

Casting a propeller, a really big one!

18



<https://www.youtube.com/watch?v=Di6fu7F2BxQ>

Casting a mirror

19



<https://www.youtube.com/watch?v=M2f4zepwcy8>



GIANT MAGELLAN
TELESCOPE

Patterns

20

- A pattern is the replica of the part to be cast, used to prepare the mould cavity.
- Patterns are made of either wood or metal
- Patterns are made somewhat larger than the final job to be produced. This excess in dimensions is referred to as the pattern allowance.
- Pattern allowances are either SHRINKAGE allowance or MACHINING allowance.



Patterns

21

- The **shrinkage allowance** is provided to take care of the contractions of a casting

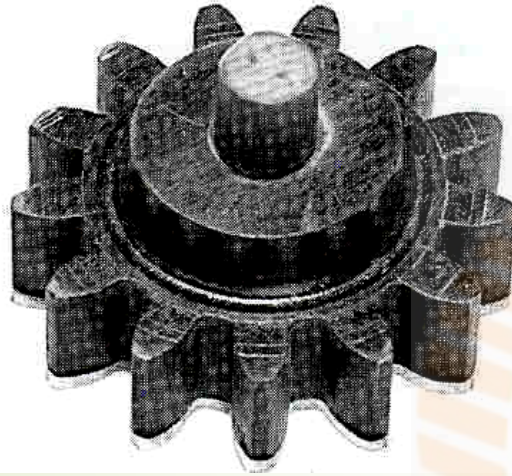
The total contraction of a casting takes place in three stages:

- The contraction of the liquid from the pouring temperature to the freezing temperature
- The contraction associated with the change of phase from liquid to solid
- The contraction of the solid casting from the freezing temperature to the room temperature (taken care of by the shrinkage allowance)



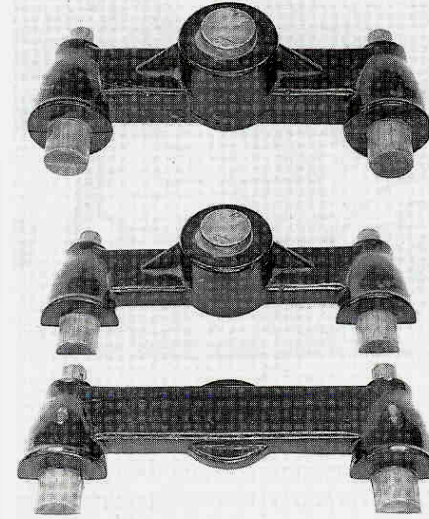
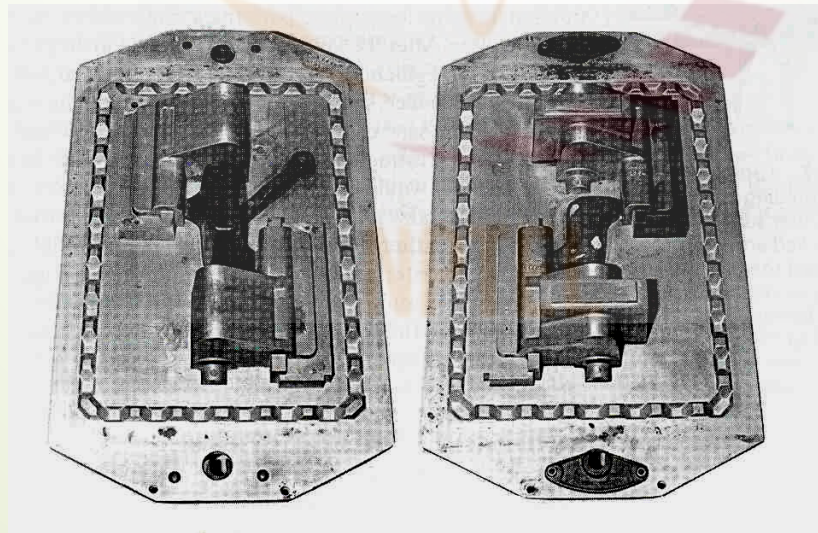
PATTERNS

22



Single

Split



Match Plate

➤ Single-piece patterns

- Simplest, least expensive
- Used when only a limited number of castings required

➤ Split patterns

- Permit molding of more complex shapes in moderate numbers

➤ Match-plate patterns

- Obtained by attaching two halves of a split pattern on opposite sides of a match plate
- Can be used for large number of castings



■ Cope and drag patterns

- Two halves of split patterns mounted on two match plates
- Usually preferred for heavy castings



Shrinkage and Machining Allowances

25

The amount of shrinkage allowance depends on the linear coefficient of thermal expansion (directly proportional)

$$\text{Shrinkage Allowance} = \alpha_l l (\theta_f - \theta_0)$$

where, α_l is the linear coefficient of thermal expansion of the material

θ_f is the freezing point of the material

θ_0 is the room temperature

l is the length of the casting

Machining Allowance

Machining operations are usually performed after casting. The excess in the dimensions of the casting over those of the final job to take care of the machining is called the Machining Allowance (depends on the material and the overall dimension of the job)

DRAFT refers to a taper put on the surface parallel to the direction of withdrawal of the pattern from the mould cavity (0.5 – 2 degrees)



Moulds

26

➤ Moulds can be classified on the basis of either the material:

- Green Sand Mould
- Plastic Mould
- Metal Mould

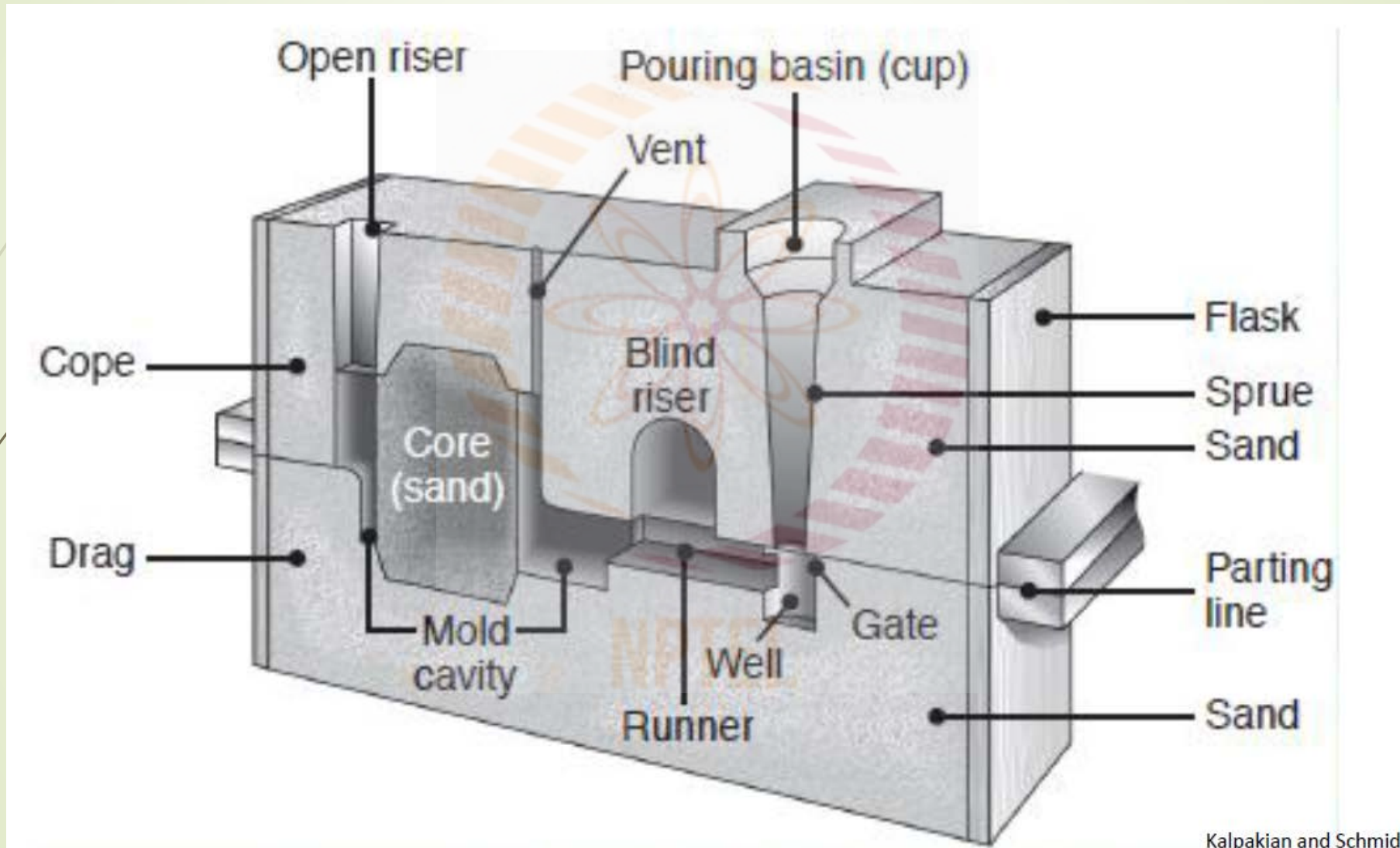
Or, on the method of making them:

- Shell Mould
- Investment Mould



Schematic of a typical sand mold

27



Kalpakian and Schmid

