

SPLIT PATTERN CASTING PROCESS WRITE-UP

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INTRODUCTION:

Casting is the process consists of introducing the molten metal into a cavity called mould and allowed to solidify, when it is removed from the mould, the casting is of same shape but slightly smaller, due to contraction of metal, we take this contraction also into account by providing an allowance called shrinkage allowance.



Advantages of Casting:

1. Casting is very cost-effective process.
2. Operation is speedy.
3. Even better accuracy and tolerance can be obtained by some special casting process.

Limitations:

1. One needs to take care of allowances.
2. Uneconomical for small run and simpler shapes.
3. Even we need to take care of shrinkage factor as per the moisture level of the sand used in casting.

Moulding sand:

It is a special type of sand used to prepare mould.

Composition of Moulding sand:

1. Sand:

It has Silica, clay and moisture.

It has 80-90% Silicon Dioxide.

It has 5-20% clay.

In general, 2-8% water is added to the soil.

2. Binder:

It adds the property of cohesiveness.

There are 3 types of binder:

(i) Clay type binder (Ex. Bentonite)

(ii) Organic binder (Ex. Resin)

(iii) Inorganic binder (Ex. Sodium Silicate)

3. Moisture:

Moisture improves the binding property of moulding sand. Nearly 6 to 10% moisture is added to the moulding sand.

3. Additive:

It increases the properties like strength, permeability etc.

Ex. Sea coal, Saw coal, Cow dung, Silica flour.

Types of Moulding Sands:

1. Green sand:

It is the mixture of silica sand with 18-30% clay and having having the moisture content from 6-8%. Clay and water give cohesive strength to the moulding sand.

It is porous, retains shape as well as provides good surface finish to the casting.

2. Parting sand:

It is the sand with very coarse grains. It is used in separating the two layers of the moulding sand while preparing the mould.

Green Sand Mould



Properties of Moulding Sand:

1. Porosity: Allows hot gases to pass through.
2. Flow ability: Allows sand to flow.
3. Cohesiveness: Ability of sand particles to stick to each other.
4. Adhesiveness: Ability of sand to stick to sides of moulding box.
5. Refractoriness: Ability of sand to withstand high temperatures.

Pattern allowances:

1. Shrinkage and contraction allowance:

When the molten metal solidifies and cools down, its size is reduced due to contraction.

2. Machining and finishing allowance:

The work piece produced by casting are not of accurate size and has a bad surface finish too.

3. Draft allowance:

When a pattern is drawn from a mould, there is always some possibility of injuring the edges of the mould.

4. Distortion allowance:

Due to the variable thickness of the casting, uneven shrinkage occurs resulting in the bending of the job.

5. Rapping allowance:

When the pattern is removed from the mould, the cavity is slightly increased in size.

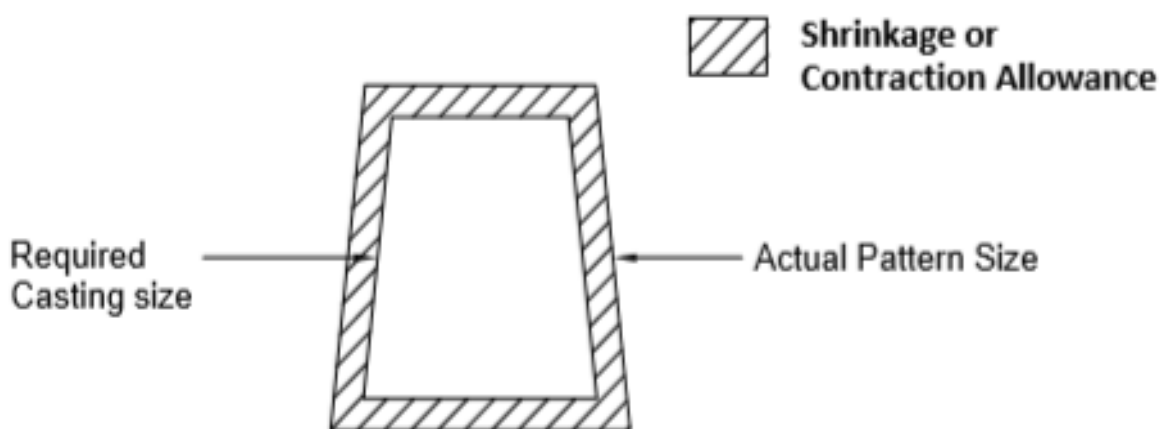


Figure. Shrinkage or contraction Allowance

Different types of patterns:

1. One piece pattern:

This pattern is the single piece without any joint.

2. Split pattern:

This pattern consists of two parts. One part makes the cavity in the cope and the other in the drag. The alignment between the two parts is governed by the dowel pins.

3. Loose piece pattern:

Some patterns cannot be withdrawn once they are embedded in the moulding sand. Such patterns are made with one or more loose pieces to facilitate their removal from the mould.

4. Match plate pattern:

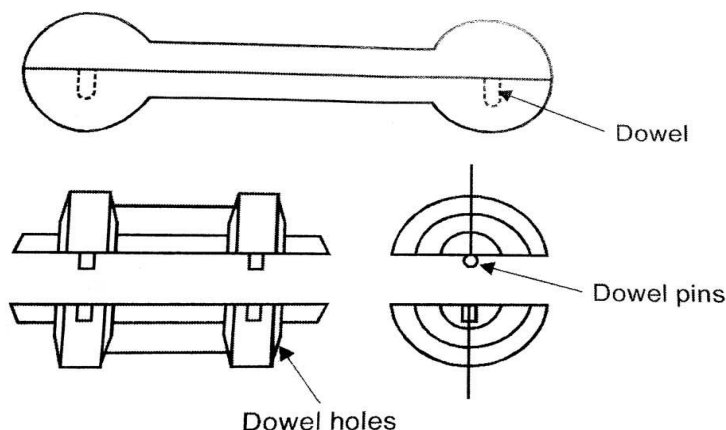
When a split pattern is mounted with one half on one side of the plate and the other half directly opposite on the other side of the plate.

Basics steps in casting process:

1. Pattern making
2. Core making
3. Mould making (Moulding)
4. Melting and pouring
5. Solidification and mould-breaking
6. Cleaning and finishing

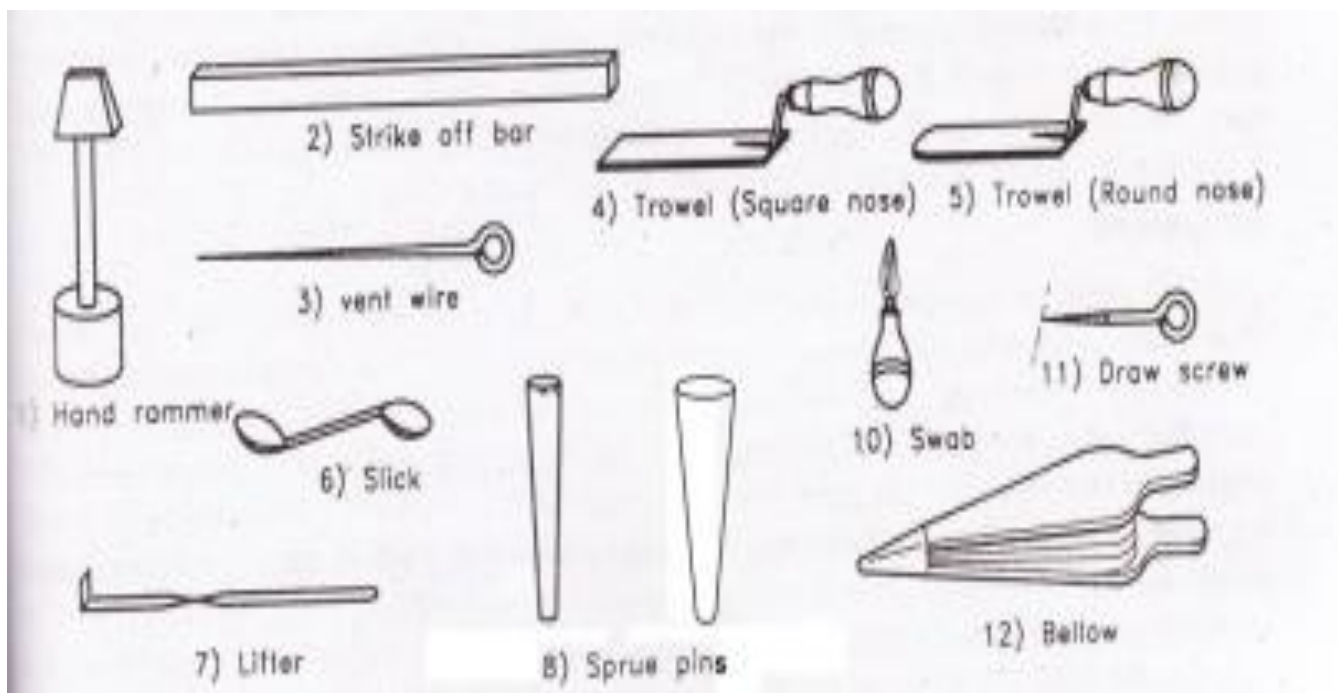
Two piece or Split piece pattern:

Many patterns cannot be made in a single piece because they cannot be removed from the mould. To eliminate this problem, some patterns are made in two parts. The lower half or pattern rests in the drag (Lower moulding flask) while the upper half of the pattern is in the cope (Upper moulding flask). The two halves of the pattern should be aligned properly by making use of dowel pins which are fitted to the (Upper half) Cope half of the pattern. These dowel pins match with the precisely made hole in the (Lower half) Drag half of the pattern.



Moulding Tools:

1. Shovel: Used for mixing and tempering moulding sand
2. Riddle: Consists of a circular or square wooden frame fitted with a standard wire mesh at the bottom & is used for removing foreign materials from the moulding sand.
3. Rammer: Wooden tool uses for packing or ramming the sand into the mould.
4. Trowel: Consists of a metal blade fitted with a wooden handle, trowels are employed in order to smooth or sleek over the surface of moulds.
5. Strike -off bar: Piece of metal or wood with a straight edge & is used to strike-off excess sand from the mould after ramming to provide a level surface.
6. Sprue pin: Tapered peg pushed through the cope to join the moulds, as the peg is withdrawn it removes the sand, leaving an opening for the metal.
7. Bellow: Used to blow loose particles of sand from the pattern and the mould cavity.
8. Swab: Small brush having long hemp fibers a bulb swab has a rubber bulb to hold the water and a soft hair brush at the opening end.
9. Gate cutter: Small piece of tin plate shaped such as to cut the gate for removal of extra metal.
10. Mallet: A raw hide mallet is used to loosen the pattern in the mould so that it can be withdrawn without damage to the mould.
11. Vent rod: A vent rod or wire shaped is used to make a series of small holes to permit gases to escape while the molten metal is being poured.
12. Draw spike or screw: It is pointed steel rod, with a loop at one end. It is used to rap and draw patterns from the sand.
13. 10 Spirit level: Used by the moulder to ensure that his bed of sand moulding machine table is horizontal.



WRITE UP / EXPERIMENT-1

AIM:

To prepare a sand mould and dumbbell pattern using split piece pattern.

MATERIALS REQUIRED:

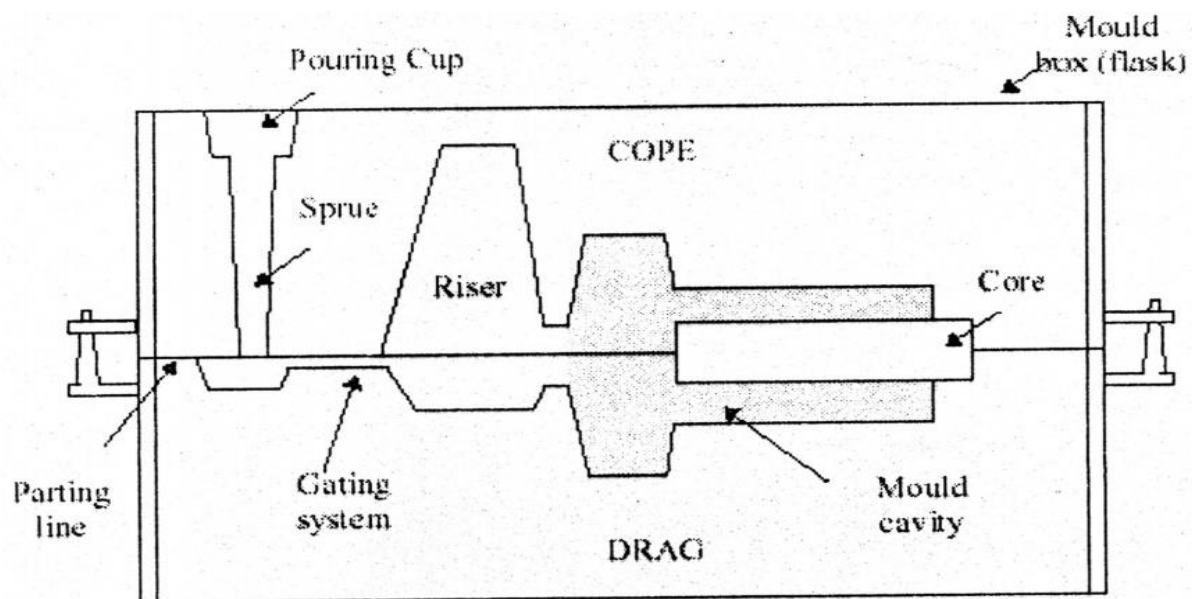
Moulding sand, Parting sand, Facing sand, Moulding boxes, 2 pieces of dumbbell shape or pattern etc.

TOOLS REQUIRED:

Showel, Sieve, Trowel, Rammers, Sprue pin, Strike off bar, Lifter, Gate cutter, Runner, Riser, Vent rod, Draw spike, Bellow etc.

SEQUENCE OF MAKING THE MOULD:

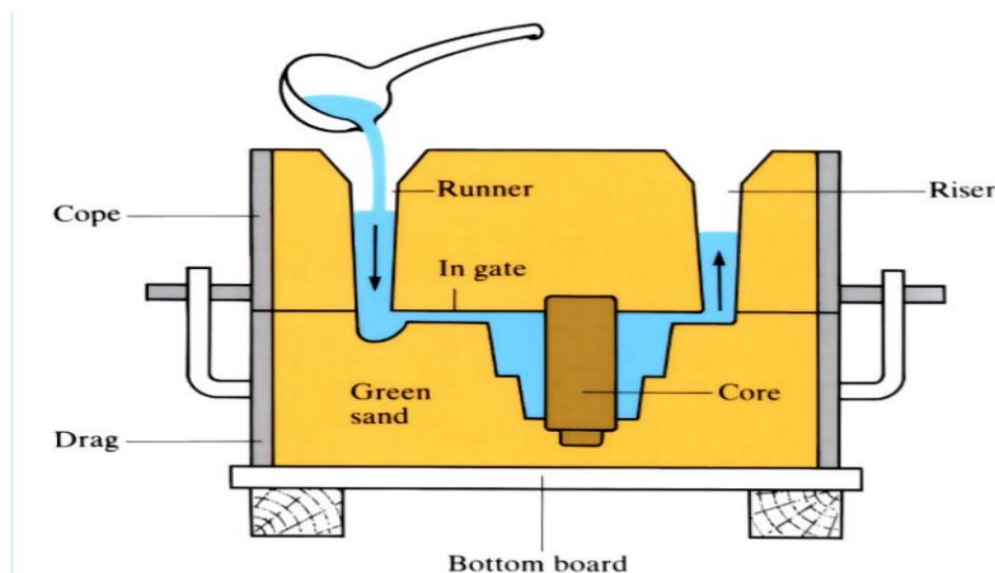
1. Sand preparation
2. Core preperation
3. Placing the pattern on the moulding board
4. Ramming of drag
5. Placing runner and riser
6. Ramming of cope
7. Removal of pattern, runner, riser and then Gate cutting



Cross-section of a typical two-part sand mold

PROCEDURE:

1. As we know, cope and drag don't have fix top or bottom.
2. We place the moulding flask (drag) on the board/table.
3. We place one part of the fixed pattern in the moulding flask (drag).
4. Then we sprinkle the facing sand on the part of the fixed pattern so that the pattern will not stick on the mould cavity and we will easily remove the pattern.
5. Then we put the green sand in the moulding flask (drag).
6. We use the Ramming process to tightly compact the green sand in the mould.
7. For ramming the corners we use pin rammer.
8. Then repeat the process 5-7 up to when the moulding flask (drag) is totally filled with the green sand.
9. Clean the strike-off bar and then by using the strike-off bar remove the excess amount of green sand.
10. Then reverse the whole moulding flask (drag) and put the second half of the pattern on the first half pattern properly.
11. Then place the other moulding flask (cope) on the first moulding flask (drag) properly.
12. Then we took 2 pins for making the sprue (broader one pin) and riser in the mould.
13. Place the sprue pin away from the pattern and the riser on the pattern.
14. Sprue is used to fill the molten metal in the mould cavity and riser will act as reservoir when the molten metal compact and shrinks.



15. Then put parting sand on the pattern and on the green sand of the drag because it is also used to divide cope and drag parts.
16. Then put the green sand in the moulding flask (cope).
17. We use the Ramming process to tightly compact the green sand in the mould.
18. For ramming the corners we use pin rammer.
19. Then repeat the process 16-18 up to when the moulding flask (cope) is totally filled with the green sand.
20. Clean the strike-off bar and then by using the strike-off bar remove the excess amount of green sand by taking special care of sprue and riser.
21. Safely remove the pins of sprue and riser by twisting them with care.
22. Then remove the cope from drag.
23. We can easily see the expression of the sprue pin on the drag.
24. Mark the impression of the sprue pin on the pattern forming a gate.
25. Remove the sand and make the gate for the liquid metal from the above expression with proper scaling.
26. Loose the pattern and then safely remove the pattern after shaking and wrapping form the moulding flasks with due care.
27. Now we are left with cavity of the pattern (With negative shaking allowance).
28. With the help of smoother we shape the cavity with appropriate structure or pattern.
29. Now place the cope on the drag.
30. Make vent hole by a simple thin rod for the exit of gases.
31. Vent holes are very important because if we don't provide vent holes then the gases may damage the mould and we don't get the desired pattern.
32. Now fill the liquid metal from the sprue with due care and let it solidify.
33. After solidification remove the cope from the drag.
34. Then remove the pattern from the drag.
35. Now removed pattern consists of gate, sprue and riser.
36. After that remove the gate, sprue and riser by different processes and we left with the desired pattern.

THANKS FOR READING !!!!!