Tuesday

Parth Johri

2K20/B17/33

Assignment No 3.

18/05/21

Workshop.

Forging

→ Forging is defined as the uncontrolled plastic deformation or working of metal into predetermined shapes.

→ Forging implies the use of powerful pressure from a hammer or press on metal which has been heated to its plastic range.

Tools & Equipments Used in forging.

1) Anvil → Used for supporting hot job while hammering is done for shaping it into various shapes

2) Swage Block → Used for holding hot bars during bending, support for punching holes in a job & various holes

3) Tongs → It is a holding device used to support and grip the job while some operation is carried out.

4) Hammers → Used to strike a tool or a job

5) Hardie → It is filled in the hardie hole provided in the tail of anvil. It has a cutting edge at the top of body.

6) Fullers :-> Used for necking down to form depressions

7) Swage → Swage is used to reduce / finish to round, square / hexagonal form. It consists of two parts - top part with handle & bottom part with square shank.

8) Flatters → Used to give smoothness and accuracy to articles which have already been shaped by fullers and swages.

9) Punch & Drift → Punch is used for making holes in a job which is at red hot condition
Drift is used for punching in a job to expand or open for accurate dimensions of hole.

10) Set Hammer → It is similar to flatter and is used for finishing corners and shouldered work where the use of flatter is inconvenient

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Forging Temperature for Different Materials

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→ Forging temperature of mainly used materials are

i) Wrought iron — 850°-1300°C

ii) Mild Steel — 750°-1300°C

iii) Medium carbon steel — 750°-1250°C

iv) High carbon steel — 750°-1150°C

v) Stainless steel — 950-1200°C

vi) Brass, Copper, Bronze — 550°-900°C

vii) Aluminium, Magnesium — 300°-850°C

TUESDAY
25/05/21

ASSIGNMENT-4

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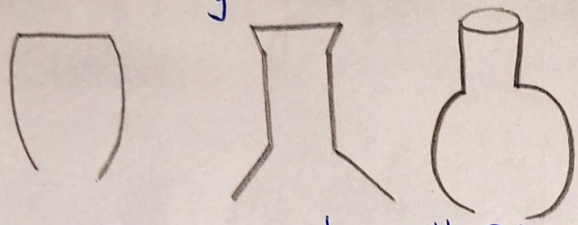
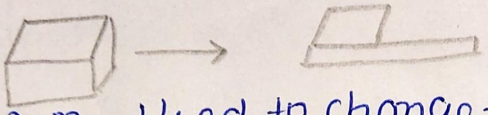
FORGING OPERATIONS

1) Upsetting - Process of increasing thickness or the cross section of metal

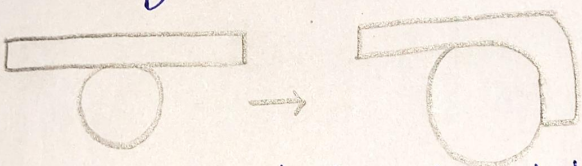


2) Drawing down - Length of metal is increased



3) Setting down - Used to change the roundness of a corner for making square by using the set hammer.

4) Bending -

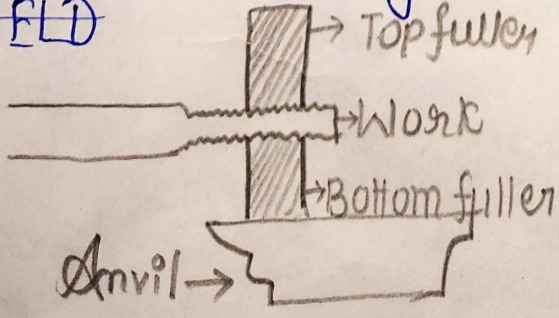


5) Cutting - • Done by using hot and cold types of chisels
• Cold cutting - thin flat or round sections

6) Punching and drifting - holes of different size and shape

7) Fullering - • Length of work piece is increased at cost of its width.

~~WELD~~



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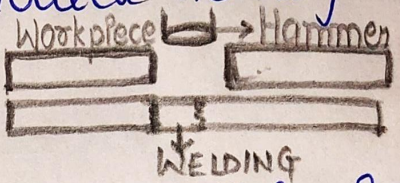
WELDING

- Two pieces of same metal are heated together with external pressure so that they can act as a single piece.
- Flux is used for protection of heated metal from oxidation.



ANNEALING

- Process of heating material upto critical temperature
- Improve properties like relieve internal stress, softening the metal.

NORMALISING

- Heating material at a certain temp of 50°C and then cool them in air.
- To remove internal stress, refine the steel structure and improve tensile ~~ben~~ strength

HARDENING

- Process of heating material at temp about 30-50°C above critical temp and then cooling it suddenly in liquid.
- Sudden cooling - quenching
- Improve toughness, strength, ductility and elasticity process.

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TEMPERING

- Improve toughness, reduce internal stress produced during previous heating, make metal metal shock resistance

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COLD FORGING

- Bar stock is cut, cut bar is sent to die
- Forge the shape in first die.
- Second die to further shape the part

IMPRESSION DIE FORGING

CLOSED DIE FORGING

- Deformation of metal at forging temp. with one or more die impressions
- Performed with pieces and hammer.
- In fresh forging, the block of metal is forced into layer called flash flows out between the die.

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Tuesday

Filing Operations

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Types of files:->

1.) Hand file:->
→ Rectangular in section and tapered in thickness but parallel in width. The faces carry double cut teeth and one of the edges single cut. The other edge, known as soft edge, does not have any teeth and this file is also known as safe edge file.

2.) Flat file:->
→ It is rectangular in section and tapered for ⅔ length in width and thickness towards the top. The faces carry double cut teeth and the edges carry single cut teeth.

3.) Square file:->
→ This file is especially used to remove the material from the inside corners which are at right angles.

4.) Three Square file:-> It is of equilateral triangular in section and tapers toward the tip. The faces are double cut and the edge sharp. These files are used to file angular hole and recesses. Used for sharpening wood saws.

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5.) Round file:-

→ It is tapered for 1/3 length with double cut or large course grades. It is used for filing out round elliptical and curved openings.

6.) Hay-Round file:-

→ It is in the form of a semi-circle that is used to remove the material from the semi-circular cross section components

Fitting Operations

1.) Chipping

Removing the metal with a chisel is called chipping and is normally used where machining is not possible. While chipping safety goggles must be put on to protect eyes from the flying chips to ensure safety of others, a chip guard is placed in position

2.) Filing

There are several methods of filing, each with a specific purpose with reference to the file -

① Holding the file :- for heavy work and to remove more metal a high pressure is used. for light pressure is applied.

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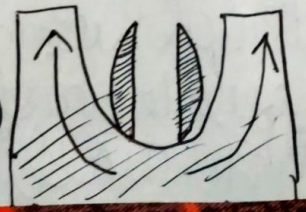
② Filling Internal curves :- A part of half round file only makes contact as shown during filing operation

③ Cross filing :- It is the most common method of filing. Cross filing is carried out across the diagonals, to produce medium surface finish. It is used when large amounts of metal is to be removed by cross filing rounding the surface is removed

④ Straight filing :- When a short length of workpiece is required to have a flat surface, straight filing is used. file works in during cross filing maybe removed to produce a relatively smoother surface.

⑤ Draw filing :- It is done to get finely finished surface. It provides a smoother surface finish than straight filing. A smooth or dead smooth flat file is used for this.



a) filing Internal Curve

b) Cross filing

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6. Sawing Operation:-

→ Metal sawing is done by hack saw. A hacksaw is a fine tooth saw with a blade under tension in a frame, used for cutting materials such as metal or bone. Hand held hacksaws consist of a metal arch with a handle, usually a pistol grip with pins of attacking a narrow disposable blade. A screw or other mechanism is used to put the thin blade under tension. The blade can be mounted with the teeth facing toward or away from the handle, resulting in cutting action on either the push or pull stroke. On the push stroke, the arch will flex slightly, decreasing the tension on the blade.

7. Punching Operation:-

→ Punching in metal working is the process of using a punch ~~beter~~ press to push a punch through the material and into a die to create a hole in the work piece. A scrap slug from the hole is deposited into the die in the process. Depending on the material being punched this slug may be recycled and reused to discarded. The hole walls will

Show furnished area, rollover, and die break and must often be further processed. Punching is often the cheapest method for creating holes in sheet metal in medium to high productio

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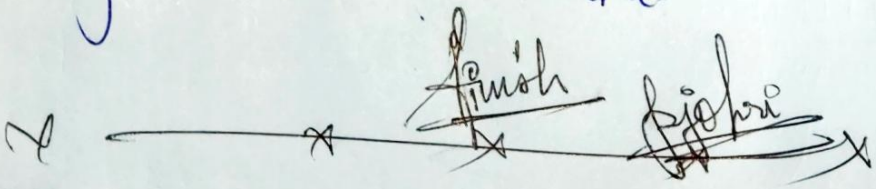
Drilling Operation:-

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole in solid material. These drills bit is a multipoint and cutting tool. It cuts by applying pressure and rotation to the work piece, which forms chips at the cutting edge.

Marking Measurings:-

Accurate working in the first step and the methods and instruments used are common in all fitting works. Measurements are taken either from a finished edge or frame centre line.



08/06/21

Welding.

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The process of joining different metals:→

- **Arc Welding:** Process in which source of heat is electricity i.e. coalesence is brought about heating the workplace with an electric arc struck b/w an electrode and the work piece.

The filler material has similar composition & melting point temp. as the base metal. It is used to fill gap b/w the joint surfaces

- **Resistance Welding:** Process which is coalescence is produced by the heat obtained from resistance of the work to the flow of electric current in a circuit of which work is a part and by application of pressure

Practical Applications of Welding:

- ★ Aircraft Construction
- ★ Automobile
- ★ Pipings & pipelines
- ★ Ships
- ★ Repair of broken & damaged components of machinery
- ★ Bridges
- ★ Buildings
- ★ Storage tanks

Welding terminology

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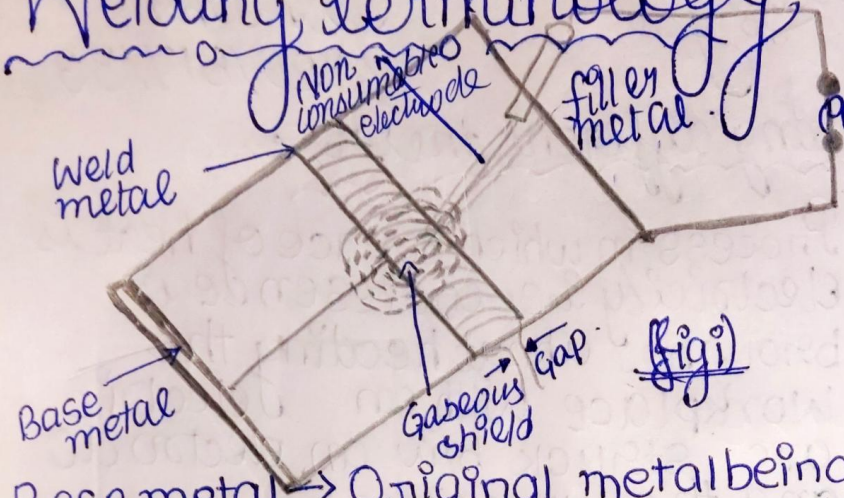

Fig(i)

Base metal → Original metal being joined.
Bead metal → Deposited Metal
Weld metal → Part of Base metal that has melted
Flux → Providing shielding to keep gases out.
Ripple → Shape of the bead.
Pass → Each layer of bead weld deposited
Crater → Depression in the base metal.
Penetration → Dept of fusion with metal
Arc Length → Distance from electrode to metal
Weldface → Exposed surface of weld.
Porosity → Voids of gas pockets in the weld.
Spatter → Metal particles expelled during welding.

Welded joints

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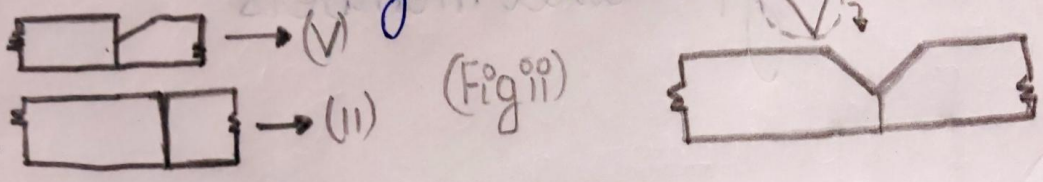
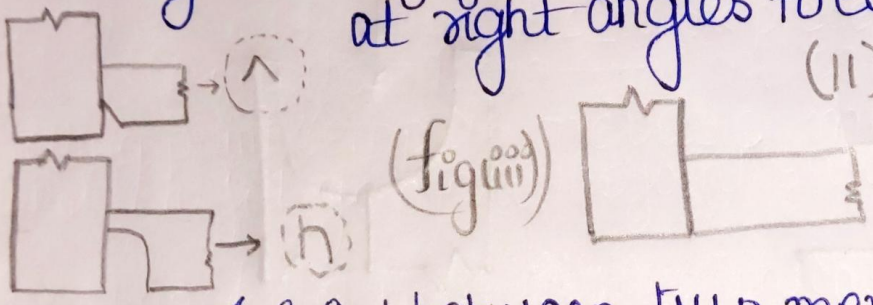
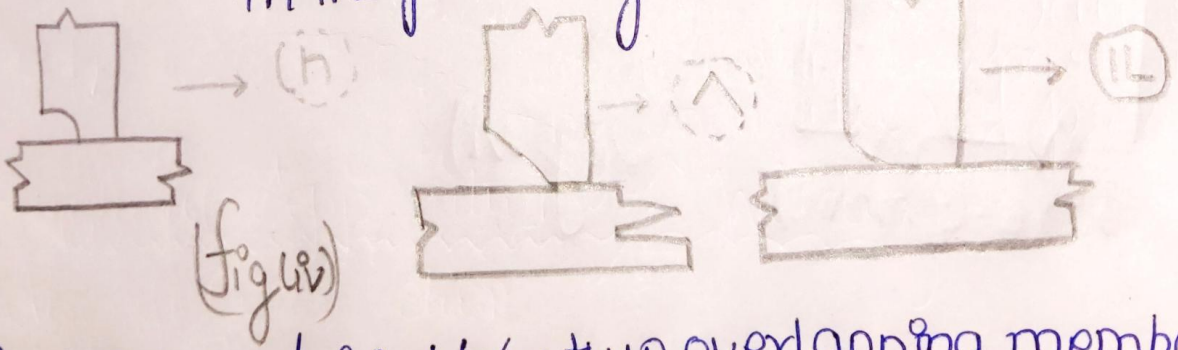
Butt joint = a joint b/w two members aligned appear in same plane



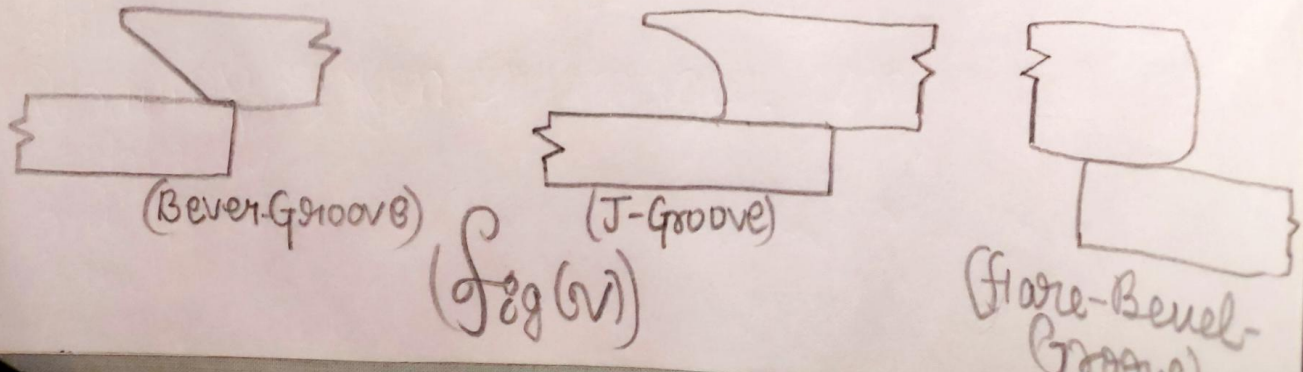
Corner joint = a joint b/w two members located at right angles to each other



T joint = A joint between two members located appear at right angles to each other in the form of T.



Lap joint = A joint b/w two overlapping members



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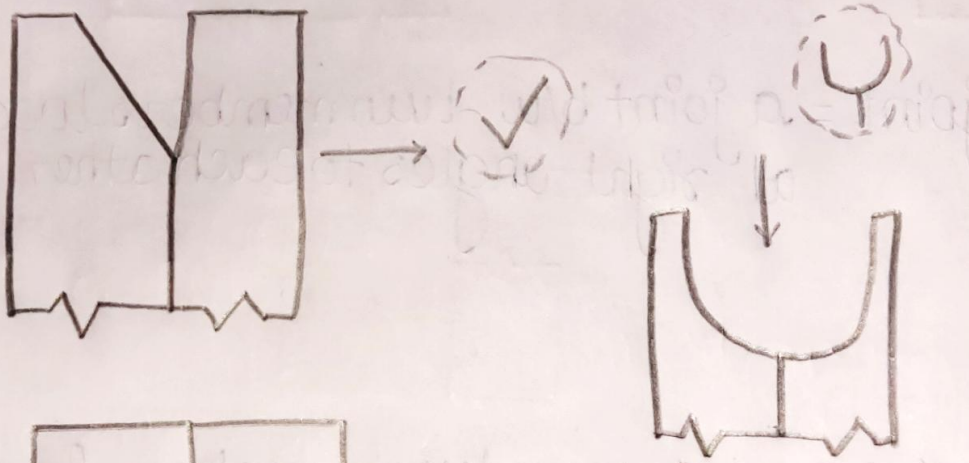
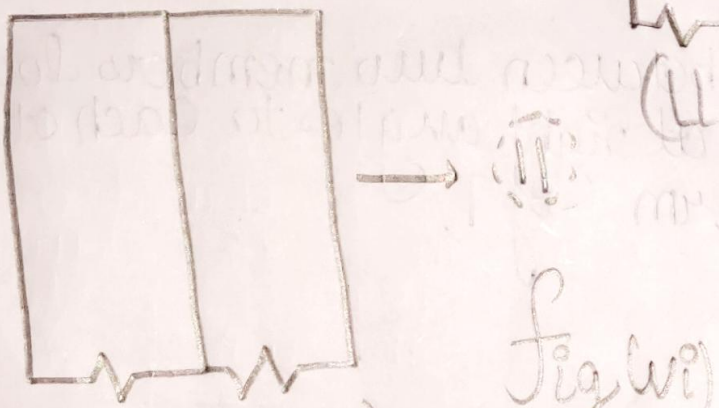
Edge joint = A joint between the edges of two or more parallel or nearly parallel members



(U-Groove)



(Square-Groove)

fig (vi)

Tuesday

Sheet Metal

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Workshop

Sheet Metal Tools

1) Cutting tools :->

(i) Chisels :-> It is used to cut the sheets and remove the unwanted metal from the surface of job by chipping.

(ii) Snips or Shears :-> It is used for cutting or shearing thin metal sheets.

2) Striking tools :->

(i) Hammers :-> It is used on metal sheet for straight-ening, bending, leveling.

(ii) Punch :-> It is used for making out work, locati-ng centres etc.

3) Supporting tools :->

(i) Stakes :-> It is used for doing various operation like forming, bending seaming etc.

(ii) Anvil :-> It acts as a base for smithy work.

(iii) Swage block.

4) Marking & Measuring Tools

(i) Steel rule

(ii) Scribers :-> It is used for making lines

(iii) Trammel.

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(iv.) Divider
(v.) Swing Blade Protectors
(vi) Wire Gauge.

5.) Bending & Folding tools

(i.) Plices:→ It is mainly used for bending the sheet metal to the required shape.

(ii.) Folding bars:→ It is used for bending & folding operation of sheet metal.

→ Sheet metal cutting operations.

(i.) Shearing Operation: It is the process of separating sheets into two or more pieces.

(ii.) Blanking & Fine Blanking Operation:→ It is the process of cutting out a predefined shape from the sheet metal.

(iii.) Punching Operation:→ Piercing operation is the process of cutting small, cylindrical holes in the sheet metal.

Perforating Operation:→ Similar to piercing but holes are not usually round in shape.

Slotting Operation:→ It is the process of cutting regular rectangular holes onto sheet metals

Notching Operations:→ It is the process of where shapes are cut from the edges of the sheet metal.

Sheet Metal forming Operations

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Forming operations cause stress below the sheet metal's ultimate strength, resulting in distortion

Bending Operation

It is the process of transforming the straight metal sheet into a curved form. There are a number of different types of bending.

* Channel Bending
* Offset Bending
* Edge Bending
* U- Bending
* V- Bending

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Tuesday.

Fitting Shop

Tools & Devices.

*Marketing & Measuring Tools

- Used for taking measurements
- Made of stainless steel or Spring steel.
- Scale of 300mm is mainly used in practice.

Surface Plate

- Used for marketing out work & for testing Flatness or trueness of work.
- Made of Grey cast iron.

Scribes

- Pointed out at once or both ends
- Used to scratch lines on given surface.

Universal Surface Gauge

- Used to scribe parallel lines at desired height from a plane surface.

- It consists of a cast iron base, perfectly machined & placed at the top, bottom & all sides.

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Punch

- It is used for making out work & locating centers in a permanent manner.
- They are made of hardened steel and may be classified in two types such as: Prick or Dot punch or Centre Punch.
- The centre punch has an inclined angle of 60°

V-Block

- It is a block of steel with V-shaped grooves for marking or drilling on a cylindrical workpiece, it serves as a useful support to the workpiece.

Try-Square

It is used to check the truchers of mutually normally surfaces or in other words we can say to check 90° angle b/w two adjacent surfaces.

In the absence of surface plate, flatness of any surface may also be checked by it.

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Callipers

The main function of callipers is to transfer and compare a dimension from an surface to another or from a part to scale or micrometer where the measurement cannot be done.

i.) Cautside calliper
ii.) Onside calliper
iii.) Hermaprodite or odd-leg caliper.

Vernier caliper & Vernier height Gauge.

- Vernier callipers can measure internal dimension, external dimensions.
- Vernier gauge is used for measuring the heights components.

Micrometer

Instrument for making precise linear measurement of dimensions such as diameters, thickness & lengths of solid bodies.

Holding & Supporting Tools

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→ Bench Vice

- The bench vice is a device commonly used for holding the work pieces.
- It is firmly fixed to the fitter's bench with the help of nuts & bolts & also known as fitter's vice.

→ Pipe Vice

- It consists of a cast iron frame & base
- It is used for holding the soft round section metal like pipes & tubes, etc.
- In this case screw is vertical & the movable jaw works vertically

Hand vice

This type of vice is usually employed for gripping very small jobs

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Pin-Vice.

It is used for holding round jobs of small diameter such as pins & wires etc.

Tools Maker's Vice.

Useful for holding small size of jobs which require filing or drilling etc. It is made of mild-steel.

Cutting, Seling & Scraping Tools

→ Chisels
For cutting & chiping away pieces of metal

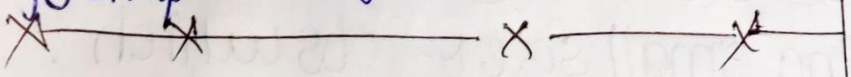
→ Flat chisel
Its cutting edge is given a slight curve so as to prevent corners from digging away the metal.

→ Cross-cut chisel
Used for cutting grooves in large surfaces & keyways in shafts or wheels.

→ Round Nose Chisel.
Used in cutting oil grooves in bearings, pulleys etc.

Diamond point chisel

One end of this chisel is drawn to a small square and this end is ground off at an angle producing "Diamond" shape.



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2K20/B17/33
Workshop

Tuesday
15/06/21

Welding Write Workshop

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2K20/BM/33

What is Welding?

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Welding is the metal joining method where in a coalescence is produced either by heating the metal to suitable temperature with or without the use of filler metal.

Types of Welding

1) Arc Welding:

It comprises of those welding processes where source of heat is electricity i.e. coalescence is brought by heating the work piece with an electric arc stuck between and electrode and workpiece

- Shielded arc
- Gas-metal arc
- Gas-Tungsten ~~arc~~
- Submerged arc
- Carbon arc

Shielded arc

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In SMAW coalescence is brought about by heating the workpiece with an electric arc setup between flux coated electrode and the workpiece. The flux covering decomposes due to arc heat and performs a variety of functions like arc stability, weld metal protection etc. The electrode melts and acts as filler metal

Submerged arc Welding

In SAW, welding is done under a blanket of ~~Space~~ flux, such that the arc, the end of electrode and the molten weld pool are submerged in finely divided granulated powder (flux) containing appropriate deoxydizers, cleaners any other fluxing elements

Gas Tungsted arc Welding

In this welding, coalscence is brought about by heating the job with an electric arc struck between a tungsten electrode and the job. An shielding gas (argon or helium) is used to avoid contamination of molten weld pool. The tungsten electrode is non-consu

so a filler metal may or may not be used

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Gas metal arc:-

In mier welding coalescence is alrough about by heating the job with an electric arc established between a continuously fed metal electrode and the job. The arc and molten metal arc shielded by shielding gas

ii) Gas Welding.

It is a fusion melting process. It joins metal using the heat of oxygen/air and a fuel gas mixture (combustion)

Gas welding
- Oxy-acytelene
- Oxy-Hydrogen
- Air acetylene.

Oxy-acytelene

When acytele is mixed with oxygen in correct proposetions in the welding torch and ignited, the flame resulting at the tip of torch is sufficiently hot to melt and join the metal.

Resistance Welding

Resistance welding is a group of welding processes wherein coalescence is brought about by heat obtained from resistance of

the work to the flow of electric current in a circuit of which work is a part and by application of pressure

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- Seam
- Spot
- Percussion
- Flash
- Projection

Welding Equipments

1) AC or DC welding supply
2) Welding Electrode
3) Electrode holder
4) Welding Leads
5) Ground Connection
6) Hand & face Shields

Welding Electrodes

1) Non-consumable (refractory)
   1) Carbon or graphite electrodes
   2) Tungsten electrodes
2) Consumable (Metallic)
   1) Bare electrodes
   2) Flux covered electrodes

ASSIGNMENT NO:-2.

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Casting.

1) Types of casting.

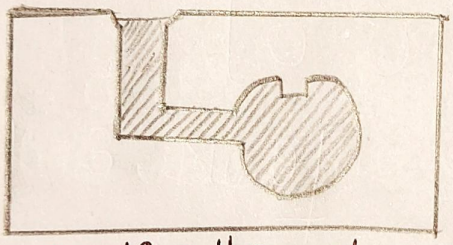
Sand casting :- Sand casting is also known as Sand molded casting. It is a metal casting process characterised by using sand as the mold material.

2) Advantages.

→ Can create very complex parts
→ Experimental cast is low
→ Almost all types of Alloys can be cast.

Disadvantages.

→ Creates high degree of porosity
→ Surface finish is poor



Casting through the gating system

The solidified casting

2) Die Casting

It is an automated casting process in which the liquid melt is pressed into a mold under high pressure (150-200 bar) & high filling speed (upto 540 km/h). The process consists of two blocks of heat resistant metals having cavities machined accurately to make the permanent mould.

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Types of Die Casting

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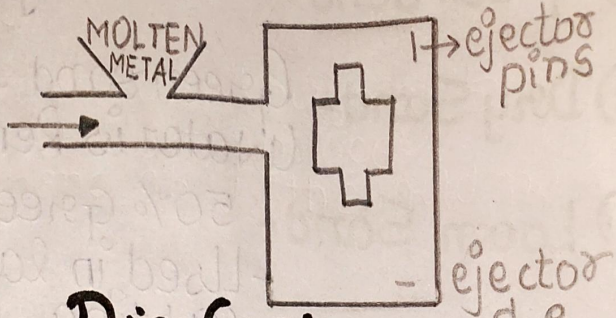
→ Gravity die casting

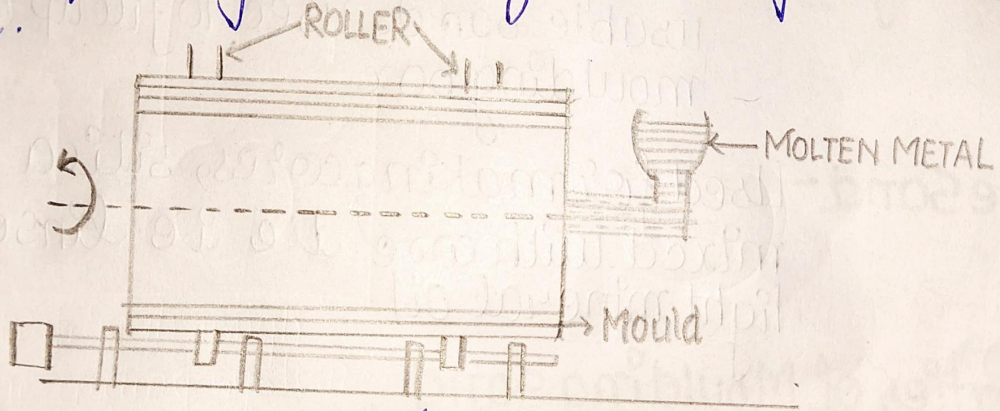
→ Pressure die casting



Die Casting

3) Centrifugal Casting :→ The molten metal is poured into the mould while it is rotating. The molten metal is poured at the centre of the mould.

The outer parts of the casting consists of dense & pure metal.



4) Investment Casting :→ Also known as wax process of precision casting. It is a manufacturing process in which wax pattern is coated with ceramic material

→ Once the ceramic material is hardened its internal geometry takes the shape of casting.

Advantages

→ Excellent surface finish.

→ Low material waste.

Disadvantages

Relatively high cost.

Requirement of skilled labour.

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Types of Moulding Sand.

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1) Green Sand - Mixture of silica sand - (18 to 30% Clay & 6-8% Water)

2) Dry Sand - Green sand is baked (Water is Removed)

3) Loam Sand - 50% Green & 50% dry sand.
- Used in large casting like skeletal casting.

4) Parting Sand - Dry silica sand, used to keep parting surface of the drag & cope to separate without clinging.

5) Backling Sand - Temporary mould, it is kind of usable sand, used to fill up the moulding box.

6) Core Sand - Used for making cores, silica sand mixed with core die i.e. linsed oil, light mineral oil

Properties of Moulding Sand.

1) Flowability or Plasticity :→
→ Ability to behave like fluid
→ To get a uniform density.

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2) Porosity or Permeability :→
→ Sand must be porous to provide a path of free escape of gases

3) Adhesiveness :→
→ Stick or adhere to another body i.e. cling to sides of

moulding box.

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4) Cohesiveness
→ Ability of sand particles to stick together
→ Due to this, mould retains its shape

5) Refractoriness
→ Withstand high temperature of molten material

6) Collapsibility
→ This will avoid tearing or contracting metal

Preparation of Mould Sand

→ The pattern whose casting is made is placed on the wooden board.
→ The drag is then placed on the board.
→ Parting sand is applied slightly on the pattern.
→ Sand is filled over the pattern & packed all over in the board.
→ Rances are used to tightly pack the sand.
→ The drag is then turned upside down & loose sand ~~Sto~~ is blown off
→ The cope box is now placed on drag & a vent rod is used for making the escape path for the gasses that comes out at the time of casting
→ Hole is widened to facilitate pouring metal
→ Pattern is removed & gate cutters are used to cut a gate.

Johri