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*"There is
nothing
impossible to
they who will
try."*

GATE 2024



प्रचंड Batch

PRODUCTION

CASTING

PART-3

Mechanical Engineering



GATE 2024



प्रत्न Batch

MECHANICAL ENGINEERING



MON/ TUE/ WED- 9PM

THEORY OF MACHINE (TOM)



THUR/ FRI/ SAT- 6PM

PRODUCTION ENGINEERING

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CASTING



INDEX

Introduction of Casting

Broad Steps in Sand Casting

Cooling Curve for Sand Casting

Types of allowances

Types of pattern

Moulding sand and its properties

Moulding sand

- Molding sand are the most commonly used for making all types of molds irrespective of whether they are used for producing casting of ferrous or non-ferrous metal
- Most sand casting operations are used silica sand.
- Sand used to manufacture a mould for casting process is held by mixture of water and clay.
- A typical mixture by volume could be 89% sand, 4% water and 7% clay.



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Types of moulding sand

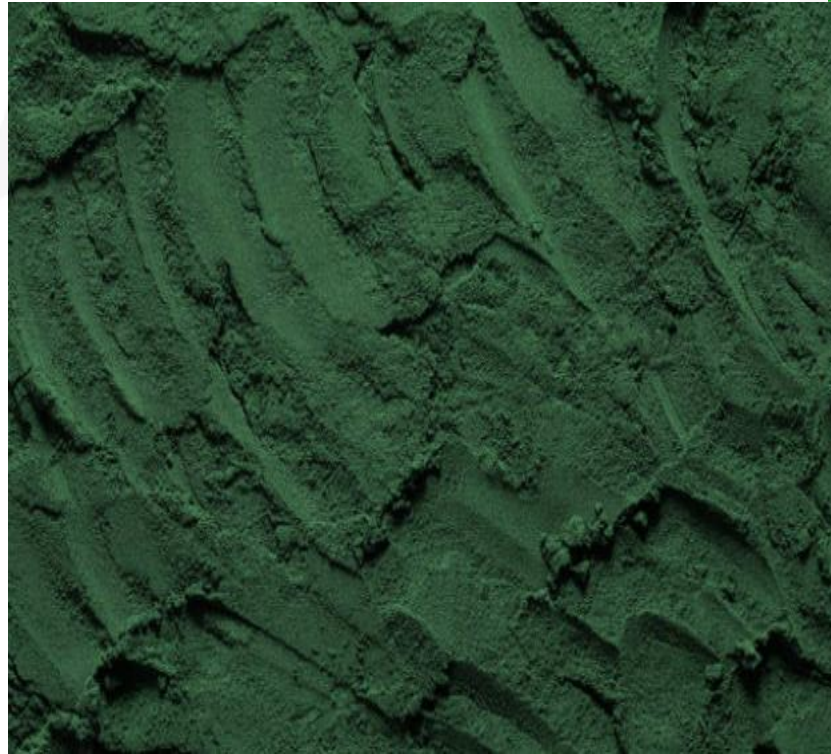
- Green Sand
- Dry Sand
- Loam Sand
- Facing Sand
- Backing Sand
- Parting Sand



Green sand

The green sand is the natural sand containing sufficient moisture in it. It is mixture of silica and 15 to 30% clay with about 8% water. Clay and water act as a bonding material to give strength. Molds made from this sand are known as green sand mould.

The green sand is used only for simple and rough casting products. It is used for both ferrous and non-ferrous metals.



Dry sand

When the moisture is removed from green sand, it is known as dry sand. The mould produced by dry sand has greater strength, rigidity and thermal stability. This sand is used for large and heavy castings.



Loam sand

Loam sand is a mixture of 50 percent sand and 50 percent clay. Water is added in sufficient amount. It is used for large and heavy moulds e.g., turbine parts, hoppers etc.



Facing sand

A sand used for facing of the mould is known as facing sand. It consists of silica sand and clay, without addition of used sand. It is used directly next to the surface of the pattern. Facing sand comes in direct contact with the hot molten metal; therefore it must have high refractoriness and strength. It has very fine grains.



Backing sand

The backing sand is old and repeatedly used sand of black colour. It is used to back up the facing sand and to fill the whole volume of the box. This sand is accumulated on the floor after casting and hence also known as floor sand.



Parting sand

A pure silica sand employed on the faces of the pattern before moulding is known as parting sand. When the pattern is withdrawn from the mould, the moulding sand sticks to it.

To avoid sticking, parting sand is sprinkled on the pattern before it is embedded in the moulding sand. Parting sand is also sprinkled on the contact surface of cope, drag and cheek.



Properties of moulding sand

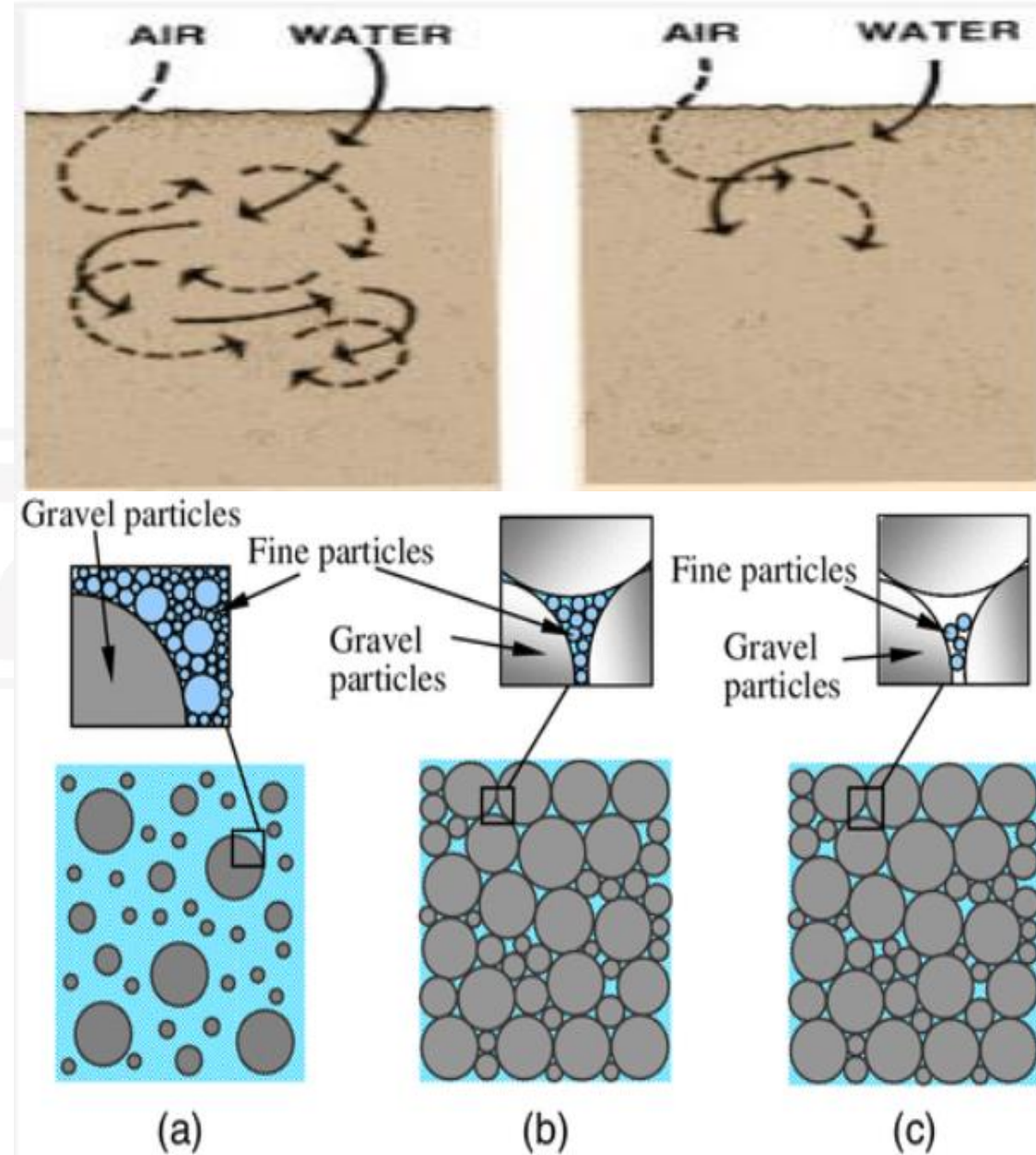
Refractoriness

Refractoriness is the property of sand to withstand high temperature of molten metal without fusion or soften.

Moulding sands with poor refractoriness may burn when the molten metal is poured into the mould.

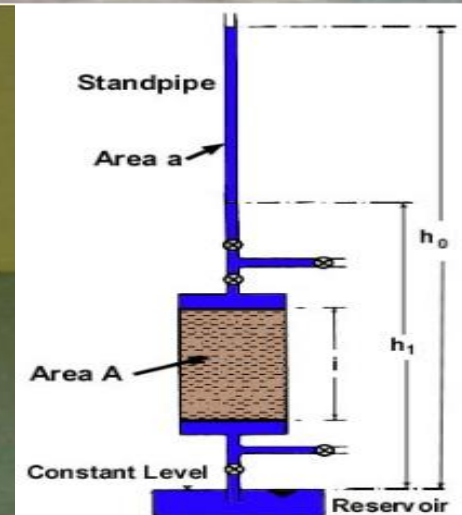
Permeability

The permeability of sand refers to its ability to allow fluids or gases to pass through it.



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Determine the permeability of moulding sand it will take 1minute 23 second to allow 2000 cm³ of air through a standard cylindrical specimen at a pressure difference of 5gm/cm².

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Flowability

Ability of the moulding sand to flow into all the corners of the mould box due to ramming force.



Strength

To retain the shape and size of the cavity and to withstand forces applied by the liquid metal on the mould surface mould must be having sufficient strength.



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Hardness

Hardness is a surface property to minimize erosion and to withstand forces applied by the liquid metal.

Mould must be having sufficient hardness.



Collapsibility

Ability of moulding sand due to which mould surface will not provide any resistance due to solid contraction of the casting.



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Adhesive property

The adhesive property of moulding sand refers to its ability to hold its shape and adhere to itself and other materials during the process of creating a sand mould for casting metal parts.



Cohesive property

The cohesive property of moulding sand refers to its ability to stick together and hold its shape without collapsing or breaking apart during the moulding process.

Additives

Additives are commonly used in moulding sand to improve its properties and enhance its performance during the casting process.

These additives can be classified into two categories: binders and modifiers.

Binders are materials that are added to moulding sand to hold the sand grains together and improve its strength and stability.

The most commonly used binders include clay, water, and synthetic resins such as phenolic, furan, and urea-formaldehyde resins.

Modifiers are materials that are added to moulding sand to improve specific properties, such as flowability, permeability, and thermal stability

Examples of modifiers include coal dust, wood flour, and various types of salts and mineral powders.



Wood flour

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Molasses



Linseed oil

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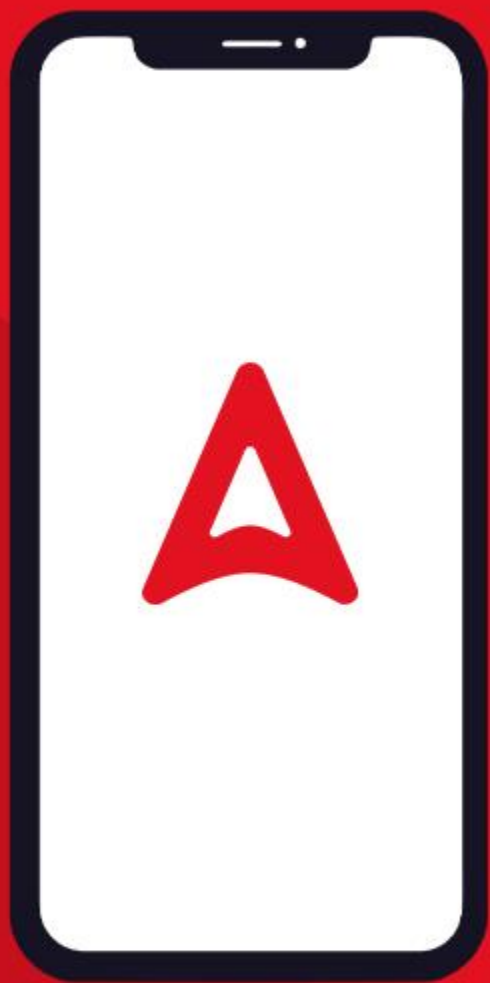


Coal dust

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