Experiment no. 01

Name of the experiment: Study of foundry shop.

a) Patterns
b) Molding
c) Cores

Objectives:

i. to provide an insight into different sand preparation and foundry equipments
ii. to provide an insight into different forging tools and equipments.
iii. to provide training to students to enhance their practical skills
iv. to practically demostrate precautions to be taken during casting and hot working.
v. to develop team qualities and ethical priciples.

Equipments:

1. Rammer:

A rammer is a tool used to pack the sand into

the mold. It has three parts —

i. Peen end
ii. Handle
iii. Butt end.

ii. Trowel:

Trowels are used for finishing and repairing mold cavities as well as for smoothing over the parting surface of the mold.

iii. Lifter :

It is an equipment used for smoothing and cleaning loose sand depression in the mold. A combination of silica and lifter is known as Yankee-lifter.

iv. Swab:

It is a brush made of hemp fibers and is used to apply water to the mold around the edge of the pattern.

v. Strike-off bar:

It is a tool used to level the molding sand.

vi. Runner / sprue cutter:

A tapered wooden peg, a runner peg is forced into the top part of the mold at the correct position. when the peg is withdrawn, it leaves a cavity known as down gate through which the molten metal is poured.

vii. Riser:

It is a wooden peg like the runner, but thinner in diameter.

viii. draw spike or screw:

The draw spike is a pointed steel rod with loops at one end with which the wooden pattern is withdrawn from the sand.

ix. Gate cutter:

It is a piece of sheet metal used to cut the opening that connects the sprue with the mold cavity. This opening is called a 'gate'.

x. Base:

It is a wooden structure upon which the molding

box stands.

xi. Molding Box:

A bo wooden box with two parts, a molding box is the box in which molding sand, patterns and everything else is contained. ~~or~~ is The bottom part is called drag part and top part is called cope part.

xii. Ventwire:

It is a wire rod used for making opening called 'vents' in the molds. The vents carry off the steam and generated by the hot metal in contact with the sand.

xiii. Mallet:

A hammer like wooden structure which is used to softly hit on the sand.

Theory:

Foundry practice deals with the process of making castings in molds, formed in either sand or other material. In any manufacturing workshop, foundry section occupies an important place. In foundry, the jobs are manufactured by pouring molten metals, such as, cast iron, brass, cast steel, metal, gunmetal, aluminium etc. into molds prepared in molding boxes, by wooden or metal patterns. The process of shaping metals by pouring is very fast and much cheaper than fabrication methods. The products in foundry are poured metals cast in molds, hence the production of foundry is known as 'castings'.

• Mold making:

A mold may be defined as the negative print of the part to be cast and is obtained by the pattern in the molding and container (boxes) into which molten metal is poured and allowed to solidify. Sand molds are destroyed as the casting is removed from the molds.

Molding is done by both hand and machines. Hand molding is restored to odd castings generally less than two pieces at a time or so. Here, ramming is done by hand which takes more time than machine molding. However the quality is better for odd castings. For mass manufacture, however, machine molding is suitable. Molding machines are prominently used in big foundries.

- Types of molds

The various types of molds, according to type of material used, are as follows:

i. Green sand mold
ii. Dry sand mold
iii. Loam mold
iv. Skin dried mold
v. Metal molding.

- Molding sand :

In a foundry shop, sand in the principal molding material and is used for all types of castings.

The molding sand used in ~~molding~~ foundry shops is not entirely silica sand. Other elements that are added to the sand to increase its efficiency are generally called additives of molding ~~sad~~ sand. The amount of these additives are variable and it depends on the temperature of the metal to be cast.

Additives of molding sand:

i. Silica sand - 60%. Also used as parting sand.

ii. Bentonite powder - 30%. - acts as temporary binding agent when moisture is present in sand.

iii. Coal dust - 8%. Acts as heat absorbant.

iv. Graphite powder - 2%. Graphite is a light material used to bring smoothness to the surface.

Other than the above mentioned additives water (moisture) is also a component of molding sand.

The molding sand possesses all the properties which are vital for foundry purposes and is used time and again.

Properties of molding sand:

i. Permeability
ii. strength or cohesiveness
iii. Refractiveness
iv. Plasticity or flowability
v. Collapsibility
vi. Adhesiveness
vii. Coefficient of expansion
viii. chemical resistivity.

Types of molding sands:

i. Naturalsand
ii. Synthetic sand

• Patterns:

Pattern is the model of desired casting with exactly same shape and size with or without the addition of allowance and core prints. Patterns may be made of wood, metal, P

plaster or plastic. The type of pattern material chosen depends on the design of the casting, the number of castings to be produced, method of production, the degree of accuracy and surface finish required.

Types of pattern materials:

1. Wood pattern -

It is a widely used material for patterns. It is cheap and light. Can be easily worked with and shaped as desired. It can be cut and fabricated into varying forms and can be preserved for a fairly ~~log~~ long time.

But, wooden patterns have the tendency to wear out by the constant contact with damp sand. As a result, it is not suitable for repetitive work.

II. Metal Pattern -

Metal patterns are made with brass, bronze, white metal, cast iron and aluminium alloys etc. When large number of castings is required, the pattern is made of a metal.

these patterns draw well from the mold and maintain a smooth finish because of their resistance to atmospheric corrosion. They are safer, durable and less expensive to produce.

Patterns should be made by keeping allowances in consideration. As metal expands when

Pattern allowance:

1. Shrinkage allowance:

Metal expands when molten and shrinks on solidification. As a result, a tolerance in dimension is provided all over the pattern to compensate for the shrinkage of metal.

11. Finishing allowance:

Metal can be corroded after filing and grinding after casting is done. The tolerance in dimension provided in the metal pattern in order to make up for this decorrosion is called finishing allowance.

iii. Draft allowance:

To facilitate the withdrawal of a pattern from a mold proper draft should be applied to the pattern surface.

Types of pattern:

i. Single piece pattern
ii. Loose piece pattern
iii. Split pattern
iv. Match plate pattern
v. Gated pattern

• Core:

core is a sand body formed by the pattern or core box which is placed in the mold cavity to ~~get~~ produce internal cavities and reenterant angles. The core is normally a disposable item that is destroyed to get it out of the piece.

Types of cores:

i. Horizontal cores
ii. Vertical cores
iii. Balance cores

Core sand:

various qualities of sand are used in making cores depending on the properties of the core. High silica sand containing very little, if any, clay bond is generally used. In choosing core sand, the foundry workers consider grain size distribution and shape mineralogical composition. A high percentage of quartz is desirable because quartz doesn't fracture when exposed to heat.

• Causes of defective castings:

i. Blow holes
ii. Cold shuts or misruns
iii. Cracked castings
iv. Crushed castings
v. Hard casting
vi. Porosity
vii. Rough castings
viii. Shifts
ix. Swelled castings.

Necessary figures/diagrams:

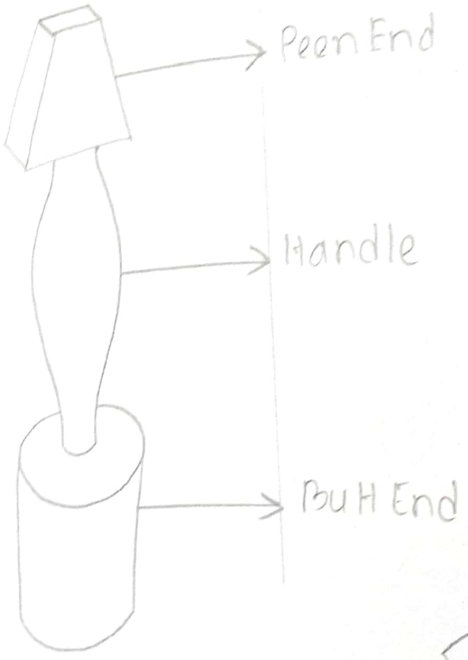

Figure-I: Rammer

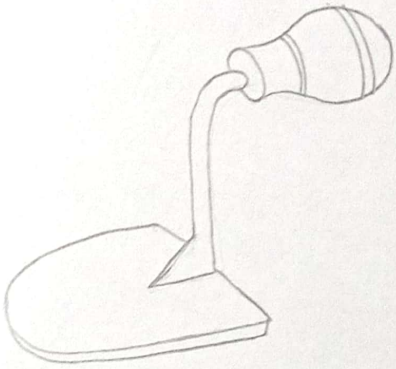

Figure-II: Trowel

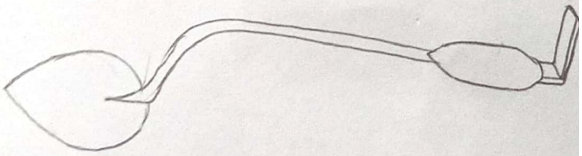

Figure-III: Lifter

Figure-IV: Swab

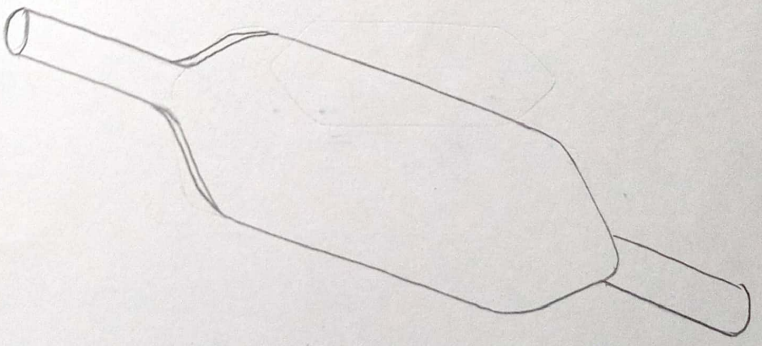

Figure-V: Strike-off Bar

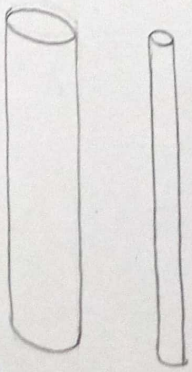

Figure-VI & VII: Runner and Riser

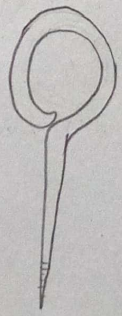

Figure-VIII: Drawspike

Figure-IX: Gatecutter

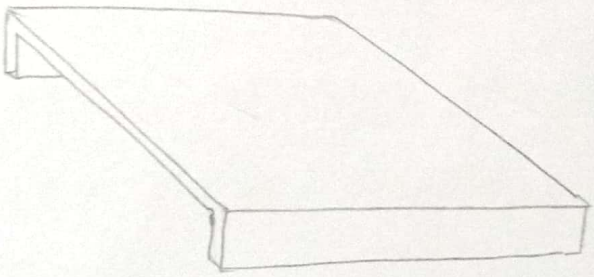

Figure-X: Base

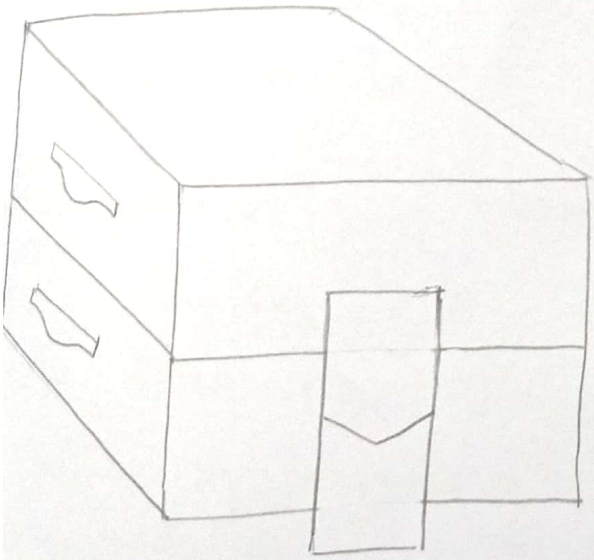

Figure-XI: Molding Box

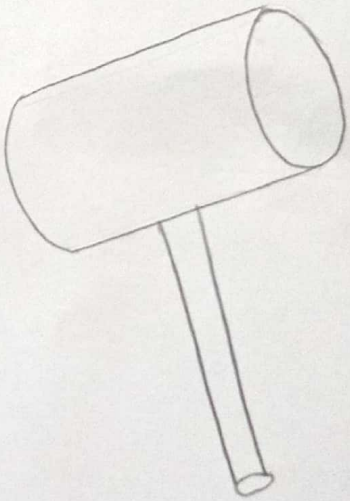

Figure-XII: Mallet.

Discussion:

i. As precautionary measures, aprons were worn and safety measures were discussed in class beforehand.

ii. equipments were checked as to not provide the learners with faulty equipments as it might lead to accidents.

iii. The pattern was placed in the drag part of the molding box. The cope part was placed over the drag part and the parts were seperated using parting sand.

iv. The down gate was carved very carefully using the gate cutter so as to not mess up the mold cavity.

v. Constant supervision of the trainor was ensured.