

FOUNDRY SESSIONAL



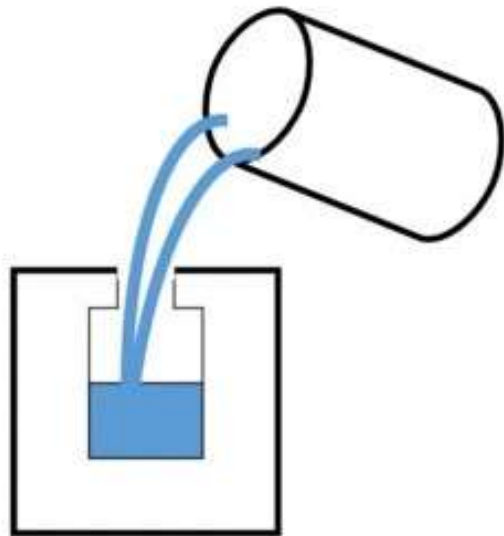


General Foundry Safety

- ❑ Before using any equipments or materials, proper knowledge of its usage is required.
- ❑ Wear leather shoes, gloves, and safety glasses while working in an foundry environment.
- ❑ Foundry furnaces, crucibles, and metals are at very high temperature, remain cautious while you work.
- ❑ Be conscious of where your hands are when working with conveyors and automated machinery.
- ❑ Molten metal that is spilled can travel a great distance, so keep the work area clear.
- ❑ Melting metal create fumes that can be hazardous to breathe.
- ❑ Molding sand contains silica. Silica dust exposure can lead to silicosis, a lung disease, or lung cancer.

FOUNDRY

Foundry is a manufacturing process in which molten metal is poured into a mould cavity & on solidification of it we get our casting or cast job.



It involves a series of operations

- ✓ Pattern making
- ✓ Core making
- ✓ Mould making
- ✓ Melting
- ✓ Pouring
- ✓ Cleaning

TYPES OF FOUNDRIES

- Based on material
 - Ferrous , Non ferrous, gray Iron, Steel, Brass, Light metal
- Based on nature and Organisational Framework
 - Jobbing foundry(A foundry that creates a wide variety of castings, in small quantities for a range of customers)
 - Production foundry
 - Semi Production foundry
 - Captive foundry(A foundry operation that is wholly incorporated into a larger manufacturing operation)

PATTERN

A Pattern is a replica of a casting along with some allowances.



PATTERN ALLOWANCES

- i) Shrinkage allowance
- ii) Machining allowance
- iii) Draft allowance
- iv) Distortion allowance

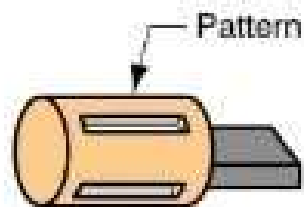
❑ Pattern materials:

- ❖ Wood - common material because it is easy to work, but it warps
- ❖ Metal - more expensive to make, but lasts much longer
- ❖ Plastic - compromise between wood and metal
- ❖ Plaster of Paris
- ❖ Wax - precision casting

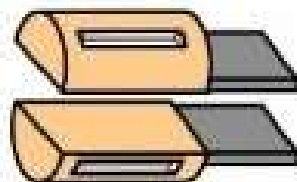
Types of Patterns

Types of patterns used in sand casting:

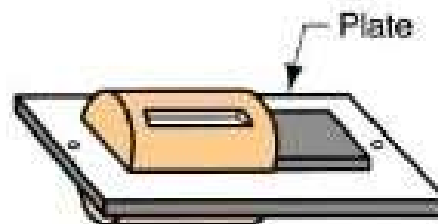
- (a) solid pattern
- (b) split pattern
- (c) match-plate pattern
- (d) cope and drag pattern



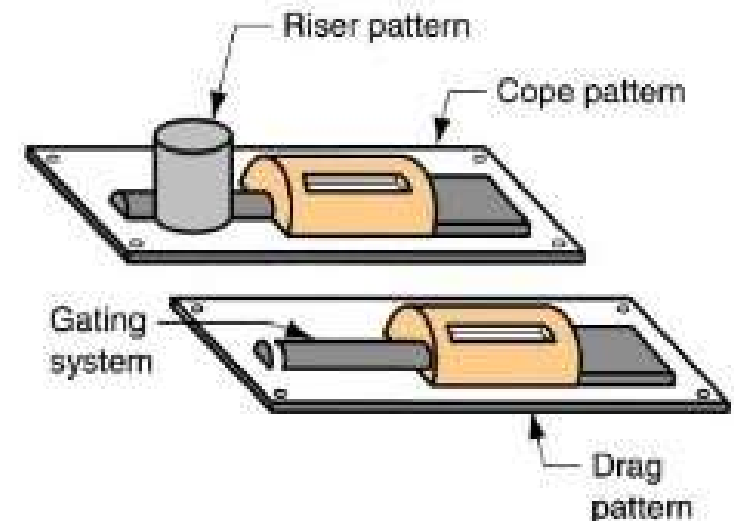
(a)



(b)

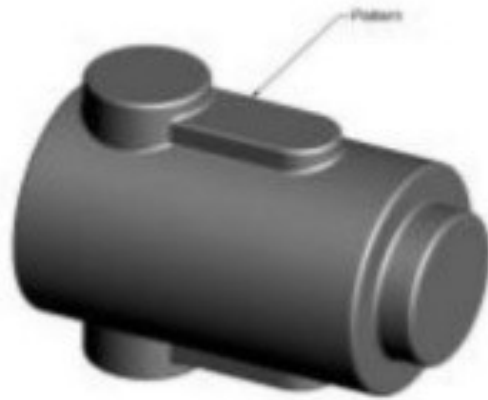


(c)



(d)

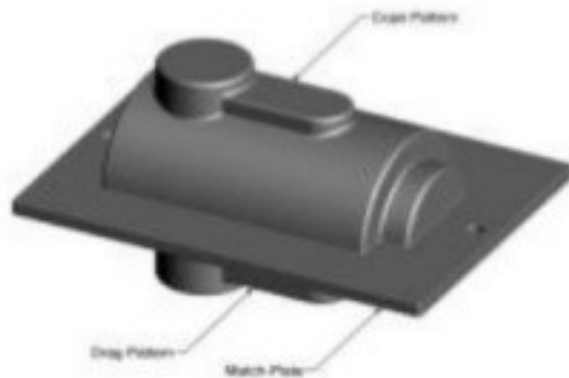
Pattern Making



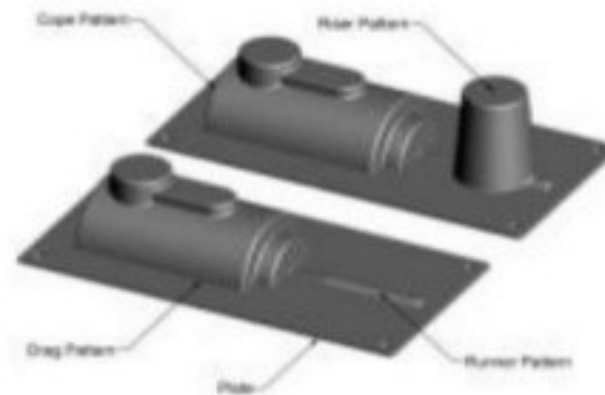
One piece or Solid Pattern



Split Pattern



Match Plate Pattern

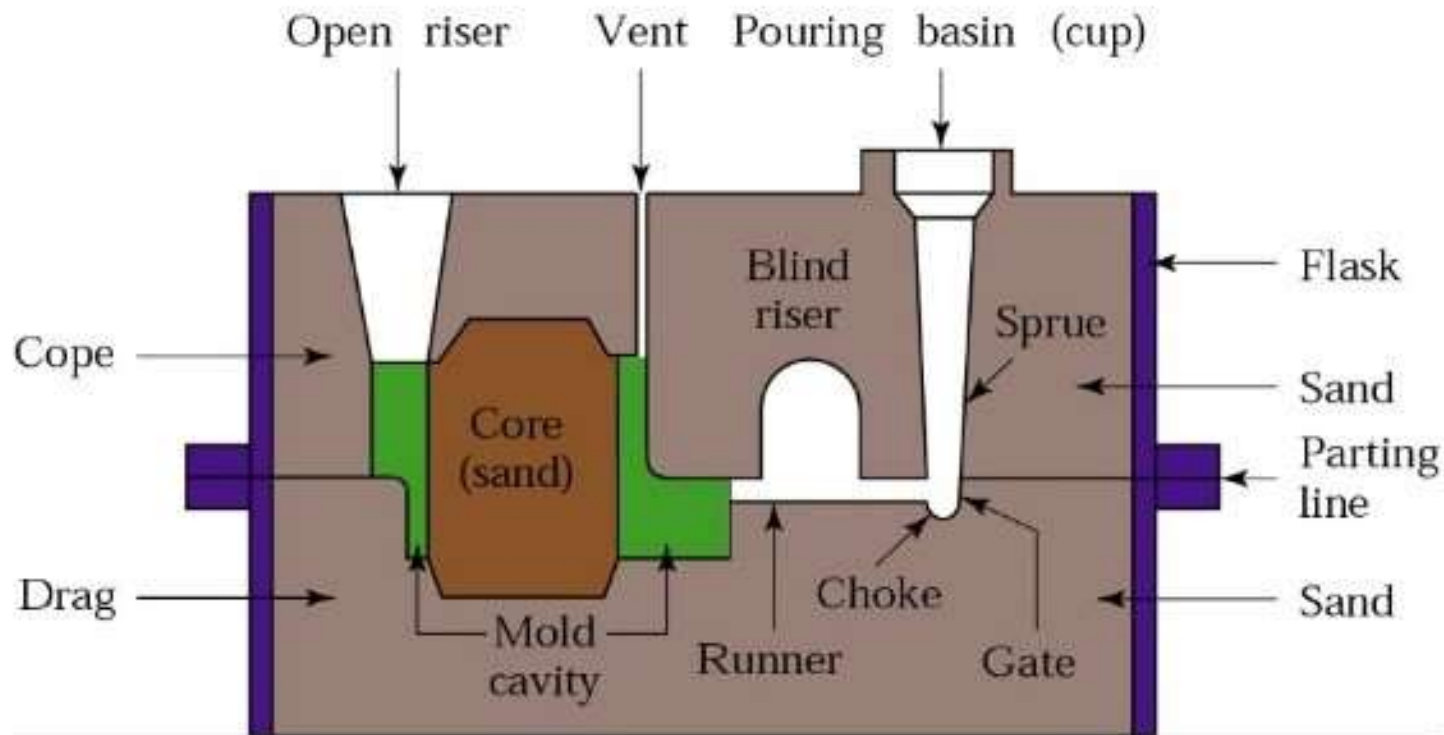


Cope & Drag Pattern

CASTING TERMINOLOGY

Key terms:

Flask, Cope, Drag, Sprue, Runner, Gate, Riser, Mold Cavity, Core, Parting Line, Draft (not shown).



FOUNDRY SHOP

POURING
BASIN

LADLE

SPRUE

RISER

SPRUE
- WELL

RUNNER

INGATE

CAST
JOB

- МЕГГ.

2 КЛОБ

ВНИИЕР

INGATE

JOB

SV21

MOLDING SAND

The constituents of molding sand are :-

- ☐ Silica Sand
- ☐ Bentonite Powder
- ☐ Water
- ☐ Additives



Properties Of Molding Sand :-

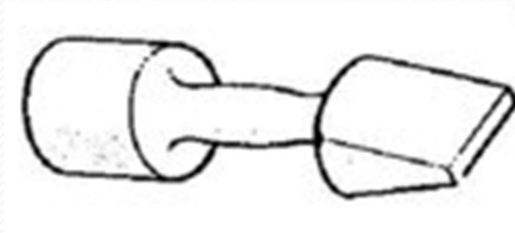
- ☐ Permeability
- ☐ Cohesive & Adhesive Strength
- ☐ Moldability
- ☐ Refractoriness
- ☐ Reusability



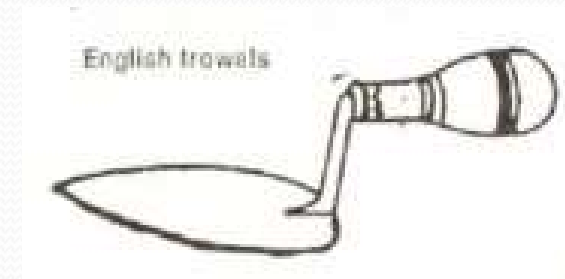
HAND TOOLS USED IN MOLDING

❑ Moulding Boxes : Cope & Drag Box

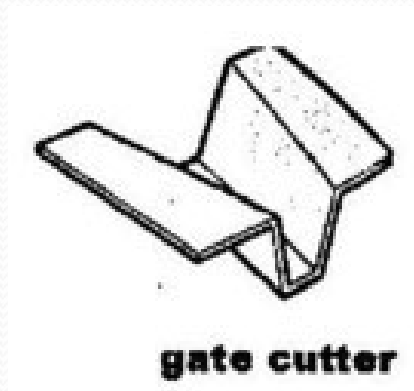
❑ Rammer



❑ Trowels



❑ Strike Off Bar



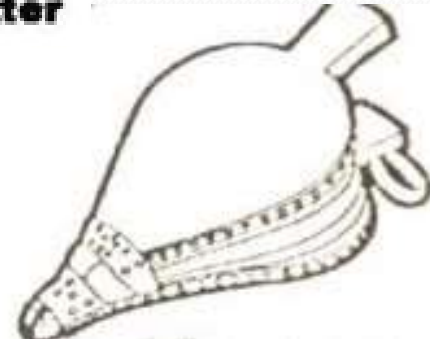
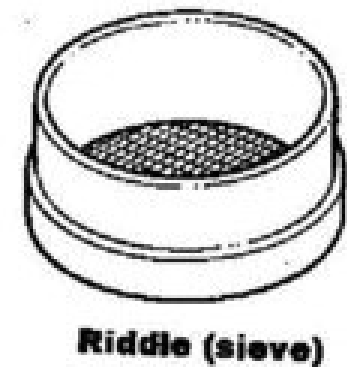
❑ Vent wire

❑ Draw spike

❑ Gate Cutters

❑ Bellows

❑ Riddle

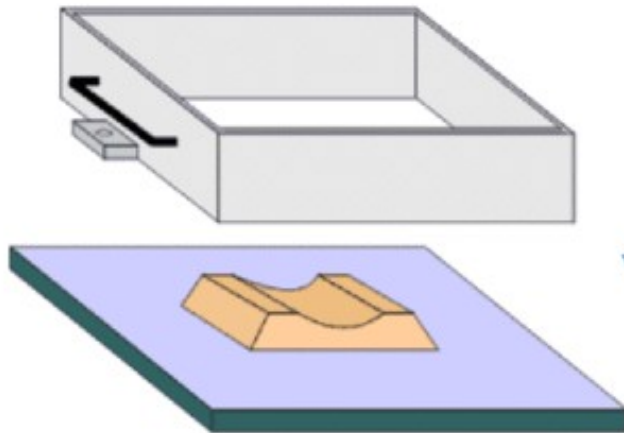


MOULDING PROCEDURE

Preparation of sand mould

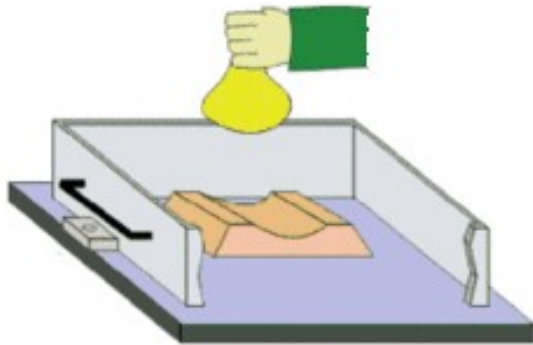
SAND CASTING

- ✓ Before any casting can take place a **wooden pattern** is made precisely.
- ✓ This is called pattern making and in industry this is a very skilful job.
- ✓ Any inaccuracy at this stage will result in the final cast being wrong or even failing.

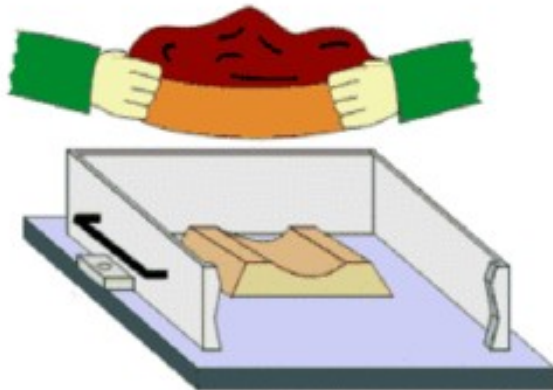


- ✓ **Drag** is placed inverted on the mould floor and pattern is placed at the center of the box

Preparation of sand mould

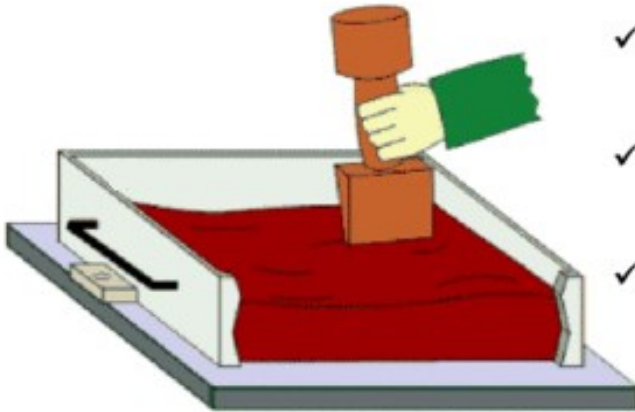


- ✓ Special casting sand will soon be packed around the pattern for easy removal of pattern from parting powder is sprinkled over and around it.
- ✓ It stops the casting sand sticking to the pattern and pulling away with it when the pattern is finally removed from the sand.

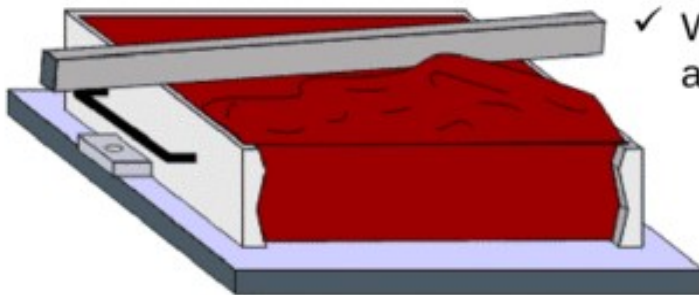


- ✓ Casting sand is then shaken through a sieve (called riddled sand) so that only fine particles fall around the pattern.
- ✓ This is called facing sand and it must be fine so that detail on the pattern shows up on the final casting.

Preparation of sand mould



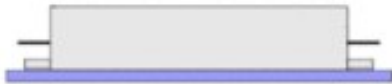
- ✓ The drag is then packed with more casting sand and then ram it down firmly using a ramming tool.
- ✓ The tool has two ends, one is cylindrical and is used for general packing down of the sand.
- ✓ The other end is quite pointed and this can be used for packing sand close up to the pattern.



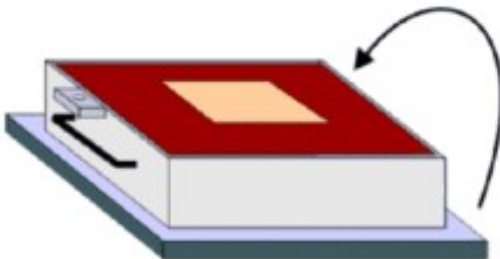
- ✓ When the drag is packed fully it is levelled off (called 'strickled off') using a straight steel bar.

Preparation of sand mould

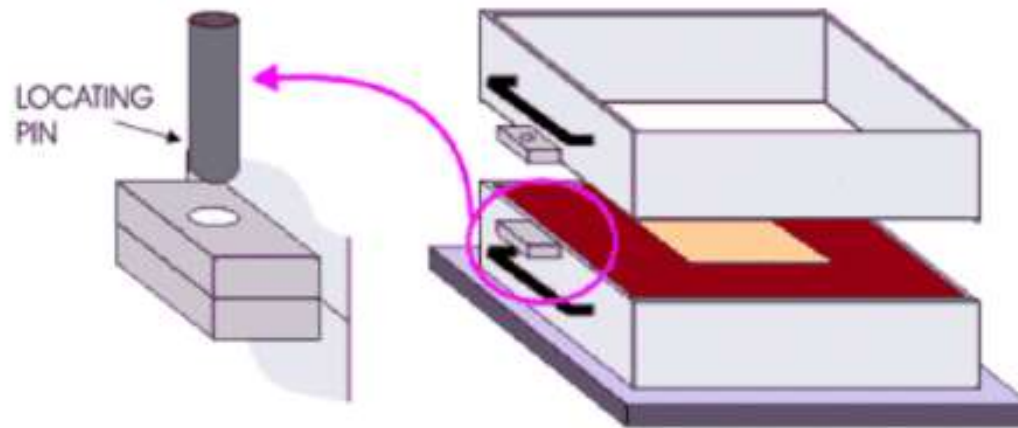
START



- ✓ The entire drag and its contents are then turned over so that the base of the pattern can be seen

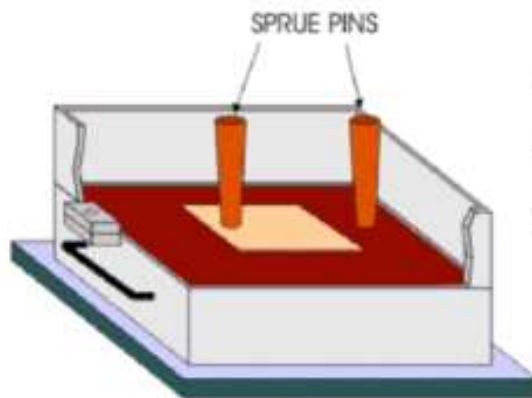


Preparation of sand mould

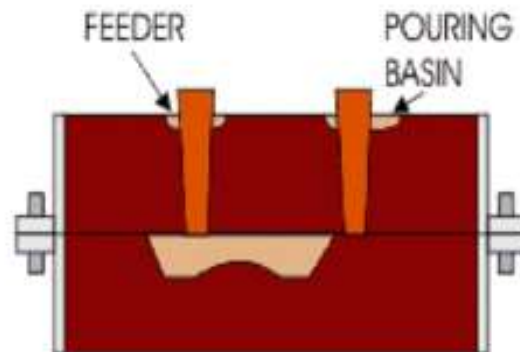
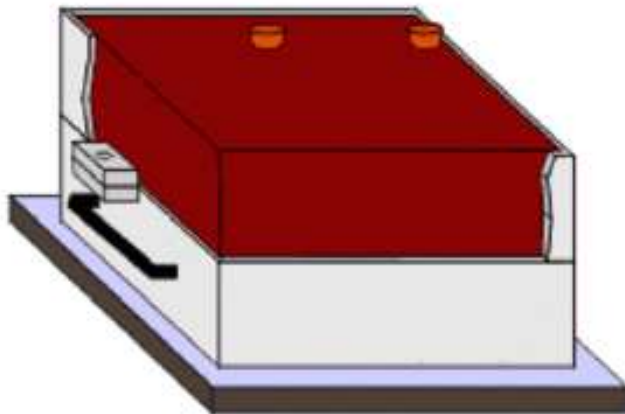


A **top box** called a '**cope**' is then placed on top of the drag and **locating pins** are put in position so that the casting boxes ***cannot move sideways***

Preparation of sand mould

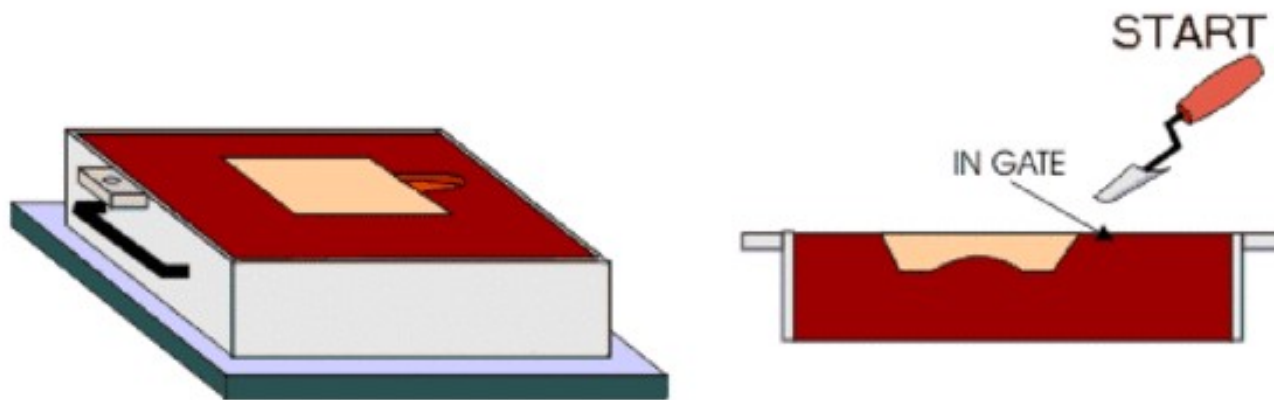


- ✓ Sprue pins are positioned.
- ✓ One usually on the back of the pattern and the other to the side.
- ✓ These will eventually provide an entrance and exit for the molten aluminium when it is poured into the sand.



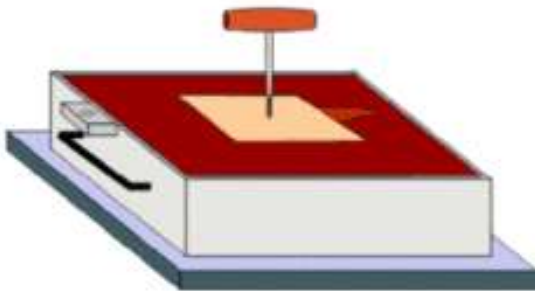
- ✓ The sand is packed/rammed into the cope in the same way as the drag

Preparation of sand mould

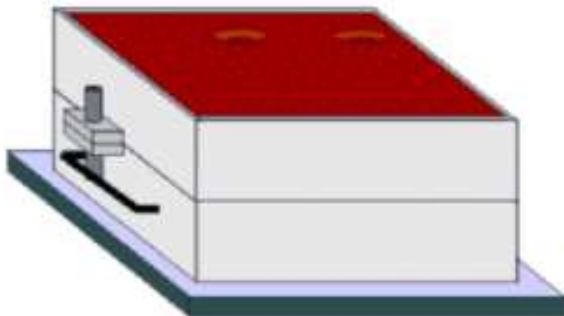


- ✓ The **top box (the cope)** is then removed and if all is well the cope with the sand inside should lift off the **drag (bottom box)** without the sand falling out.
- ✓ A small '**gate**' is cut below the position of one of the **Sprue pins**.
- ✓ This will help the molten metal to flow into the cavity left by the mould.
- ✓ Small tools are available or can easily be made to dig a variety of shapes in the casting sand.
- ✓ They are similar to small **trowels**

Preparation of sand mould

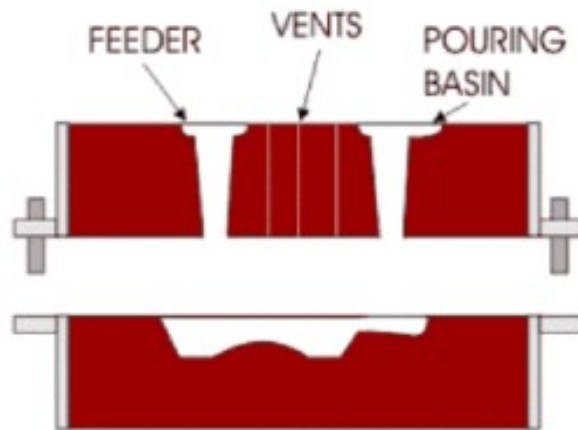


- ✓ The pattern is removed using a 'spike'.
- ✓ Before removing the pattern it is a good idea to gently tap the spike so that it loosens the pattern from the sand.
- ✓ It can then be lifted away from the casting box (drag).



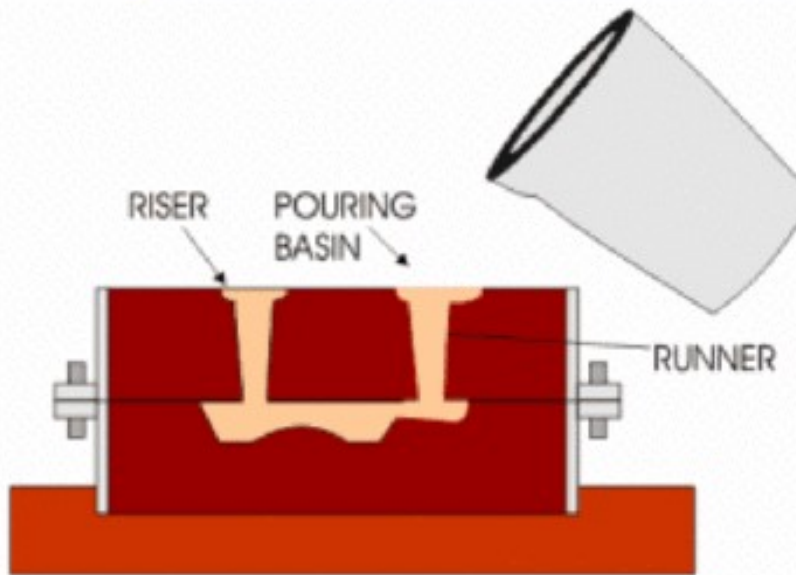
- ✓ The cope (top casting box) is placed back on top of the drag and the locating pins put in position.

Preparation of sand mould

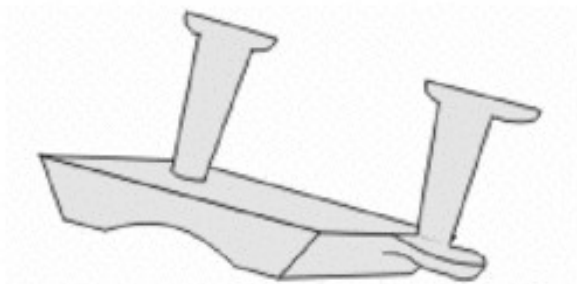


- ✓ Vents can be created using a thin piece of welding rod, pushing it through the sand
- ✓ This allows gases to escape once the molten metal is poured.

Preparation of sand mould



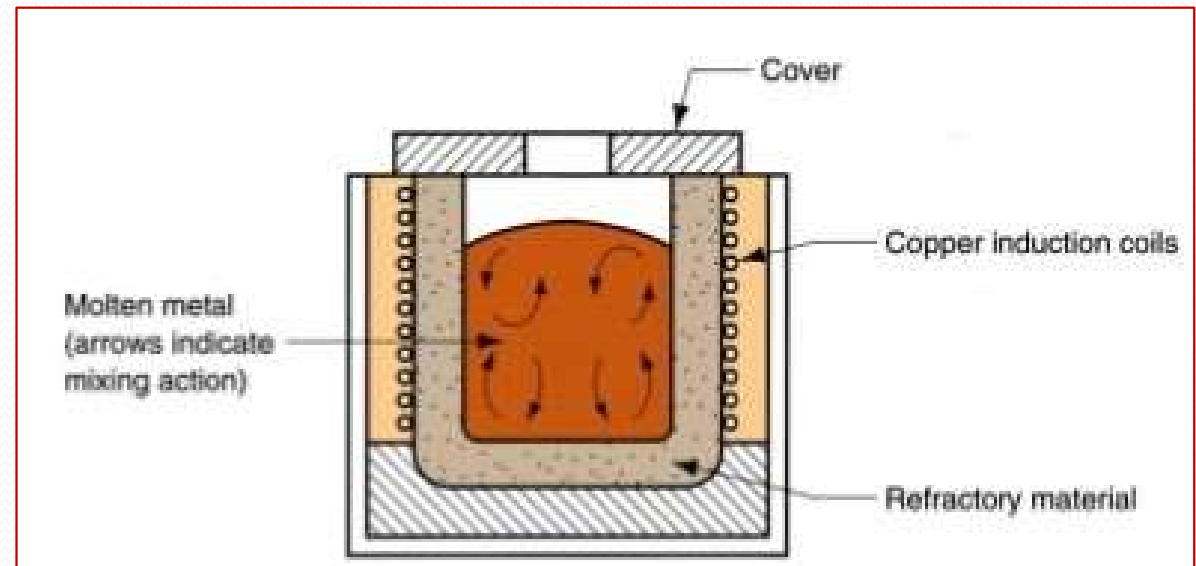
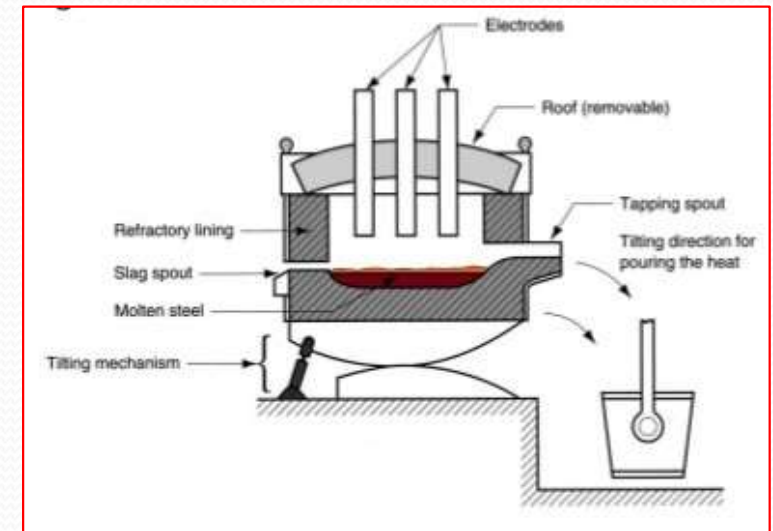
- ✓ The molten metal is poured with great care.
- ✓ The molten metal is poured down the hole left by the first **Sprue pin** (now called the '**runner**').
- ✓ As it runs down the runner it flows through the 'gate' cut by the trowel, into the cavity left by the pattern and up the riser (the hole left by the second Sprue pin).



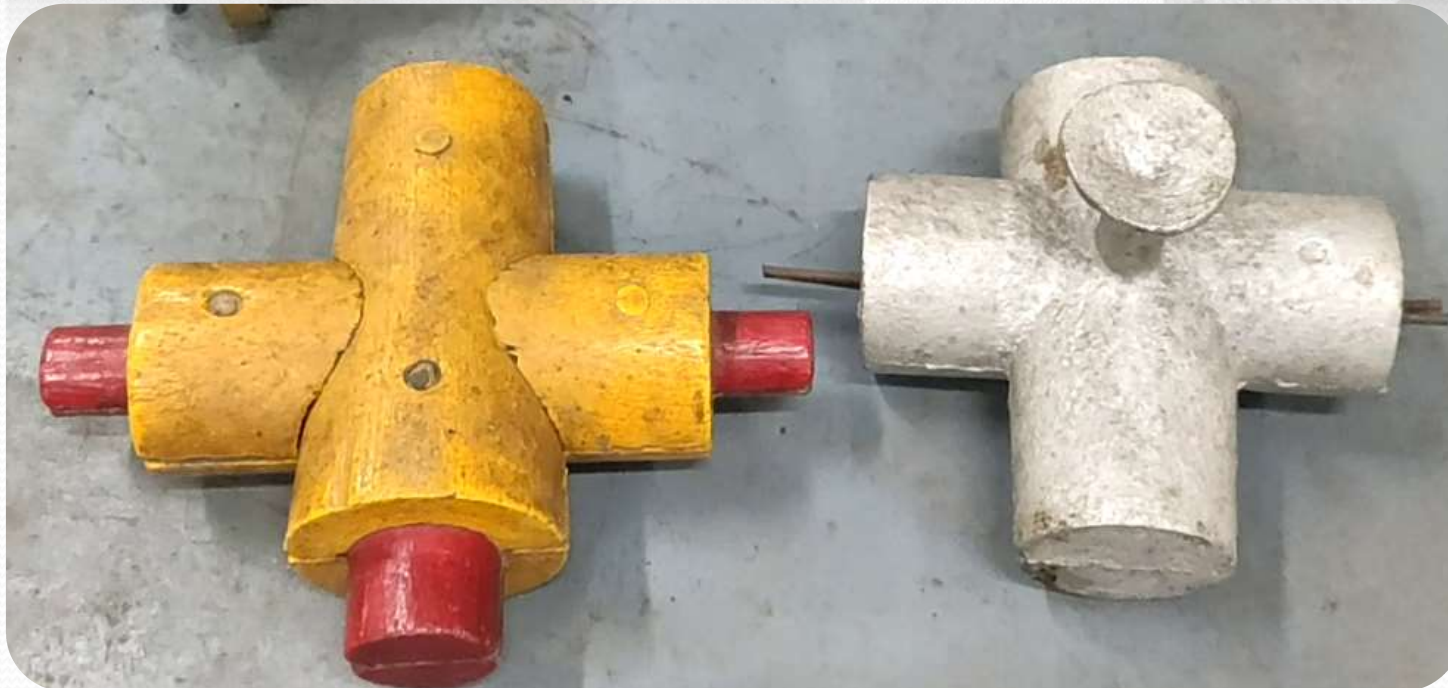
- ✓ The casting should be left for at least an hour before removal from the sand
- ✓ When removed from the sand, the runner and riser are cut away and the casting is ready for machining

FURNACES FOR CASTING PROCESSES

- ❑ CUPOLAS
- ❑ CRUCIBLE FURNACES
- ❑ ELECTRIC ARC FURNACES
- ❑ INDUCTION FURNACES



FINAL CAST JOB



Challenges With Casting

- Several defects can develop in castings
 - Most can be avoided with proper design and processing techniques
-
- Metallic Projections - fins, flash, rough surface
 - Too high pressure
 - Improper mating mold pieces
 - Cavities - pockets caused by shrinkage or gases
 - Can be controlled by adding flux
 - Discontinuities – includes cracks, cold/hot tearing, and cold shuts
 - Constrained cooling
 - Molten metal too low temperature

A handwritten Project Report is to be submitted covering the following points

- ☐ Definition of Foundry with its Classification.
- ☐ Definition of Pattern with its Classification.
- ☐ Tools & Equipments used for Molding.
- ☐ Molding process in brief.
- ☐ Casting Defects.