauge. It has two jaws. One jaw is formed at one end of its main scale and the

other jawis made part of a vernier scale.



Vernier height gauges are **used in metrology and metalworking to detect or measure vertical distances**. The height gauges are often used to measure a granite surface or scribe part features from a datum plane. To detect the measured feature, a scriber, test indication, touch probe, or CMM-style probe is often utilized.

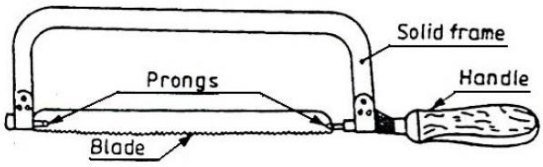
The calculations are as below

Total reading =main scale reading + (co-insiding vernier scale division X least count)

TR = MSR +(CVSD X LC)

4 CUTTING TOOLS

1 Hack Saw



The Hack Saw is used for cutting metal by hand. It consists of a frame, which holds a thin blade,

firmly in position. Hacksaw blade is specified by the number of teeth for centimeter. Hacksaw

blades have a number of teeth ranging from 5 to 15 per centimeter (cm). Blades having lesser

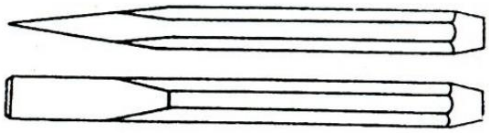
number of teeth per cm are used for cutting soft materials like aluminum, brass and bronze.

Blades having larger number of teeth per centimeter are used for cutting hard materials like steel

and cast Iron. Hacksaw blades are classified as (i) All hard and (ii) flexible type.

WORKSHOP PRACTICE (Fitting Shop)

.2 Chisels



Chisels are used for removing surplus metal or for cutting thin sheets. These tools are made

from 0.9% to 1.0% carbon steel of octagonal or hexagonal section. Chisels are annealed,

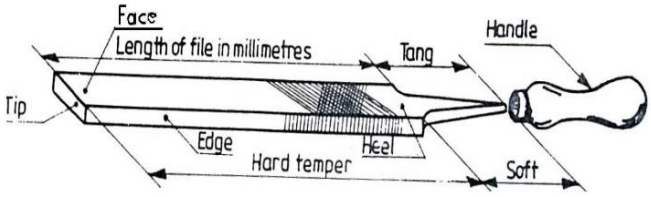
hardened and tempered to produce a tough shank and hard cutting

edge. Annealing relieves the

internal stresses in a metal. The cutting angle of the chisel for general purpose is about 60°.

1.5.2 Files

Filing is one of the methods of removing small amounts of



material from the surface of a metal

part. A file is hardened steel too, having small parallel rows of cutting edges or teeth on its

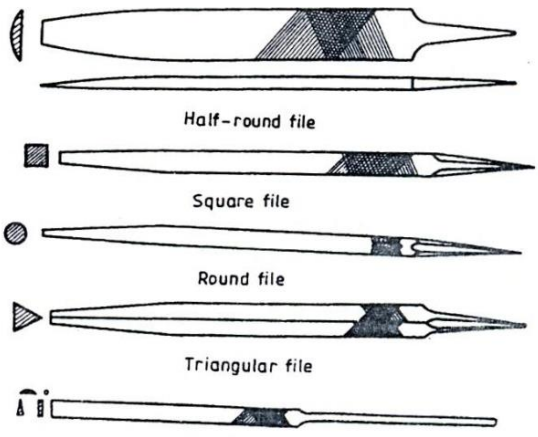


Figure 1.23: Types of file

surfaces. On the faces, the teeth are usually diagonal to the edge. One end of the file is shaped to fit into a

wooden handle. The figure shows various parts of a hand file. The hand file is parallel in width

and tapering slightly in thickness, towards the tip. It is provided with double cut teeth. On the

faces, single cut on one edge and no teeth on the other edge, which is known as a safe edge.

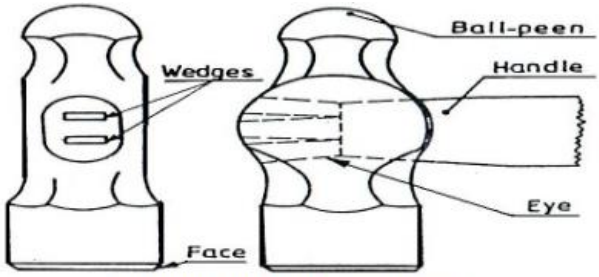


Figure 1.25: Ball peen hammer

1.6.2 Ball- Peen Hammer Ball- Peen Hammers are named, depending upon their shape and material and specified by their

weight. A ball peen hammer has a flat face which is used for general work and a ball end,

particularly used for riveting.

20 most important safety rules in the workplace

Here are examples of safety rules in a workplace:

1. Follow the dress code

It is important to dress according to the workplace dress code. This may prohibit jewelry or open-toe shoes, for example. Often a workplace may require employees to wear specific footwear and long sleeves and pants in order to protect against common workplace accidents. Dress codes can promote professionalism and also help keep employees safe.

Related: How To Ask About Dress Code (With Tips for Your First Day)

2. Wear safety gear

Safety gear is necessary in labs, around machinery and on construction sites, for example. Companies include safety gear in the dress code when it is necessary for your job. Safety gear is a precaution against hazardous materials and potentially dangerous working conditions.

Related: Protective Gear for Construction Workers (With Examples)

3. Maintain personal hygiene

Maintain your personal hygiene, such as cleanliness, to help prevent illness at work. Good hygiene can also help promote health and self-esteem, which reduces risks.

4. Take responsibility for your personal safety

To take responsibility for your personal safety means ensuring that you follow safety procedures. If employees rely on themselves to keep the workplace safe, this can create a safe environment for all. Responsibility also prevents negligence, which can limit on-the-job accidents.

5. Maintain a clean workspace

It is important to keep your desk or other personal workspaces clean. Be sure to put away supplies when they are not in use. Gathering necessary materials before starting a task can help keep a clean workspace. Maintaining your work area promotes organization and attentiveness, both aspects of promoting safety in the workplace.

6. Follow work procedures

to help comply with safety protocols and best practices, so if you follow work procedures, safety standards are likely met. It is important to follow procedures even if you think performing a task differently might save time. Often there'll be an employee handbook or safety station where the company provides their work procedures.

7. Learn how to act in an emergency

Learn emergency protocols including where to go in case of a fire or during a natural disaster such as a tornado. Much like work procedures, companies design emergency protocols with strong consideration for safety regulations. Knowing where to go or how to behave during an emergency protects you as well as your coworkers.

8. Report accidents if they occur

Report accidents to the managers or other personnel when they occur. If you injure yourself or cause an accident, be sure to report it and follow procedure immediately to help reduce the risks of further harm or endangering coworkers. This helps to get proper treatment for your injury and addresses the possible causes of the incident to prevent it from happening again. It is important to follow company policy and report even minor incidents. Your employer may require a written report of the incident as well.

9. Report unsafe conditions

If you observe an unsafe practice or condition such as faulty equipment, it is helpful to report this so that personnel can address the situation and make corrections to prevent an incident. Unsafe conditions pose a threat to your coworkers and to you, so reporting a potentially dangerous situation is in the best interest of all employees. Consider marking any unsafe condition to protect others who may encounter it while you go to report it.

10. Lift objects carefully

Professionals advise lifting by squatting and using your knees when picking items up instead of bending at your waist because this can cause strain on your back and may result in injury. Use equipment if necessary or ask for help in lifting heavy items. Back pain is a common workplace injury that you can avoid with proper posture and using caution in actions that you often repeat at work, such as carrying materials.

11. Operate machinery that you are familiar with

Only operate machinery that employers authorize you to use. Some types of workplace equipment, such as forklifts, require training. Training can prevent misuse and provide proper safety knowledge and skill for machines. It is important to become familiar with all equipment that is in regular use at work.

12. Use break times

Taking breaks can maximize employee attentiveness because they are well-rested. Breaks provide other benefits, such as time to relax and reduce stress. During breaks, you may need to sit or stretch to maintain personal safety and prevent muscle injury.

13. Stay in your work zone

While working, try to stay in your designated work area. This allows you to be familiar with your surroundings and increases the likelihood that you understand the rules of conduct in the area. If you visit

another working area, try to find a professional who can help you navigate the area so you are confident in your surroundings.

14. Stay alert and attentive

Being alert and attentive to your surroundings in a work environment helps identify risks. It is important to limit distractions as well and ensure you focus on tasks at work. Taking care to be mentally present while working helps you actively follow procedures and practice caution.

15. Keep exits clear

Try to keep walkways clear and take care not to block exits. This prevents falls and helps people leave the room or building safely and quickly in the event of an emergency. In small spaces keeping walkways clear can be difficult but it may be useful to practice a walk-through to ensure that employees can maneuver safely around equipment.

16. Ask for help

If you require assistance, ask for help. This greatly reduces the risk of having an accident and helps foster a safe work environment by setting an example. Refer to company protocol when performing tasks or operating equipment, and if protocol suggests doing a task with another employee, do not attempt the task alone.

17. Use caution signs

Use caution signs when applicable. For example, wet floor signs prevent slips on a floor after you mop or after a spill. Areas at work may require barriers or signs when equipment such as forklifts are in use. Another example is road signs to notify drivers of workers or highway cleanup crews. It is important to place caution signs while working and read and obey caution signs placed by others.

18. Use proper equipment

Use the equipment a procedure recommends to help prevent an accident. Companies usually provide equipment to limit strain on employees and to comply with safety regulations. It is also important to learn how to operate any equipment that is available before using it for work.

19. Eat in designated areas

Employers sometimes restrict food and drink to specific areas at work to prevent spills, contamination and unsafe conditions. Having liquids around machines risks spills that can cause malfunctions, and eating where you work can cause contamination and possibly result in illness. If your workplace requests employees eat in a certain place or restrict food and drinks in a work environment, it is important to observe this rule.

20. Follow safety guides

Follow all safety guides put in place to protect you and your coworkers. Companies design safety rules to prevent incidents. Sometimes rules result from a previous accident which is why it is important to report your injuries as well as unsafe conditions. If you do not understand why a safety rule exists, you can ask your employer for clarification.

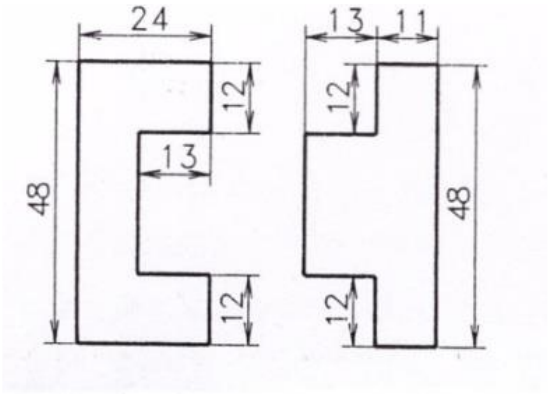
Practice session -1. U joint

Aim: - To prepare the 'U' joint as per the dimensions and join

Material required: two pieces of MS flat with dimension 25 X 50

Operations performed; -

1.Measuring
2. Cutting off
3.filing
4.Marking
5.hack Sawing
6.Chiselling
7.Fitting and finishing



Tools required: -

1.Steel rule
2. Hacksaw
3. vernier height gauge
4.rough file
5.smooth file
6.cold chisel

Procedure: -

two mild steel flat pieces of dimensions 25X50 MM are cut with the help of hack saw from a lengthy flat. They are marked with the help of vernier height gauge and "V" block for cutting as per dimension using hack saw for as per dimensions for both male and female parts. Later with the help of punch and a hammer the marking lines are punched, later the portions is cut and removed on the male part on both sides with the help of hack saw.

Later the female part is measured and marked with the help of vernier height gauge to create the slot in the middle for the recess of 24mm with 17mm depth

Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished with the help of smooth file.

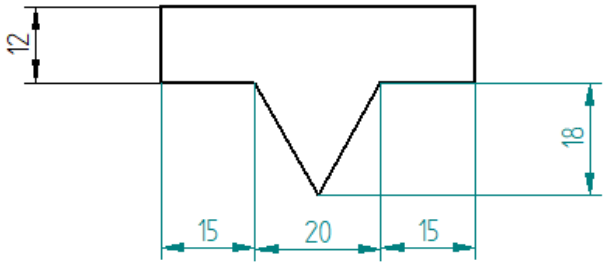
Practice session -2. triagular "VEE" joint

Aim: - To prepare the 'VEE' joint as per the dimensions and join

Material required: two pieces of MS flat with dimension 25 X 50

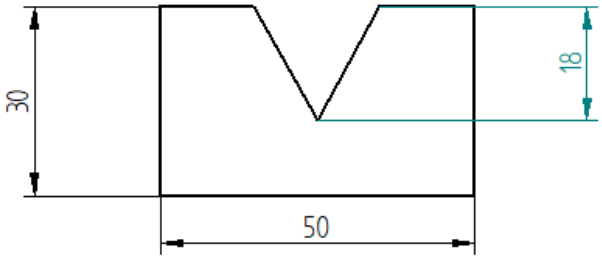
Operations performed; -

1.Measuring
2. Cutting off
3.filing
4.Marking
5.hack Sawing
6.Chiselling
7.Fitting and finishing



Tools required: -

1.Steel rule
2. Hacksaw
3. vernier height gauge
4.rough file
5.smooth file
6.cold chisel



Procedure: -

two mild steel flat pieces of dimensions 30X50 MM are cut with the help of hack saw from a lengthy flat. They are marked with the help of vernier height gauge and "V" block for cutting as per dimension using hack saw for as per dimensions for both male and female parts. Later with the help of punch and a hammer the marking lines are punched, later the portions is cut and removed on the male part on both sides with the help of hack saw.

Later the female part is measured and marked with the help of vernier height gauge to create the slot in the middle for the recess of 24mm with 17mm depth

Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished with the help of smooth file.

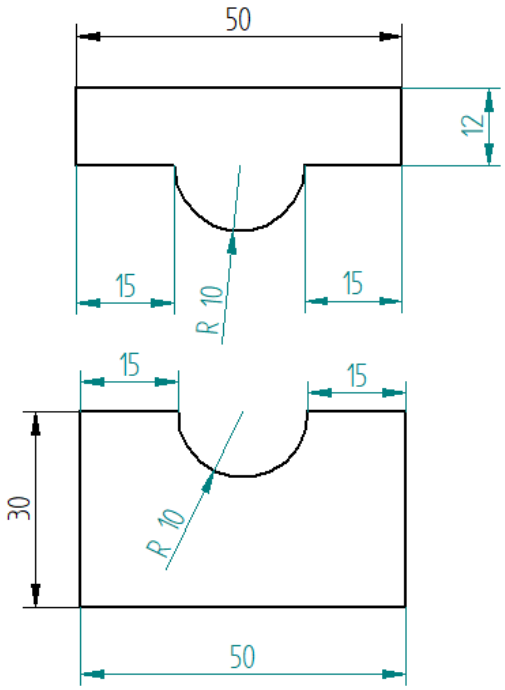
Practice session -3. Half round joint

Aim: - To prepare the 'half round' joint as per the dimensions and join

Material required: two pieces of MS flat with dimension 25 X 50

Operations performed; -

1.Measuring
2. Cutting off
3.filing
4.Marking
5.hack Sawing
6.Chiselling
7.Fitting and finishing



Tools required: -

1.Steel rule
2. Hacksaw
3. vernier height gauge
4.rough file
5.smooth file
6.cold chisel
7. half round file

Procedure: -

two mild steel flat pieces of dimensions 30X50 MM are cut with the help of hack saw from a lengthy flat. They are marked with the help of vernier height gauge and "V" block for cutting as per dimension using hack saw for as per dimensions for both male and female parts. Later with the help of punch and a hammer the marking lines are punched, later the portions is cut and removed on the male part on both sides with the help of hack saw.

Later the female part is measured and marked with the help of vernier height gauge to create the slot in the middle for the recess of 24mm with 17mm depth

Both the male and female pieces are brought together to fit by doing the necessary adjustments and finished with the help of smooth file.

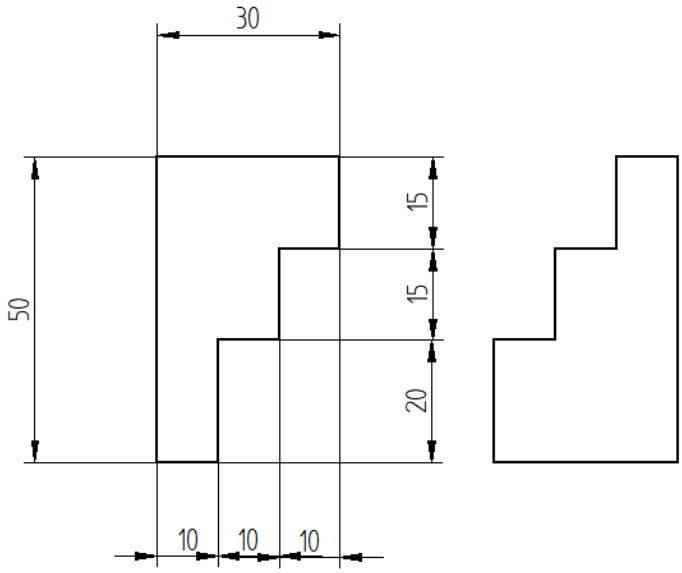
Practice session -4. "stepped joint"

Aim: - To prepare the "stepped joint" as per the dimensions and join

Material required: two pieces of MS flat with dimension 25 X 50

perations performed; -

1.Measuring
2. Cutting off
3.filing
4.Marking
5.hack Sawing
6.Chiselling
7.Fitting and finishing



Tools required: -

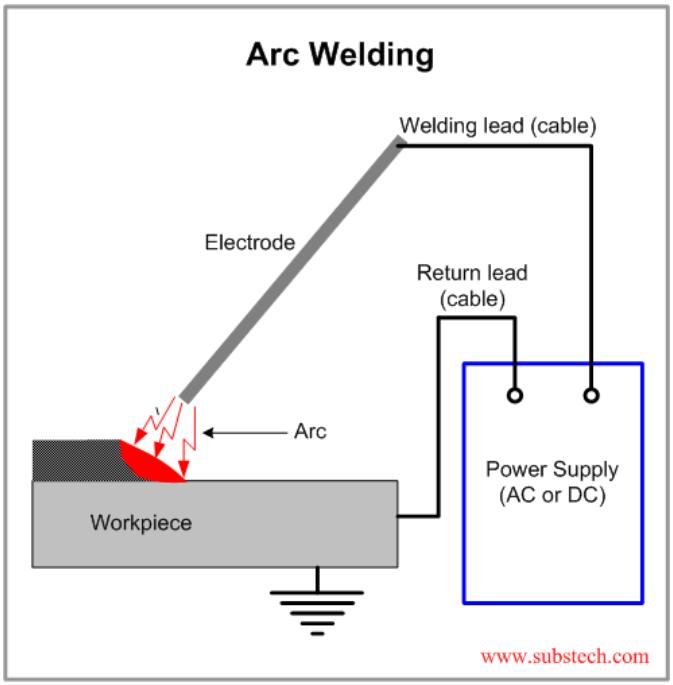
1.Steel rule
2. Hacksaw
3. vernier height gauge
4.rough file
5.smooth file
6.cold chisel

Procedure: -

two mild steel flat pieces of dimensions 30X50 MM are cut with the help of hack saw from a lengthy flat. They are marked with the help of vernier height gauge and "V" block for cutting as per dimension using hack saw for as per dimensions for both parts. Later with the help of punch and a hammer the marking lines are punched, later the portions is cut and removed on both with the pieces with the help of hack saw.

Both the pieces are brought together to fit by doing the necessary adjustments and finished with the help of smooth file.

INTRODUCTION to electric Arc welding



What is electrode arc welding?

In electrode welding, **contact between the rod electrode and workpiece ignites the arc**. This creates a short circuit for a fraction of a second between the two poles, meaning that current can then flow. The arc burns between the workpiece and the electrode. This creates the required fusion heat.

Why is arc welding used?

Arc welding can deliver extremely strong bonds even between thin metals. The construction industry uses arc welding **to guarantee strong, sustainable connections within buildings, bridges, and other infrastructures**. Other industries that use arc welding are the oil and gas industry and the power industry

What are the 4 types of welding?
4 Main Types of Welding Processes

- Gas Metal Arc Welding (GMAW/MIG)
- Gas Tungsten Arc Welding (GTAW/TIG)
- Shielded Metal Arc Welding (SMAW)
- Flux Cored Arc Welding (FCAW)

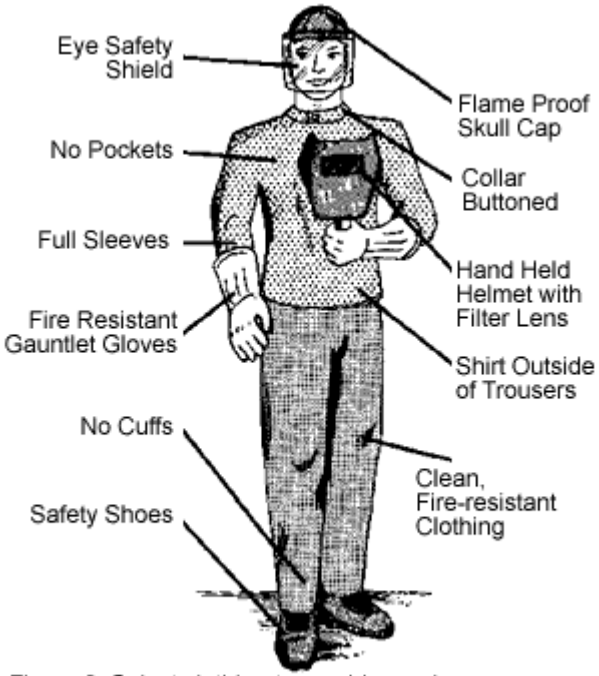
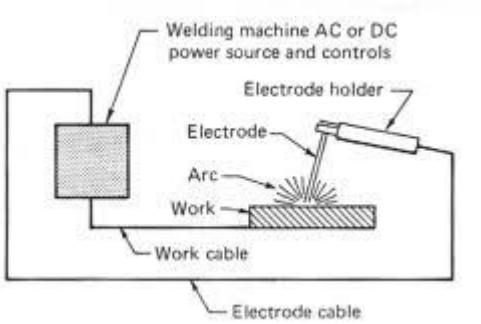
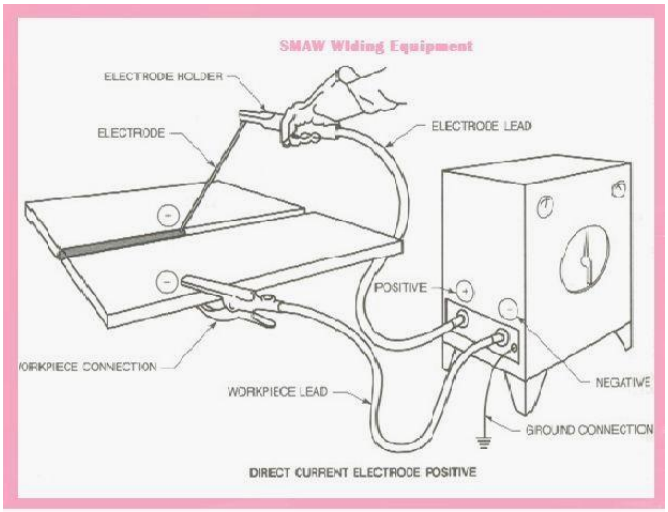


Figure 3. Select clothing to provide maximum protection from sparks and hot metals

What are the advantages of electric arc welding?

- There are a number of advantages to using arc welding compared with many other formats: Cost – equipment for arc welding is well-priced and affordable, and the process often requires less equipment in the first place because of the lack of gas. Portability – these materials are very easy to transport.



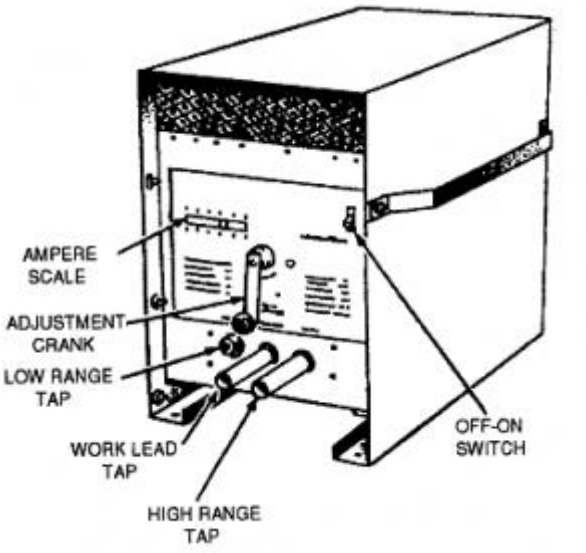


Arc welding power source:

arc welding power source comes in two types direct current (DC) and alternative current (AC). These machines have their own advantages, AC power supply is used where electricity supply is available. Well, the advancement of arc welding has brought to a reduction of supply voltage from 200-400 volts to 50-90 volts. Here are some factors to be considered when selecting an arc welding power supply.

Welding cables:

welding cables are made of aluminum or copper cables insulated with either red, black, or blue color. It is used for connecting or transferring current from the power source to the electrode holder and produces arc to the workpiece back to the power source.



Wire brush:

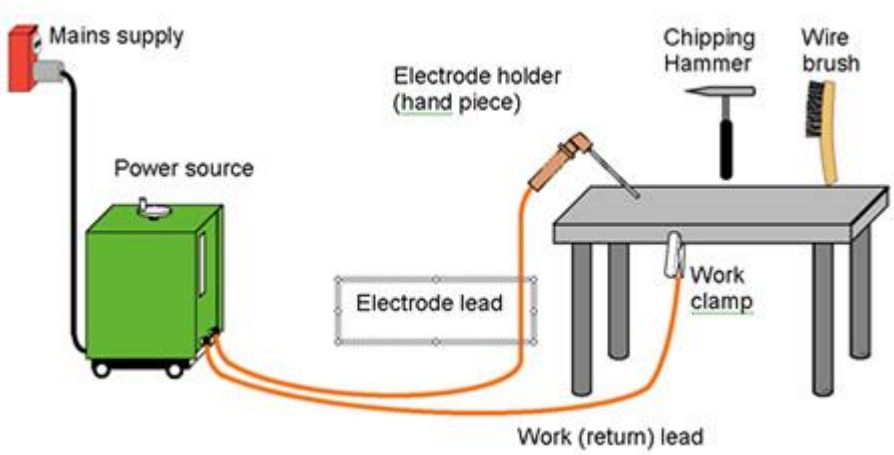
these types of arc welding equipment are used to clean dirt and to wipe away rust from the metal before welding. it is made of a wooden handle and wires on its surface.

Hand screen:

hand screen is used for supervising weld bead and for protection of the eye.

Protective clothing:

These types of arc welding equipment are used to protect the body of the operator, protecting clothing include; apron, booth, goggles, etc.



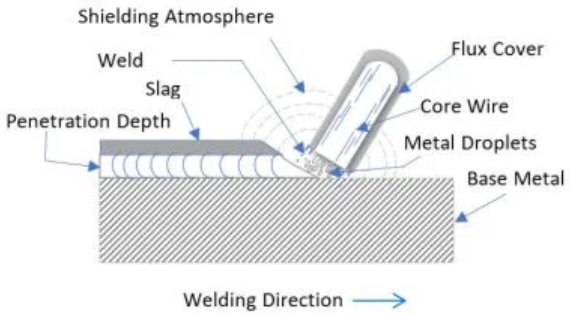
Chipping hammer:

this arc welding equipment is used to reduce slag that occurs during welding. it is made of a wooden or rubber handle and a flat and punch head made of metal. It is used by striking off the slags on the flat head of the hammer.

Welding electrodes

A welding electrode is a piece of wire or rod, which can be of metal or alloy and has a flux with or without flux and carries an electric current to obtain sufficient heat for welding.

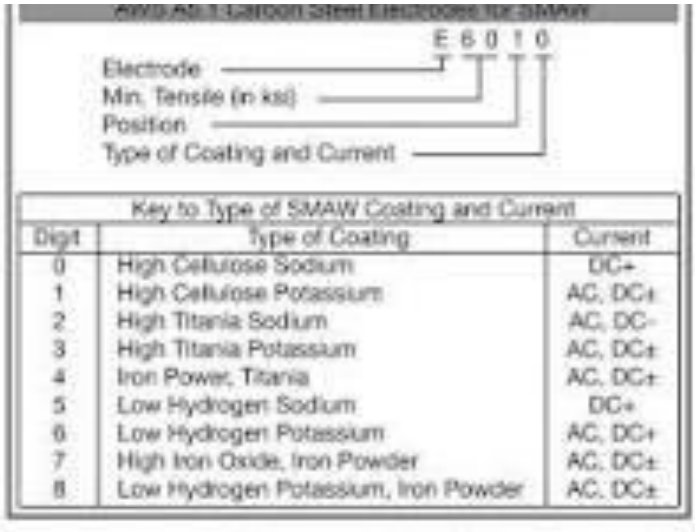
At one end it is fastened to a holder and an arc is installed at the other.



Introduction

Electrodes are the most part of welding work. Welding without electrodes is impossible in most welding processes, mainly divided into two parts, based on the electrode work function.

Types of welding electrode



Key to Type of SMAW Coating and Current

Digit	Type of Coating	Current
0	High Cellulose Sodium	DC+
1	High Cellulose Potassium	AC, DC±
2	High Titania Sodium	AC, DC-
3	High Titania Potassium	AC, DC±
4	Iron Power, Titania	AC, DC+
5	Low Hydrogen Sodium	DC+
6	Low Hydrogen Potassium	AC, DC+
7	High Iron Oxide, Iron Powder	AC, DC±
8	Low Hydrogen Potassium, Iron Powder	AC, DC±

Welding electrodes Welding electrodes are **metal wires with baked on chemical coatings**. The rod is used to sustain the welding arc and to provide the filler metal required for the joint to be welded. The coating protects the metal from damage, stabilizes the arc, and improves the weld.

What is welding electrode specification?

1. Size – **The commonly available sizes are 1/16, 5/64, 3/32 (commonest), 1/8, 3/18, 7/32, and 5/16 inches**. The core wire of the used electrode happens to be narrower than the material welded.
2. Material – The stick welding electrodes come in mild steel, iron-free, high carbon steel, cast iron, and special alloy.

Flux is a mixture of various minerals, chemicals, and alloying materials that primarily protect the molten weld metal from contamination by the oxygen and nitrogen and other contaminants in the atmosphere. The addition of certain chemicals and alloys also help to control arc stability and mechanical properties.

What are Stick Electrodes?

(also known as welding electrodes, welding rods, weld rods)

Welding electrodes are metal wires with baked on chemical coatings. The rod is used to sustain the welding arc and to provide the filler metal required for the joint to be welded. The coating protects the metal from damage, stabilizes the arc, and improves the weld. The diameter of the wire, less the coating, determines the size of the welding rod. This is expressed in fractions of an inch such as 3/32", 1/8", or 5/32." The smaller the diameter means it requires less current and it deposits a smaller amount of filler metal.

The type of base metal being welded, the welding process and machine, and other conditions determines the type of welding electrode used. For example, low carbon or "mild steel" requires a mild steel welding rod. Welding cast iron, aluminum or brass requires different welding rods and equipment.

The flux coating on the electrodes determines how it will act during the actual welding process. Some of the coating burns and the burnt flux forms smoke and acts as a shield around the welding "pool," to protect it from that air around it. Part of the flux melts and mixes with the wire and then floats the impurities to the surface. These impurities are known as "slag." A finished weld would be brittle and weak if not for the flux. When the welded joint is cooled, the slag can be removed. A chipping hammer and wire brush are used to clean and examine the weld.

The metal-arc welding electrodes may be grouped as bare electrodes, light coated electrodes, and shielded arc or heavy coated electrodes. The type used depends on the specific properties required that include: corrosion resistance, ductility, high tensile strength, the type of base metal to be welded; and the position of the weld that is flat, horizontal, vertical, or overhead.

The American Welding Society's (AWS) classification number series has been adopted by the welding industry. The electrode identification example below is for a steel arc-welding rod labeled E6010:

- "E" indicates "electrode" for electric arc welding
- The first two (or three in some cases) digits (60) indicate tensile strength in thousands of pounds per square inch
- The third (or fourth in some cases) digit (1) indicates the position of the weld. An "O" indicates that this classification is not used; "1" is for all positions; "2" is for flat and horizontal positions only; 3 is for flat position only
- The last two digits together (10) indicate the type of coating and the type of power supply required, 10 organic coating and DC current with reverse polarity.
- Therefore, a welding rod numbered E6010 indicates "E" an manual arc-welding electrode with (60) a minimum strength of 60,000 psi., that can be used (1) in all positions and (10) DC reverse polarity is required.

The flux coting of the electrode: - The flux in SMAW electrode is available in three different coatings: Basic Flux: It is made from calcium carbonate, magnesium carbonate, calcium fluoride, and other shielding components. Cellulosic-Based Flux: It is made from cellulose and other organic compounds. Rutile-Based Flux: It is made from titanium oxide.

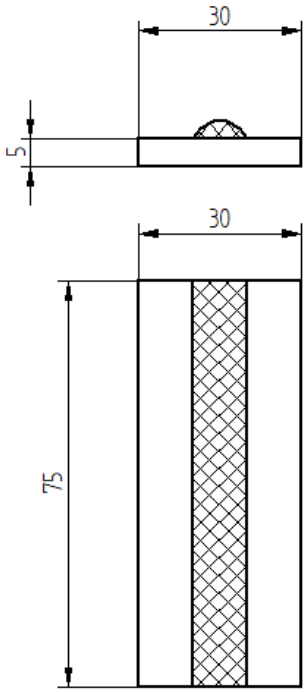
Practice session -1. "Beading practice"

Aim: - To practice the welding exercise beading practice

Material required: one piece of MS flat with dimension 30 X 75

perations performed; -

1.Measuring
2. Cutting off
3.edge preparation
4.Marking
5.welding
6.Chipping
7. finishing



Tools required: -

1.Steel rule
2. welding electrode
3. welding machine
4. hand shield
5.hand gloves
6.Apron
7. chipping hammer
8. wire brush

Procedure: -

The MS flat is placed on the welding table as wanted. Welding electrode is fixed in the welding holder. The ground is fixed to the welding table.

The welding machine is turned on and the down welding is done continuously from the start until end without lifting the welding electrode, to get the uniform weld bead.

The weld bead is chipped off the slag layer with the help of chipping hammer and then the surface of the weld is brushed with the wire brush.

Practice session -2. "Lap joint"

Aim: - To prepare the lap joint welding exercise

Material required: two piece of MS flat with dimension 30 X 75

perations performed; -

1.Measuring
2. Cutting off
3.edge preparation
4.Marking
5.welding
6.Chipping
7. finishing

Tools required: -

1.Steel rule
2. welding electrode
3. welding machine
4. hand shield
5.hand gloves
6.Apron
7. chipping hammer
8. wire brush

Procedure: -

The MS flat is placed on the welding table as wanted one above the other as per the maark. Welding electrode is fixed in the welding holder. The ground is fixed to the welding table.

The welding machine is turned on. The two pieces are fixed in the work holder and is tacked on both the ends and later down welding is done continuously from the start until end without lifting the welding electrode, to get the uniform weld bead and joint

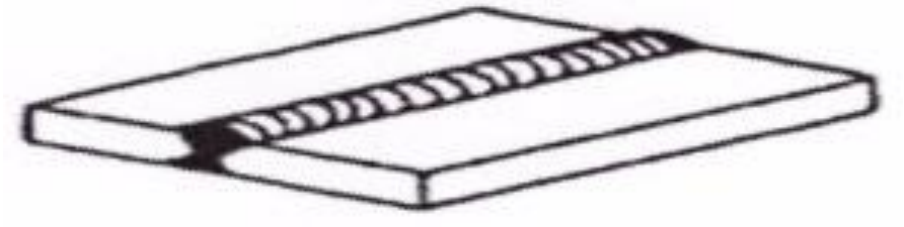
The weld bead is chipped off the slag layer with the help of chipping hammer and then the surface of the weld is brushed with the wire brush.

Practice session -3 Butt joint"

Aim: - To prepare the Butt joint welding exercise

Material required: two piece of MS flat with dimension 30 X 75

perations performed; -



1.Measuring
2. Cutting off
3.edge preparation
4.Marking
5.welding
6.Chipping
7. finishing

Tools required: -

1.Steel rule
2. welding electrode
3. welding machine
4. hand shield
5.hand gloves
6.Apron
7. chipping hammer
8. wire brush

Procedure: -

The MS flat is placed on the welding table as wanted one above the other as per the maark. Welding electrode is fixed in the welding holder. The ground is fixed to the welding table.

The welding machine is turned on. The two pieces are fixed in the work holder with the help of additional supporting piece and is tacked on both the ends and later down welding is done continuously from the start until end without lifting the welding electrode, to get the uniform weld bead and joint.

The weld bead is chipped off the slag layer with the help of chipping hammer and then the surface of the weld is brushed with the wire brush.

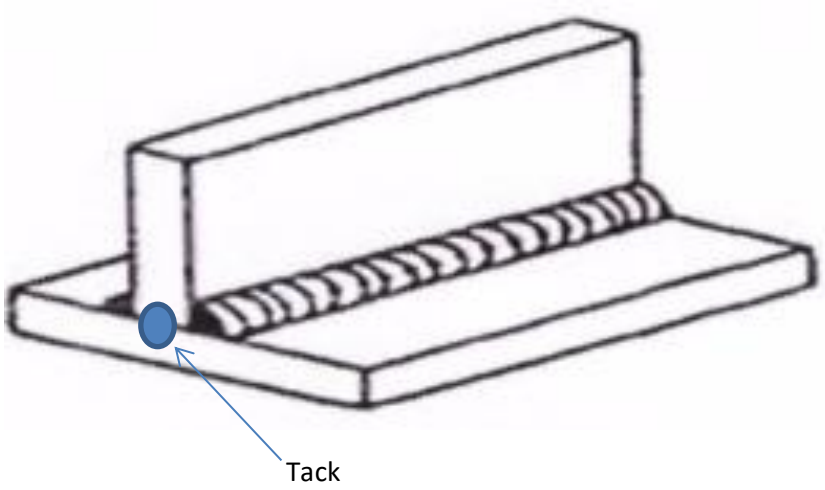
Practice session -4 'TEE' joint

Aim: - To prepare the TEE joint welding exercise

Material required: two piece of MS flat with dimension 30 X 75

perations performed; -

1.Measuring
2. Cutting off
3.edge preparation
4.Marking
5.welding
6.Chipping
7. finishing



Tools required: -

1.Steel rule
2. welding electrode
3. welding machine
4. hand shield
5.hand gloves
6.Apron
7. chipping hammer
8. wire brush

Procedure: -

The MS flat is placed on the welding table as wanted one above the other as per the maark. Welding electrode is fixed in the welding holder. The ground is fixed to the welding table.

The welding machine is turned on. The two pieces are kept one right angles to other with the help of additional supporting piece and is tacked on both the ends and later down welding is done continuously from the start until end without lifting the welding electrode, to get the uniform weld bead and joint.

The weld bead is chipped off the slag layer with the help of chipping hammer and then the surface of the weld is brushed with the wire brush.

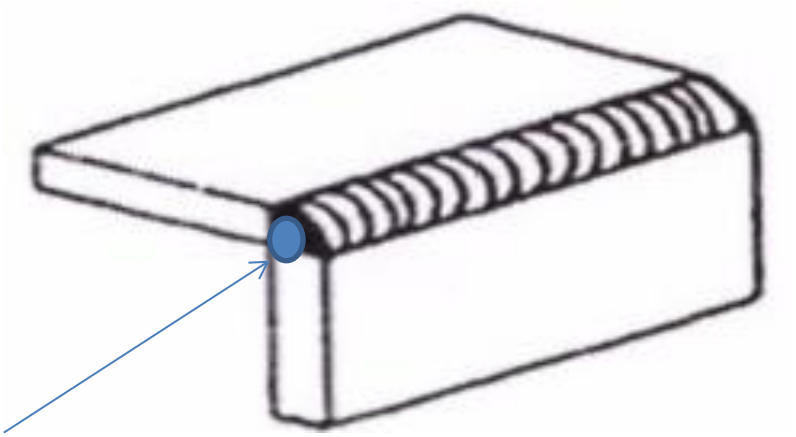
Practice session -5 corner or "L" joint"

Aim: - To prepare **corner or "L"** joint" welding exercise

Material required: two piece of MS flat with dimension 30 X 75

perations performed; -

1.Measuring
2. Cutting off
3.edge preparation
4.Marking
5.welding
6.Chipping
7. finishing



Tools required: -

1.Steel rule
2. welding electrode
3. welding machine
4. hand shield
5.hand gloves
6.Apron
7. chipping hammer
8. wire brush

Procedure: -

The MS flat is placed on the welding table as wanted one above the other as per the mark. Welding electrode is fixed in the welding holder. The ground is fixed to the welding table.

The welding machine is turned on. The two pieces are fixed together at 90 degrees to each other with the help of additional supporting piece and is tacked on both the ends and later down welding is done continuously from the start until end without lifting the welding electrode, to get the uniform weld bead and joint.

The weld bead is chipped off the slag layer with the help of chipping hammer and then the surface of the weld is brushed with the wire brush.