

A Foundry is a factory that pours molten metal into moulds, producing cast metal objects.

Introduction :

- Casting: Pouring molten metal into a mould with a cavity of the shape to be made and allowing it to solidify.
- When solidified, the desired metal object is taken out from the mould either by breaking the mold (or) taking the mold apart. The solidified object is called the casting.
- By this process, intricate parts can be given strength and rigidity frequently not obtainable by any other manufacturing process.

Pattern :

A pattern is a model or the replica of the object (to be casted). It is embedded in molding sand and suitable ramming of molding sand around the pattern is made. The pattern is then withdrawn for generating cavity in molding sand.

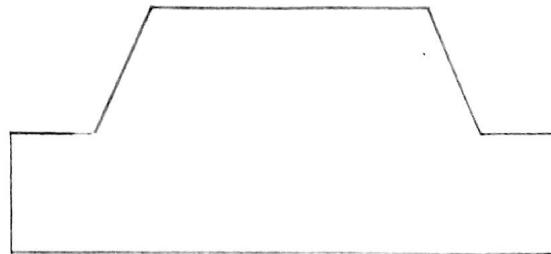
Types of pattern

There are basically two types of patterns

1) single piece (or) solid pattern

Solid pattern is made of single piece without joints, parting lines (or) loose pieces. It is the simplest form of the pattern.

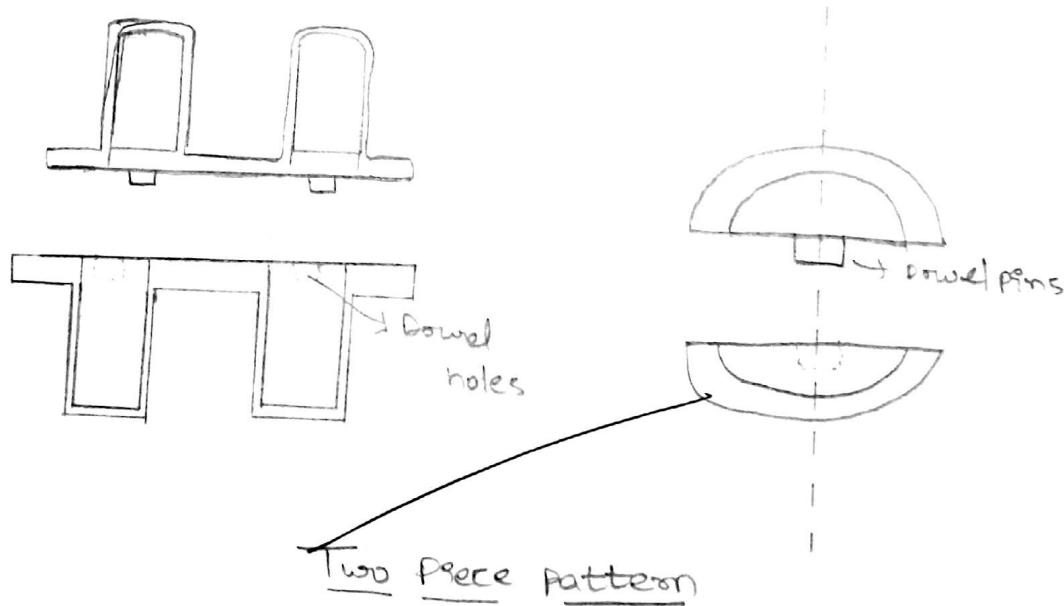




Single piece pattern

Two - Piece (or) split pattern.

When solid pattern is difficult to withdraw from the mold cavity, then solid pattern is split in two parts. Split pattern is made in two pieces which are joined at the parting line by means of dowel pins. The splittings at the parting line is done to facilitate the withdrawal of the pattern.



Molding sand:

The general source of receiving molding sands are the beds of sea, rivers, lakes, granular elements of rock and deserts

kinds of moulding sand.

Moulding sands can also be classified according to their use into number of varieties which are described

below.

- 1) Green Sand: Green sand is also known as tempered or natural sand which is a just prepared mixture of silica sand with 15 to 30% clay, having moisture content from 6 to 8%.
- 2) Dry Sand: Green sand that has been dried (or) baked in suitable oven after the making mold and cores, is called dry sand. It possesses more strength, rigidity and stability.
- 3) Loam Sand: Loam is mixture of sand and clay with water to a thin plastic plate. Loam sand possesses high clay as much as 30-50% and 18% water.
- 4) Facing Sand: Facing sand is just prepared and forms the face of the mould. It is directly next to the surface of the pattern and it comes into contact with molten metal when the mould is poured. Initial coating around the pattern and hence for mould surface is given by this sand.
- 5) Backing Sand: Backing sand or floor sand is used to back up the facing sand and is used to fill the whole volume of moulding sand.
- 6) Parting Sand: Parting sand without binder and moisture is used to keep the green sand not to stick to the pattern and also to allow the sand on the parting surface the cope and drag to separate without clinging.
- 7) Core Sand: Core sand is used for making cores and it is sometimes also known as oil sand. This is highly rich silica sand mixed with oil binders such as core oil which

composed of linseed oil, resin, light mineral oil and other bind materials.

Binders:

In general, the Binders can be either inorganic or organic substance. The inorganic group includes clay, sodium silicate and portland cement etc. In foundry shop, the clay acts as binder which may be kaolinite, ball clay, fire clay, limonite, fuller's earth and bentonite. Binders include in the organic group are dextrin, molasses, cereal binders, linseed oil, and resins like phenol formaldehyde, urea formaldehyde etc.

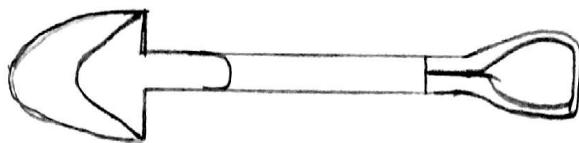
Additives:

Additives are the minerals generally added to the molding and core sand mixture to develop some special property in the sand. Some common used additives are.

1. Coal dust: Coal dust is added mainly for producing a reducing atmosphere during casting.
2. Corn flour: It belongs to the starch family of carbohydrate and is used to increase the collapsibility of the molding and core sand.
3. Dextrin: Dextrin belongs to starch family of carbohydrates that behaves also in a manner similar to that of the corn flour. It increases dry strength of mould.

Hand tools used in foundry shop

Shovel: It consists of a steel pan fitted with a long wooden handle. It is used in mixing, tempering and conditioning the foundry sand by hand. It is also used for moving and transforming the moulding sand to the container and molding box (or) flask.



shovel

Hammers

These are required for stroking the molding sand mass in the molding box to pack or compact it uniformly the pattern.



hammers

Sprue pin

It is a tapered rod of wood or iron which is placed (or) pushed in cope to join mold cavity while the molding sand in the cope is being hammered.

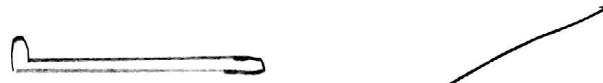


sprue pin

Trowels: These are used for (levelling) finishing flat surfaces and corners inside a mould. Common shapes of trowels are shown as under. They are made of iron with a wooden handle.



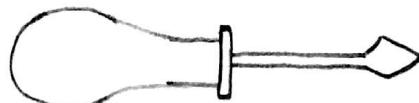
Lifter: A lifter is a finishing tool used for preparing the mould and finishing the mould stand. Lifter is also used for removing loose sand from mould.



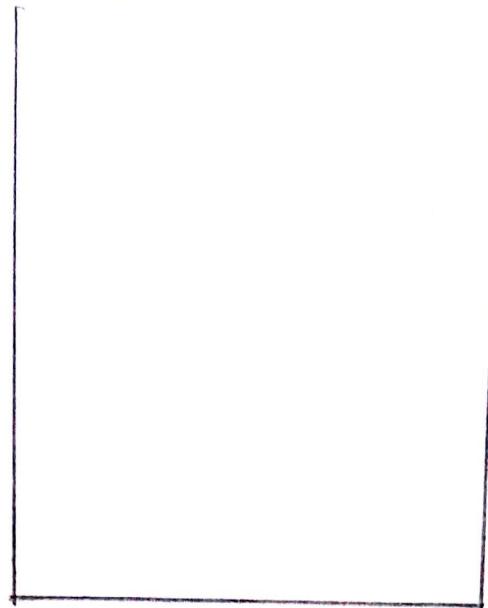
strike off Bar: It is a flat Bar, made of wood (or) iron to strike off the excess sand from top of a box after ramming. Its one edge made beveled and the surface perfectly smooth and plane.



Vent wire: It is a thin steel rod carrying a pointed edge at one end and a wooden handle (or) a bent loop at the other.



Casting terminology:



?

Core: A separate part of the mold, made of sand and generally baked, which is used to create openings and various shaped cavities in the castings.

Pouring basin: A small funnel shaped cavity at the top of the mold into which the molten metal is poured.

Sprue: The passage through which the molten metal, from the pouring basin, reaches the mold cavity. In many cases it controls the flow of metal into mold.

Runners: The channel through which the molten metal is carried from sprue to the gate

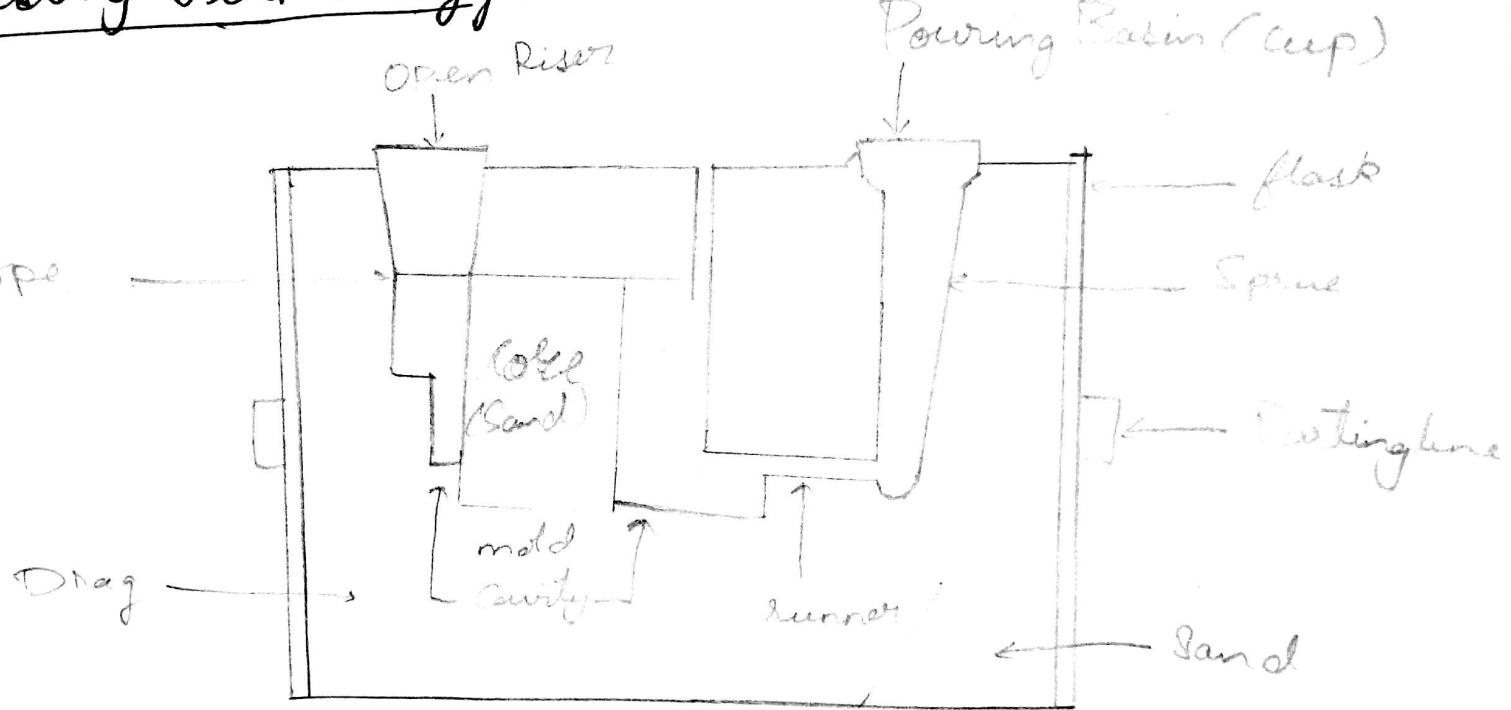
Gate: A channel through which the molten metal enters the mold cavity.

Chaplets: Chaplets are used to support the cores inside the mold cavity to take care of its own weight and over come the metalostatic force.

Riser: A column of molten metal placed in the mold to feed the castings as it shrinks and solidifies also known as feed head.

Casting terms

Casting Terminology :-



* M. I. I. P. & D. H. *

* Mould form split pattern

Aim: To prepare a sand mold, using the given split piece pattern.

Raw materials Required: Moulding sand, Parting sand, facing sand, Baking sand, pattern, bottom board, moulding boxes.

Tools required:

Moulding Board

Drag and cope boxes

Molding sand

Parting sand

Hammer

strike-off Bar

Bellows

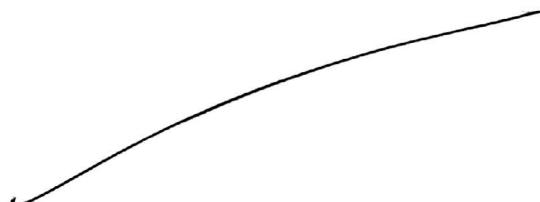
Raser & sprue pens

Gate cutter

Vent Rod

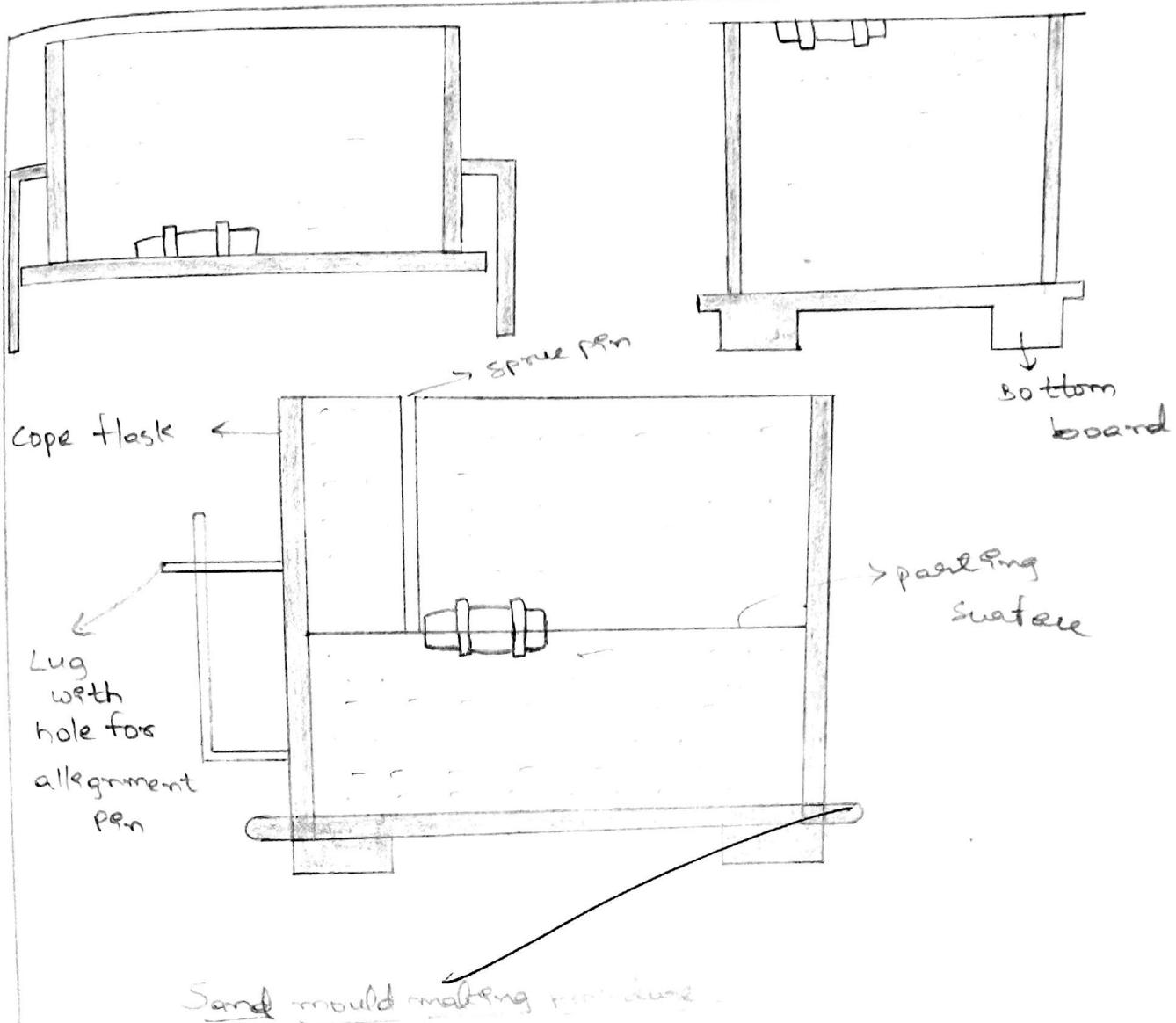
Draw spike

Wire brush



Sequence of operations:

- 1) sand preparation
- 2) placing the mould flask on the moulding board
- 3) placing the split pattern at the centre of the moulding flask
- 4) ramming the drag
- 5) placing the pattern at the centre of the moulding flask
- 6) placing summer and riser
- 7) ramming the cope
- 8) removal of the pattern, summer, risers.
- 9) gate cutting.



- The required mould cavity is prepared using the given

 - 1) place Drag post of the pattern on mould board and fill it with mould sand.
 - 2) Turn drag box upside down and place cope box over the drag box
 - 3) place Cope part of the pattern, risers, sprue, runner in position and fill it with mould sand.
 - 4) Finally the mould cavity is produced by removing the pattern.
 - 5) The mould is ready for pouring molten metal. The liquid metal is allowed to cool and become solid which is the casting desired.

Casting Defects

The following are the major defects, which are likely to occur in sand castings.

- 1) Gas defects
- 2) shrinkage defects
- 3) molding material defects
- 4) pouring metal Defects
- 5) mold shift

Advantages:

- Molten material can flow into very small sections so that intricate shapes can be made by this process. As a result, many other operations, such as machining, forging and welding can be minimized (or) eliminated.
- It is possible to cast practically any material that is ferrous (or) non-ferrous. As the metal can be placed exactly where it is required, large saving in weight can be achieved.
- The necessary tools required for casting molds are very simple and inexpensive. As a result, for production of a small lot, it is the ideal process.
- There are certain parts made from metals and alloys that can only be produced this way.
- Size and weight of the product is not a limitation for the casting process.

Limitations :

- Dimensional accuracy and surface finish of the castings made by sand casting process are a limitation to this technique. Many new casting process have been developed which can take into consideration the aspects of dimensional accuracy and surface finish. Some of these process , vacuum sealed molding process and shell molding process
- The metal casting process is a labour intensive process.