GATING AND RISERING

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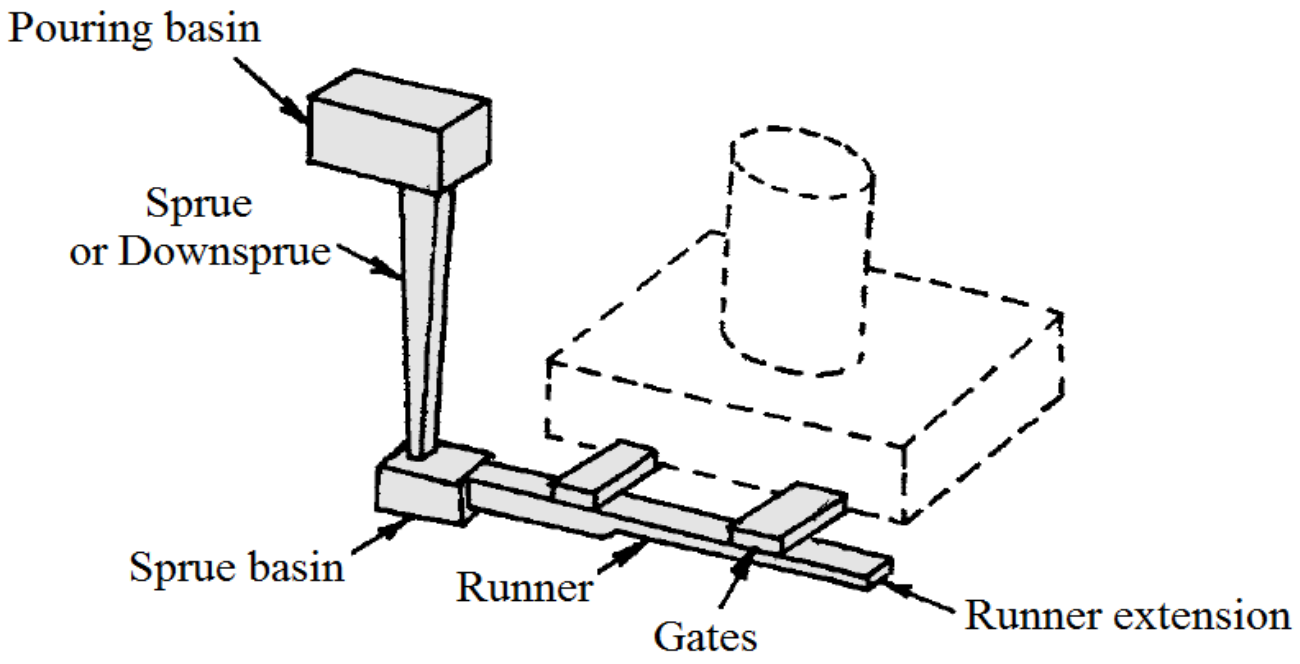
CONCEPT OF GATING AND RISERING

- DEFINTION
- TYPES OF GATES
- GATING DESIGN
- GATING RATIO
- RISERING
- TYPES
- FUNCTIONS

ELEMENTS OF GATING SYSTEM

1.Pouring basin
2.Down sprue
3. Sprue base
4. Runner
5. Runner Extension
6. Gates



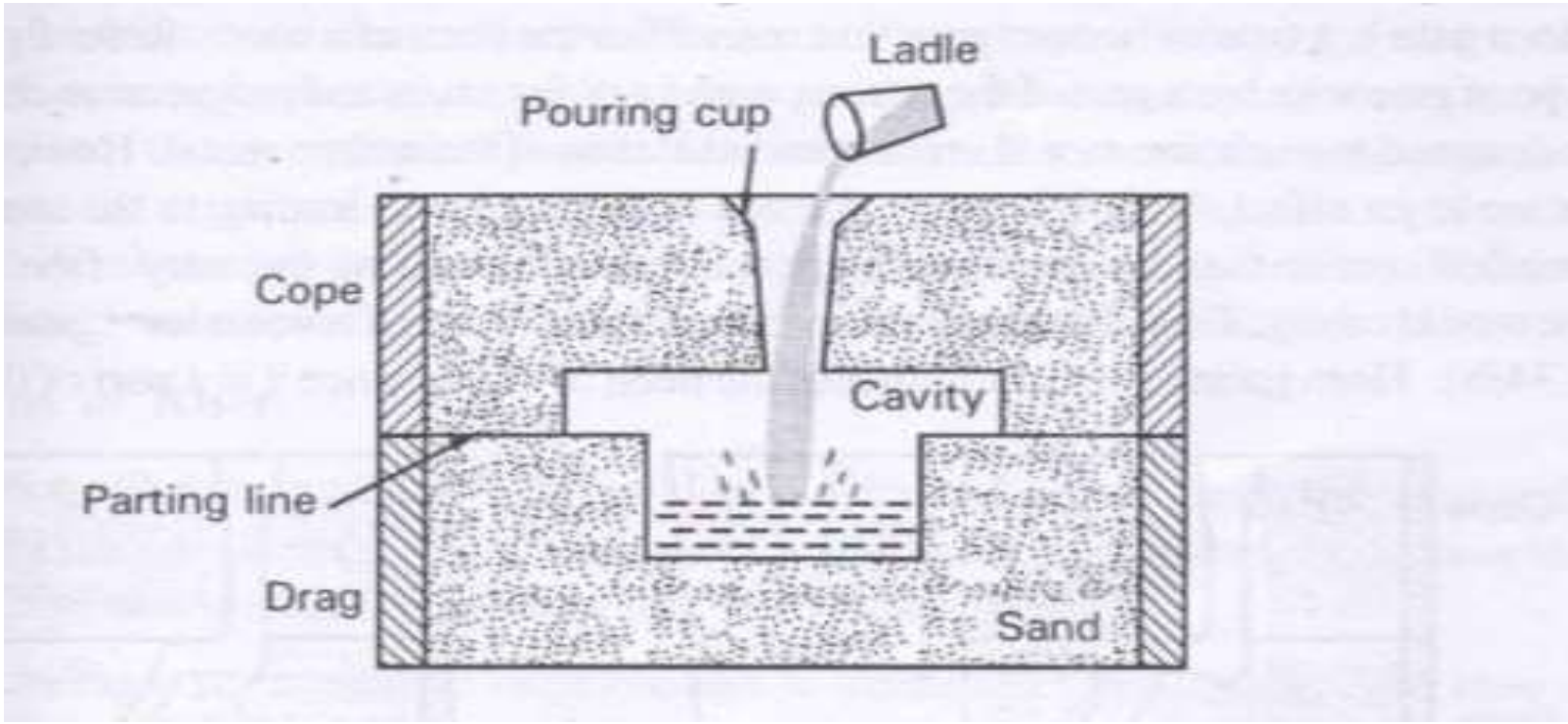
GATING

- Gating are flow passages to run and fill molten metal in mould cavity.
- Gating system include distribution of clean metal with proper rates and velocities at specific location in the mould.

TYPES OF GATING SYSTEM

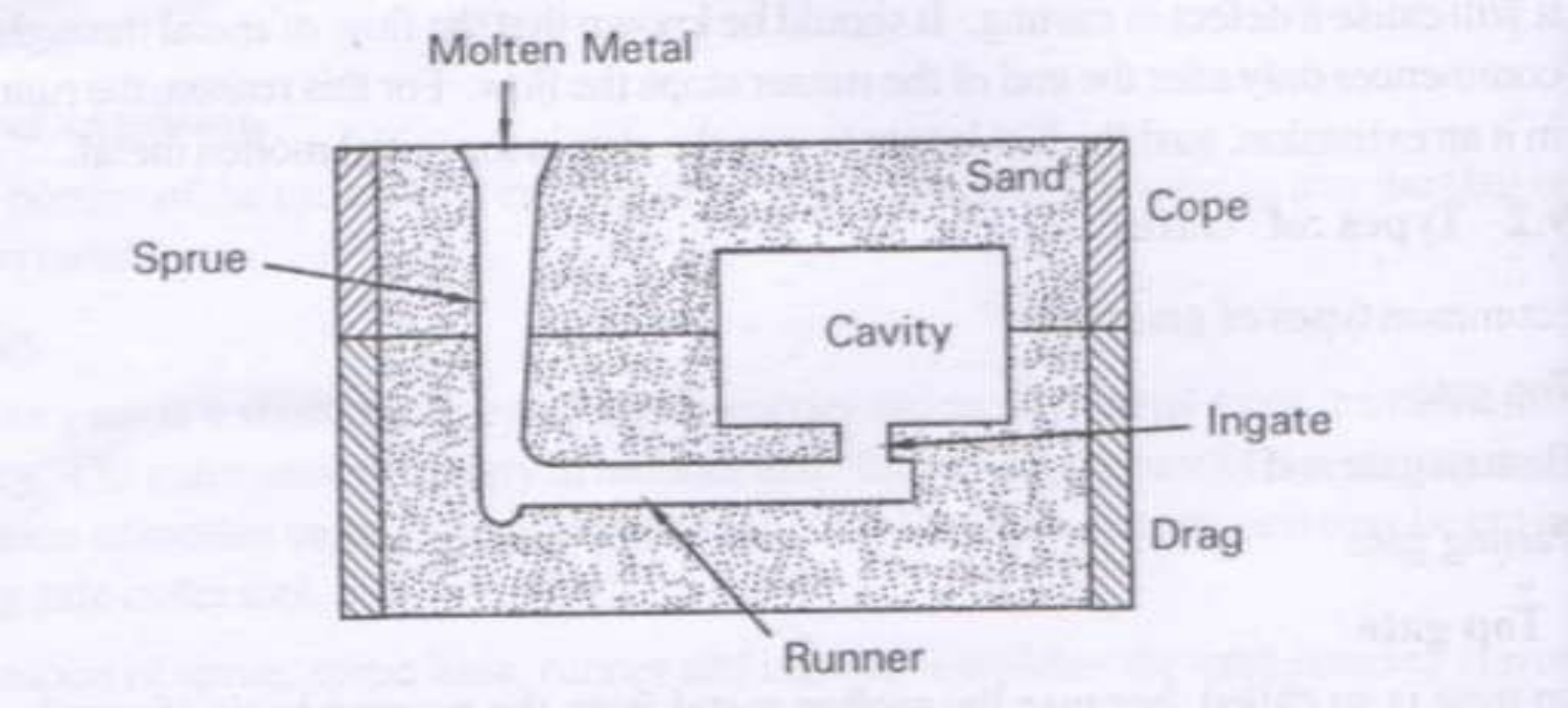
- Top gate
- Bottom gate
- Branch gate
- Horn gate
- Parting type

Top gate



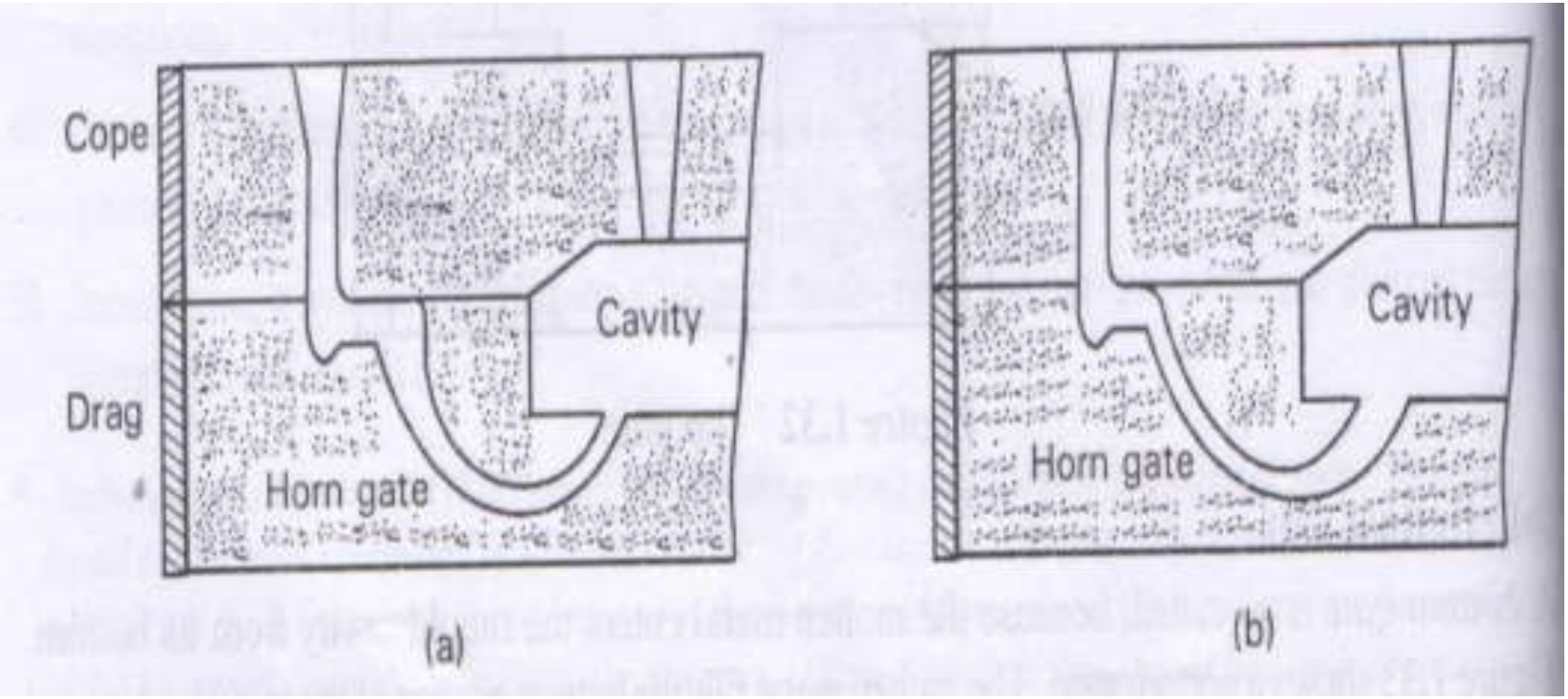
- **Molten metal from pouring basin is fed directly into the mould cavity.**
- **The hottest metal remains at the top of casting , this promotes directional solidification from the casting towards the gate**

Bottom gate



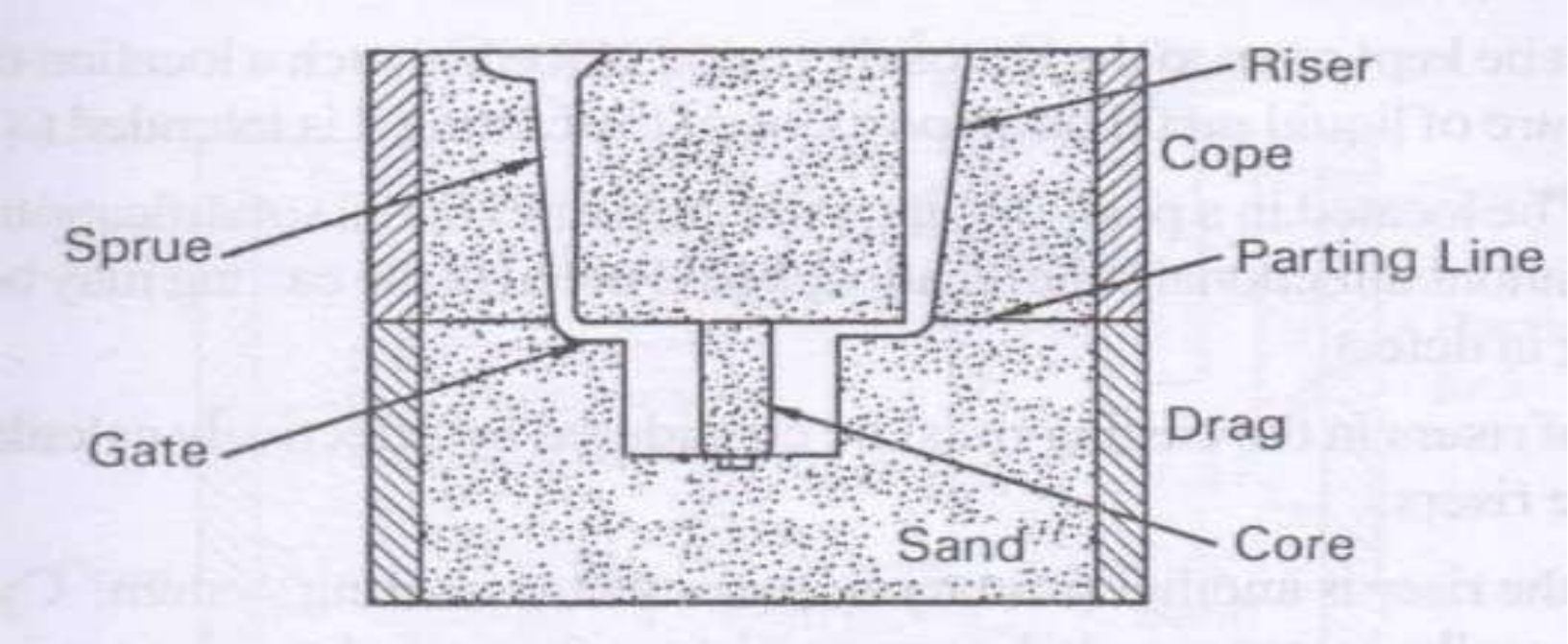
- **The molten metal enters from bottom to the mould cavity.**
- **It minimizes turbulence and erosion in the mould cavity.**
- **Provides unfavorable temperature gradients that do not promote directional solidification.**

Horn gate



- This type of gate which is a part of the pattern with smooth curves and progressive change in dimension is designed to minimize mould erosion and oxidation of molten metal.

Parting type



- It is most commonly used gate and is a compromise between top and bottom gates.
- The gate is provided at the parting line of the mould .

Risering

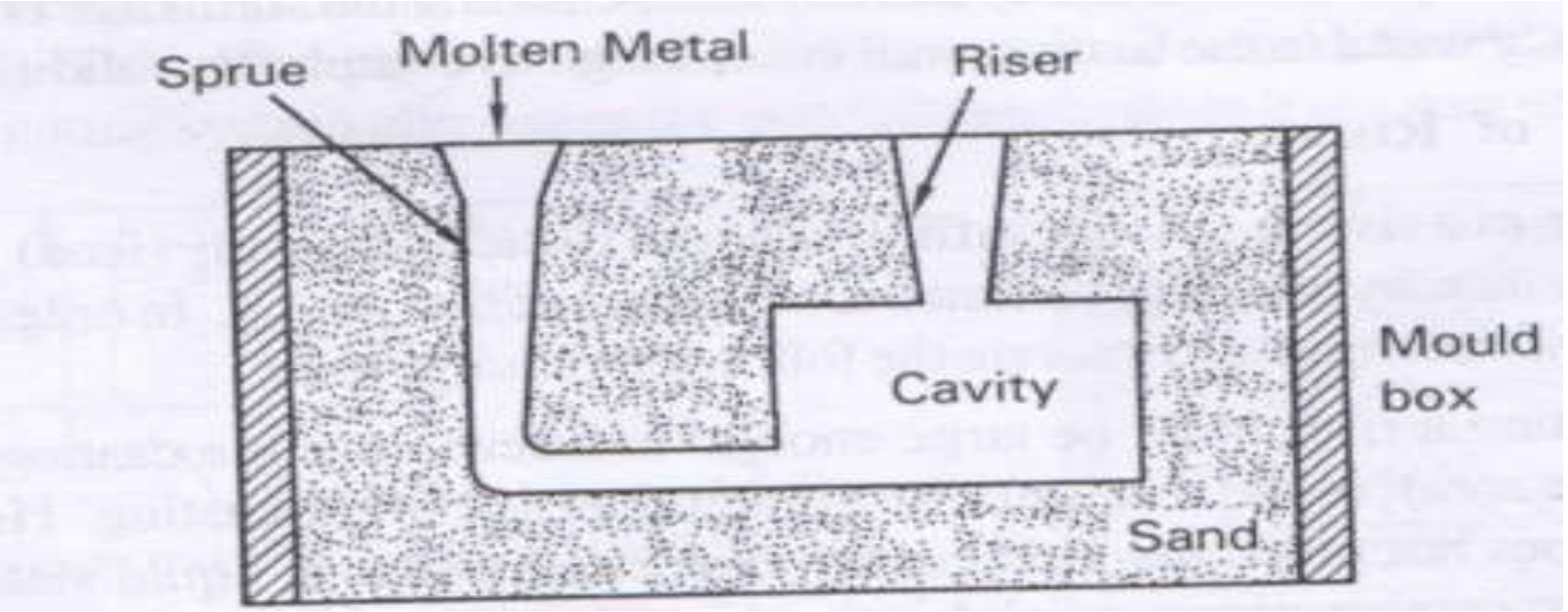
- A riser or feeder head is a vertical passage made in the cope to store the liquid metal and supply the same to the casting as it solidifies.

Functions:

- Store sufficient liquid metal and supply the same to the casting it solidifies there by avoiding volumetric shrinkage of the casting.
- The riser must be kept open to the atmosphere and placed in such a location that it maintains a positive pressure of liquid metal on all portions of the casting it is intended to feed.
- The cylindrical shaped riser are generally recommended compared to spherical shaped risers which although consider as the best.

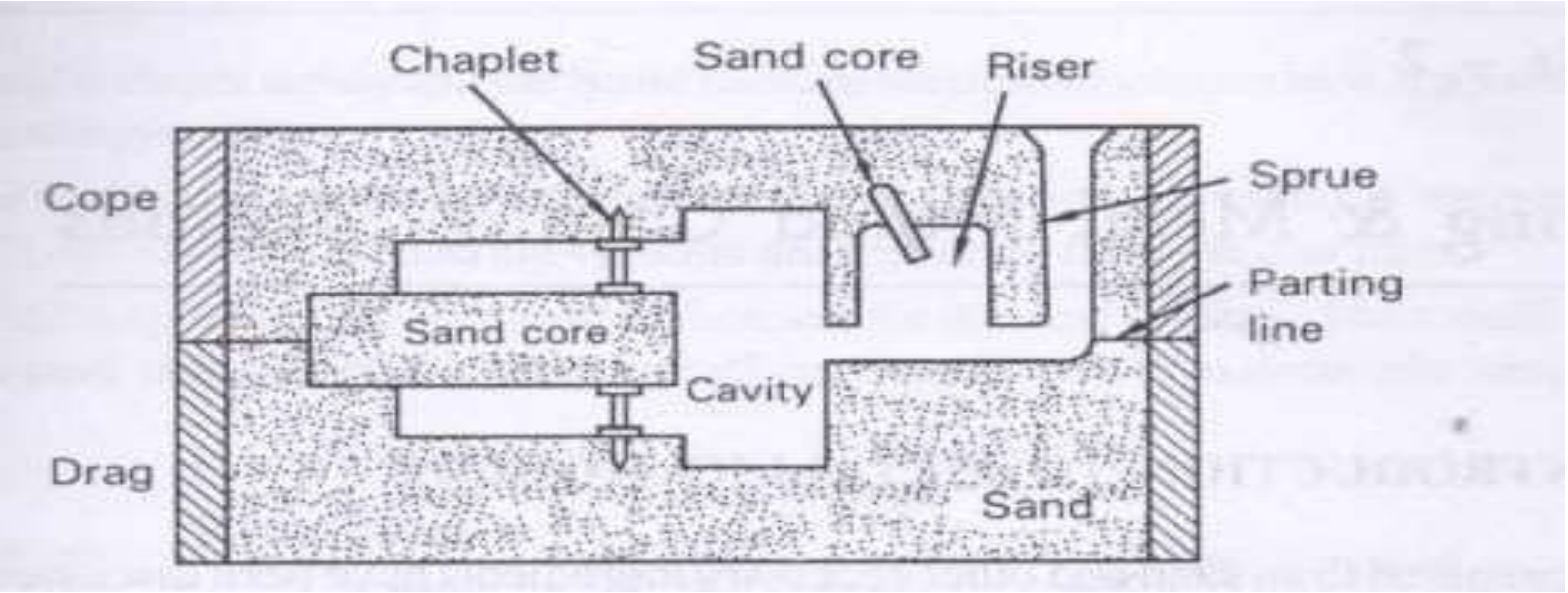
Types of riser

1. **Open riser / Top riser**



- The top surface of the riser will be open to the atmosphere.
- The open riser is usually placed on the top of the casting.
- Gravity and atmospheric pressure causes the liquid metal in the riser to flow into the solidifying casting.

2. Blinder riser/ Side riser



- It is completely enclosed in the mould and not exposed to the atmosphere .
- The metals cools slower and stay longer promoting directional solidification.
- The liquid metal is fed to solidifying casting under the force of gravity alone.

Solidification Time For Casting

- Solidification of casting occurs **by loosing heat from the surfaces** and **amount of heat is given by volume of casting** .
- **Cooling characteristics** of a casting is the ratio of **surface area to volume.**
- Higher the value of cooling characteristics **faster is the cooling of casting.**

Chvorinov rule state that **solidification time** is inversely proportional to cooling characteristics.

Solidification time

$$t_s = K\left(\frac{V}{SA}\right)^2$$

Where

Ts = Solidification time V = Volume of casting

SA = Surface area K = mould constant

(15) Condition for minimum surface area & max Solidification time in Calc of cylindrical riser

1- Sidering

$$SA = 2\frac{\pi}{4}d^2 + \pi d h \quad \text{---} (1)$$

$$V = \frac{\pi}{4}d^2 h \qquad h = \frac{4V}{\pi d^2}$$

h put in eqn (1)

$$SA = 2\frac{\pi}{4}d^2 + \pi d\left(\frac{4V}{\pi d^2}\right)$$

$$SA = \frac{\pi}{2}d^2 + \frac{4V}{d}$$

$$\frac{\partial SA}{\partial d} = 0 \qquad = \pi d - \frac{4V}{d^2} = 0$$

$$V = \frac{\pi d^3}{4} = \frac{\pi}{4}d^2 h$$

$$\boxed{h = d}$$

$$\frac{SA}{V} = \frac{2\frac{\pi}{4}d^2 + \pi d h}{\frac{\pi}{4}d^2 h} \qquad h = d$$

$$\boxed{\frac{SA}{V} = \frac{6}{d}}$$

Top right = $SA = \frac{\pi}{4}d^2 + \pi dh$ ... (1)

$V = \frac{\pi}{4}d^2h \Rightarrow h = \frac{4V}{\pi d^2}$

$SA = \frac{\pi}{4}d^2 + \pi d\frac{4V}{\pi d^2}$

$SA = \frac{\pi}{4}d^2 + \frac{4V}{d}$

$\frac{\partial SA}{\partial d} = 0 \qquad \frac{\pi d}{2} - \frac{4V}{d^2} = 0$

$V = \frac{\pi d^3}{8} = \frac{\pi}{4}d^2h$

$\boxed{h = \frac{d}{2}}$

$\frac{SA}{V} = \frac{\frac{\pi}{4}d^2 + \pi dh}{\frac{\pi}{4}d^2h}$

$\boxed{h = \frac{d}{2}}$

$$\delta l = l \alpha \Delta T$$

Pr⇒ In a cubical casting of 50mm size undergoes volumetric solid contraction of 6%. & volumetric solidification contraction of 6%. & volumetric solidification shrinkage of 4%. there of Novikov is used for pattern making allowance is not considered what is the final size of the casting.

Solve ⇒

Volume of material $= a^3 = 50^3 mm^3$

Volume of material $C = 50^3 \times .96$

Volume of material $P = (50^3 \times .96) \times .94$

$a^3 = 112800\ mm^3$

$a = 48.31\ mm$

Thank you