



UNIT V

FOUNDRY CASTING

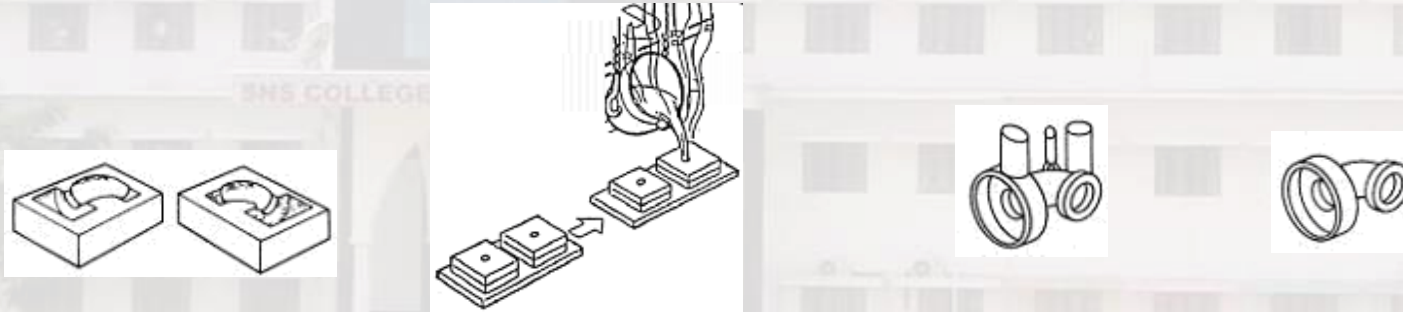
Basic Civil and Mechanical Engineering

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CASTING



Refractory mold → pour liquid metal → solidify, remove → finish

- **VERSATILE:** complex geometry, internal cavities, hollow sections
- **VERSATILE:** small (~10 grams) → very large parts (~1000 Kg)
- **ECONOMICAL:** little wastage (extra metal is re-used)
- **ISOTROPIC:** cast parts have same properties along all directions



CASTING PROCESS



Casting Process:

Casting is the process of pouring molten metal into the previously made cavity to the desired shape and allow it to solidify.

The following are the basic operations of casting process

Pattern making

Melting the metal

Pouring it into a previously made mould which confirms to the shape of desired component.



CASTING PROCESS



Pattern:

A pattern is an element used for making cavities in the mould, into which molten metal is poured to produce a casting.

Requirements of a good pattern, and pattern allowances.

Secure the desired shape and size of the casting

Simple in design, for ease of manufacture

Cheap and readily available Light in mass and convenient to handle

Have high strength



PATTERN



Pattern materials

- Wood
- Common metals such as Brass, cast Iron, Aluminium and white metal etc.
- Plastic
- Gypsum

Pattern allowances

- Shrinkage allowance
- Machining allowance
- Draft allowance
- Shake allowance
- Distortion allowance



PATTERN



Different types of patterns

1. Split or Parted Pattern
2. Loose Piece Pattern
3. Draw backs
4. Gated Patterns.
5. Match Plate pattern
6. Cope and Drag Pattern
7. Sweep Patterns.



PATTERN



MOULD PREPARATION

Green sand mould : A green sand mould is composed of mixture of sand, clay and water.

Dry sand mould : Dry sand moulds are basically green sand moulds with 1 to 2% cereal flour and 1 to 2% pitch.

Materials used in mould preparation: Silica sand, Binder, Additives and water

Various properties of moulding sand .

- Permeability
- Strength or Cohesiveness Refractoriness.
- Plasticity or flow ability
- Collapsibility
- Adhesiveness.
- Co-efficient of Expansion



CORE



CORE MAKING

Core is a body made of refractory material (sand or metal, metal cores being less frequently used), which is set into the prepared mould before closing and pouring it, for forming through holes, recesses, projections, undercuts and internal cavities.

Core Prints. Core prints are the projections on a pattern and are used to make recesses (core seats) in the mould to locate the core

Casting

Factors to be considered for selecting a furnace for a job

1. Capacity of molten metal
2. Melting rate and temp armature control desired, Quality of melt required
3. Method of pouring and types of product contemplated.



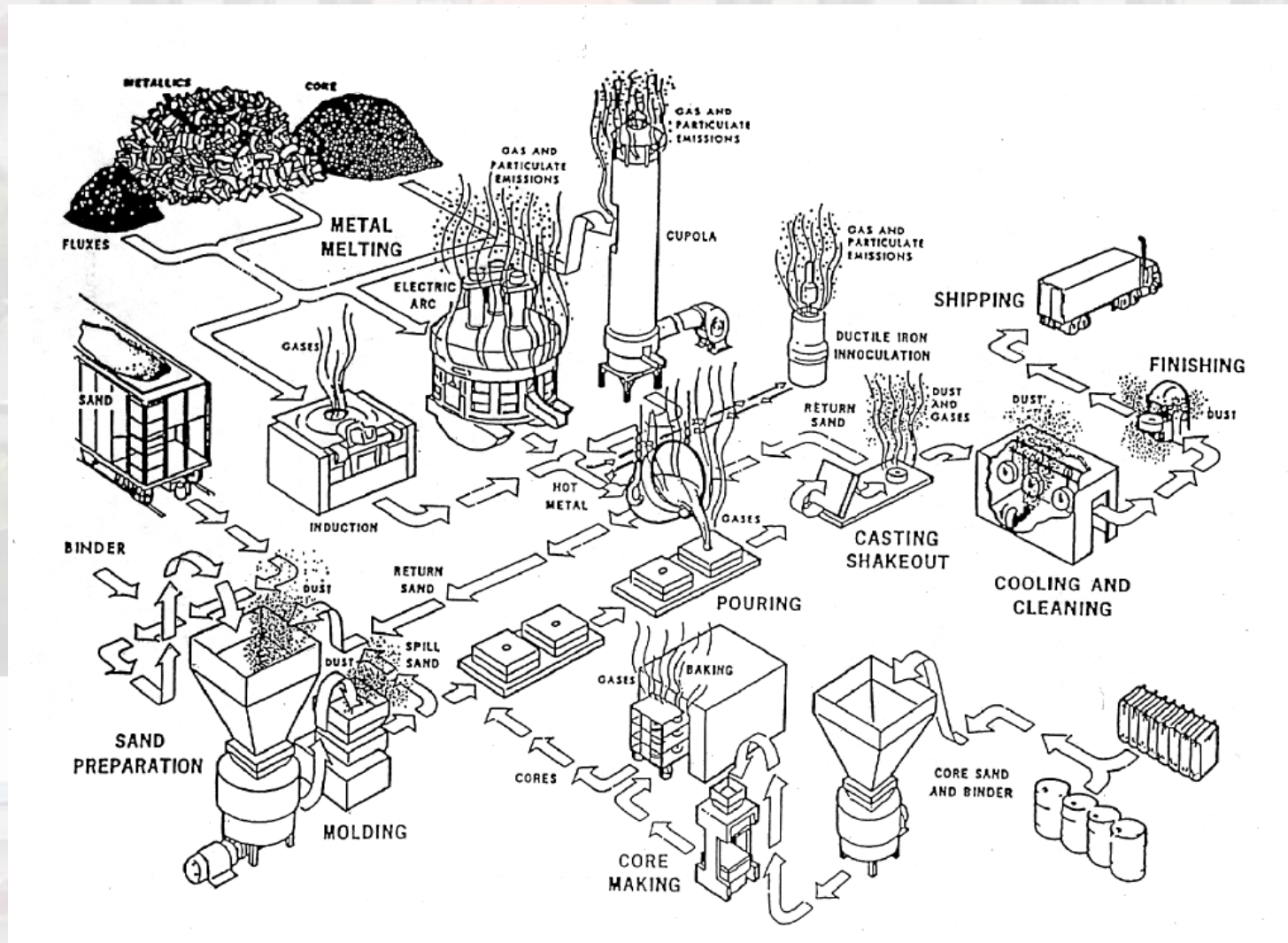
DIFFERENT CASTING PROCESSES



Process	Advantages	Disadvantages	Examples
Sand	many metals, sizes, shapes, cheap	poor finish & tolerance	engine blocks, cylinder heads
Shell mold	better accuracy, finish, higher production rate	limited part size	connecting rods, gear housings
Expendable pattern	Wide range of metals, sizes, shapes	patterns have low strength	cylinder heads, brake components
Plaster mold	complex shapes, good surface finish	non-ferrous metals, low production rate	prototypes of mechanical parts
Ceramic mold	complex shapes, high accuracy, good finish	small sizes	impellers, injection mold tooling
Investment	complex shapes, excellent finish	small parts, expensive	Jewellery
Permanent mold	good finish, low porosity, high production rate	Costly mold, simpler shapes only	gears, gear housings
Die	Excellent dimensional accuracy, high production rate	costly dies, small parts, non-ferrous metals	gears, camera bodies, car wheels
Centrifugal	Large cylindrical parts, good quality	Expensive, few shapes	pipes, boilers, flywheels



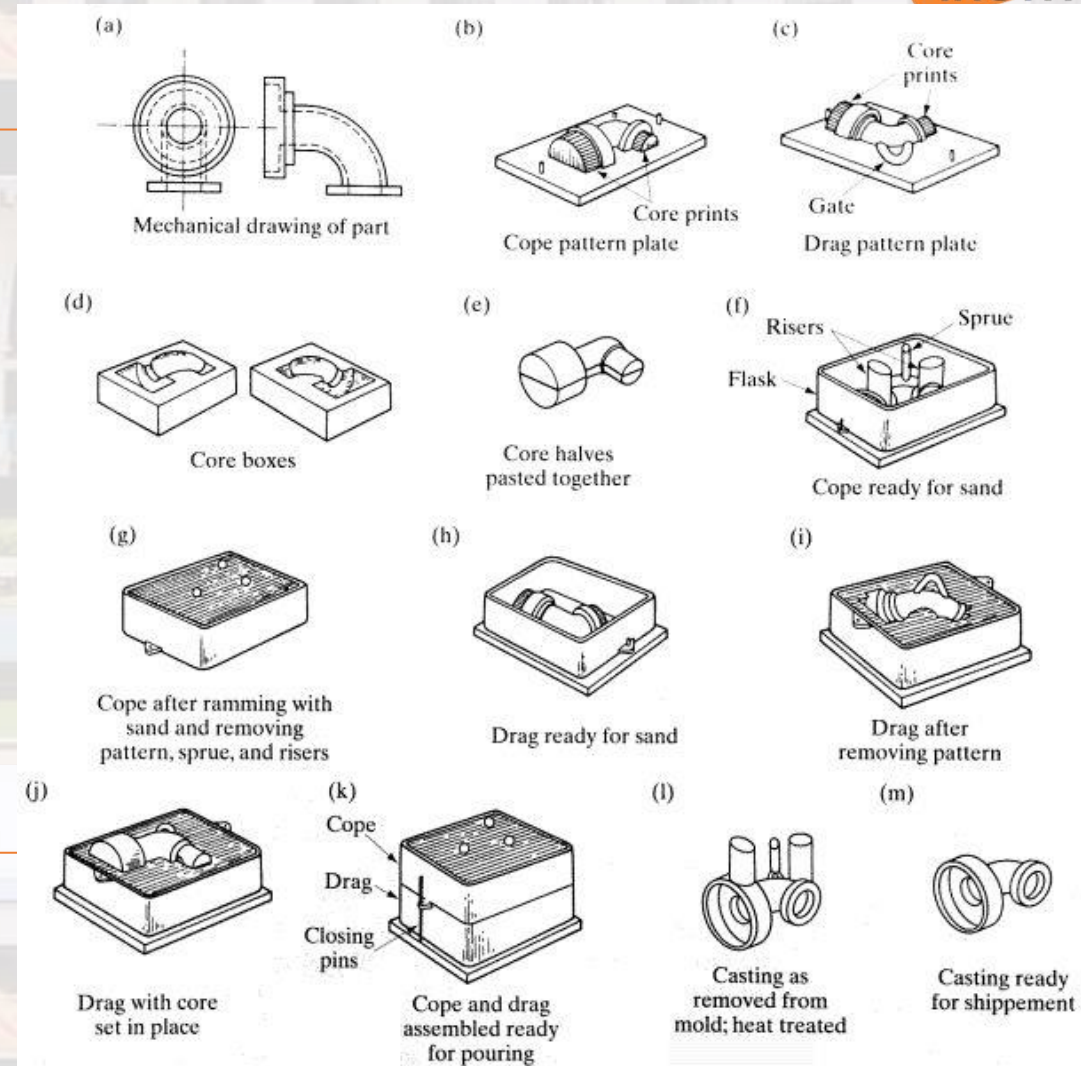
SAND CASTING





SAND CASTING

- **cope:** top half
- **drag:** bottom half
- **core:** for internal cavities
- **pattern:** positive
- **funnel** → **sprue** → **runners** → **gate** → **cavity {risers, vents}**





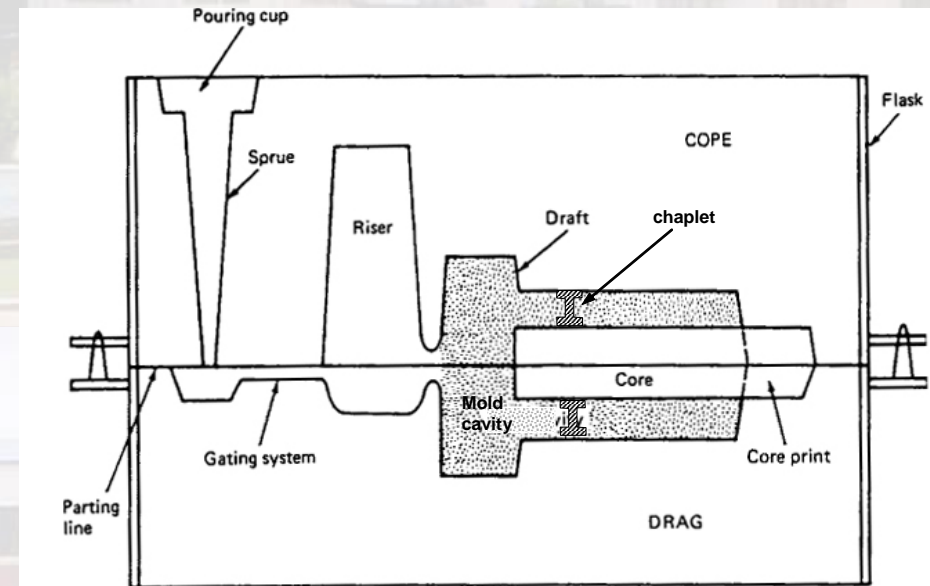
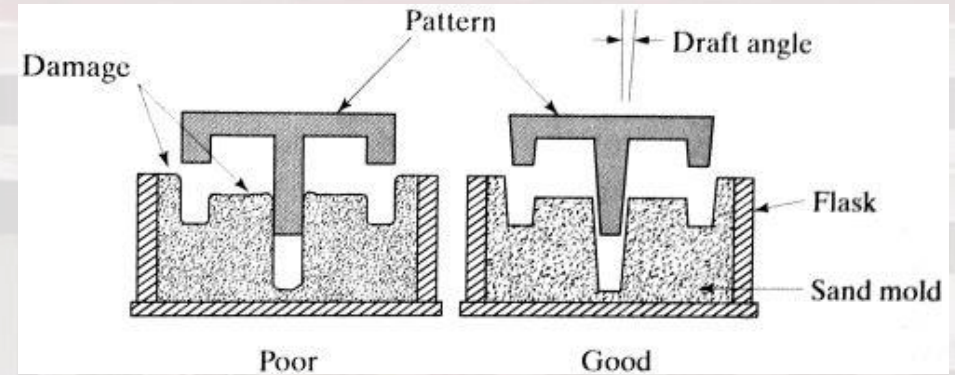
SAND CASTING

(d) **Taper** - do we need it ?

(e) **core prints, chaplets**

- hold the core in position
- chaplet is metal (why?)

(f) **cut-off, finishing**





THANK YOU