

Unit-4

1. Define below bin and waste bin.

Ans → A below bin is a type of small bin which is usually located near a point where ore is discharge from and ore pass into a loading station. It is design to collect or regulate ore discharge before it is loaded into mine car or skips etc. It is located at the shaft station or haulage level right under ore pass.

→ Waste bin - A waste bin is a bin specially designed container used for the collection temp storage and disposal of unwanted or discarded material. Waste bin are one of the most important tools in waste management system because they allow people to segregate, handle and dispose of waste in a safe, clean and organized manner. Waste bin can be made of plastic, metal or composite material depending on their use, they are found in home, school, industries, hospital, public places and workshop.

→ Ore bin It is a large storage container or chamber which is used to hold and regulate the flow of ore after producing from mining operation. It act as buffer b/w mining operation and processing plant.

- (i) It is used to mixup different type of ores.
- (ii) To provide a continue and control flow of a ore to the processing plant or other down stream equipment.

Ore passes An ore pass is a vertical or steeply inclined underground opening used in mines for the transfer of ore or waste rock from one level to another by gravity.

It acts like a vertical chute, allowing broken ore from stopes to move downwards to haulage levels loading station or directly to crushers.

Q. Describe ore bin in vertical and inclined shaft with sketches.

Ans An ore bin is an underground storage bunker or container built near the shaft station for the temporary storage bunker or container waste rock before it is loaded into mine cars skip or conveyor.

Ore bins are designed to handle large volume of ore ensure a steady supply for hoisting or transport and to reduce delays in mine production.

1. Ore bin in vertical shaft

- In vertical shaft mines ore from stope from dumped into ore passes which deliver it to the ore bin near the shaft.
- The ore bin acts as a storage reservoir feeding the ore into skips for hoisting to the surface.
- Ore is withdrawn from the bottom of the bin through chutes or loading gates into skips.

2. Ore bin in inclined shaft.

- In inclined shaft ore bin are built adjacent to the shaft.
- Ore is transported by scrapers loaders or directly from ore passes into the bin.

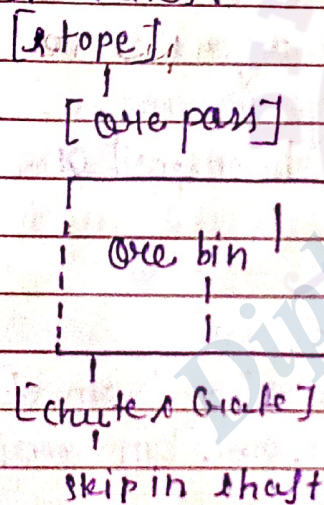
- From the bin ore is loaded into mine cars or belt conveyors, which then move along the inclined shaft.

→ function of ore bin

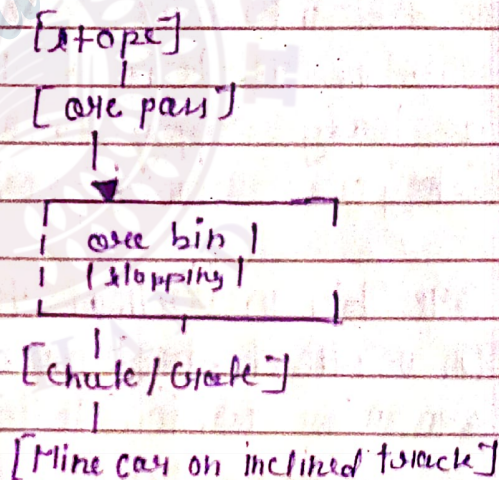
- storage: provide temporary storage of ore to balance of ore to balance production and hoisting rates.
- Regulation: ensure continuous feeding of ore to skip cars or conveyors.
- safety: Reduce congestion in haulage shift
- efficiency: minimize delay during in haulage shift changes or equipment downtime.

→ Sketches :-

Ore bin vertical



ore bin inclined



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3. Explain type of ore binetope: open, filled, shrinkage, Caving method.

Sol- In open stoping ore is excavated and the mineral-out void is left unsupported no artificial support or filling is provided the walls and roof the slope must be strong enough to stand without collapsing.

- Application: suitable for strong ore bodies and competent wall rock, usually with steep dip.
- procedure: stopes are opened either upward or downward depending on ore dip and access.

→ Adv

- Simple and cheap method
- No filling material required, reducing cost and effort.

→ Dis

- Limited to strong rock formation
- Dangerous in weak ground risk of collapse.

2. Filled stopes: In this method ore is excavated in horizontal slices and after each slice the void is filled with waste rock tailing sand or other material. mining then continues on top of the fill

- Application: best suited for weak ore bodies and weak surrounding rock, irregular ore shapes and steep dips.
- procedure: Ore is mined in slices after each slice waste material is introduced into the stope to provide support to the walls and roof.

Adv

- Very safe, as filling provides continuous support.
- High ore recovery, as walls are protected from collapse

Dis

- Costly as filling material and extra labour are required
- Slow process, reducing production rate.

3. **Shrinkage Stope:** Ore is broken in slices and most of it is left in the stope itself to act both support and working platform. About 30-40% of the broken ore is drawn out regularly to provide working space while the remaining ore stays until the stope is complete. At the end all the ore is the withdrawn.

- **Application:** suitable for steeply dipping ore bodies where both ore and waste rocks are strong and self-supporting.

- **Procedure:** suitable for steeply dipping ore stoping starts from the bottom and progresses upward broken ore accumulate on the floor and support miners and stopes walls. After the top is reached the ore is drawn off.

Adv

- Cheap as no artificial support or filling is needed
- Broken ore provides natural support to stope walls.

Dis

4. **Caving** - In caving method ore extraction is carried out by allowing the ore body or the overlying strata to collapse and to cave in under gravity. Ore is then collected at drawpoints.

Type: Top slicing, Sublevel Caving, Block Caving.

- **Application:** suitable for large massive ore bodies with weak overlying strata.

Adv

- Very economical for large deposits; low cost per ton
- High production capacity, suitable for mechanization.

Dis

- Dilution of ore due to mixing with waste rock
- Surface subsidence and environmental issues.

Q Reef Drive Vs footwall drive.

Ans	Reef drive	Footwall drive	
	Along the ore body	In solid rock of the footwall parallel to ore	location
	Expose ore continuously	ore reached only through chancuts.	ore Expose
	less stable	More stable	stability
	Useful for exploration and initial development	Useful for permanent haulage ventilation services	Usefulness
	More support needed	less support required	supports required
	Drive may get destroyed during stopping	Drive remain safe during stopping.	ore loss
	A reef drive is a horizontal excavation made along the ore body	Driven in solid rock good for permanent haulage and safety but required chancuts ore	Design

List the material employed for support in minning.

- 1 Timber
- 2 steel
- 3 Concrete
- 4 Masonry
- 5 Rock bolts and cable bolts
- 6 Shotcrete
- 7 Wire mesh and lagging
- 8 Hydraulic and friction props

Q. Raizes Vt Winzes

<u>Ans</u>	Raizes	Winzes
	Excavated upwards from a lower level	Excavated downward from an upper level
	Ventilation, ore passes, manways access	Exp. placement downward, access drainage.
	Starts from below.	Starts and from above
	Difficult and dangerous	easier and easier
	fall naturally downward	Must be hoisted upward
	Very effective	limited use
	Need strong supports if in weak ore.	More stable as gravity assists working.

What are the kind of timber used as support

-> The main kinds of timber supports are:

- i) props (vertical)
- ii) caps (horizontal beams)
- iii) sill (floor timber)
- iv) wall plates (sides supports)
- v) sets (frame of props + caps)
- vi) lagging (plates covering gaps)
- viii) chocks / coes (crib-like packs)
- ix) wedges (for tightening)
- x) Square sets (3D timber framework for very weak ground)

Q Explain methods of timber preservation?

i. Air seasoning (Natural Drying)

- Timber is cut and stacked in the open air for several months.
- Reduces the moisture content, making it less susceptible to fungal attack.

ii. Water Seasoning

- Logs are immersed in standing water for weeks or months.
- Removes sap and soluble sugars that attract insects and fungi.

iii) Chemical Treatment.

- Chemicals are applied to timber to protect it from decay, fungi and termites. Common methods are:

(a) Surface Application (b) Sealing (c) Pressure treatment

iv) Charring

- Timber ends are lightly burnt before being placed in the ground.
- Charred layer resists termite and insect attack.

v) Injection method.

- Preservatives are injected directly into drilled holes in timber using syringes or pressure devices.
- Useful for large-sized logs where pressure treatment is difficult.

vi) Coal tar

- Timber is coated with hot coal tar or bitumen.
- Forms a protective waterproof layer against moisture and fungi.

Q) Steel Support Vs Timber Supports.

<u>Any</u> Timber	Steel
• low to moderate	Very high, withstands heavy loads
• Short life, decays in damp mines	long life, durable
• Susceptible to fire and insects	fire-resistant not attacked by insects
• Cheap initially, but high replacement cost.	High initial cost, low replacement cost
• light easy to transport and cut.	Heavy, needs machinery for handling
• frequent replacement required	less maintenance, reusable
• Shallow/medium depth mines temporary work.	Deep mines long-term and heavy-duty work
• Good elastic, absorbs sudden loads	poor (rigid transmits shocks)

Q Explain Support of junction by cogs and bars.

Ans In underground mines, a junction is the meeting point of two or more roadways.

- These junction are weak points because the roof area is larger and irregular which increases the risk of roof falls.
- Hence, special support is needed - commonly provided, cogs.

1.7 Cogs ÷ A cog is a pack-like support made of short timber logs.

- logs are cut into short length and stacked in a cross-cross manner forming a solid box-like structure.
- function
- Cogs are placed at the corners of the junction to bear heavy roof loads.
- They act as permanent supports since they cover more area than a single prop.

2 Bars

— A bar is a horizontal timber beam laid across the roof, resting on the cogs.

- Bars span the opening and transfer roof load onto the cogs.

function

• Bars are fixed between cogs across the opening.

- They provide continuous roof support by covering wide spans.

• Laying planks may be placed over bars for extra supports and to stop small pieces of rock from falling.

Adv (i) provide strong rigid and permanent support

(ii) Distributes roof pressure over large area

(iii) prevent roof falls at corner intersection.

Q Complete timber set vs incomplete set

Ans Complete

Incomplete

(i) Cap + legs + sill

Cap + legs

(ii) Rectangular

Inverted "U"

(iii) Stronger, more stable

Comparatively weaker

(iv) Evenly distributed to floor
via sill

Directly transfer through
legs only

(v) Weak/soft floors, shaft
wet ground

Hard floors, firm ground,
normal roadways

(vi) Higher (more timber required)

Lower (less timber required)

(vii) Takes more time & labour

Quick and simple

① Steel Arches

- Steel arches are rigid curved support made from rolled steel section used to support mines roadways and tunnels.

- Shape - Usually semicircular, three-centered or elliptical arches fitted closely to the roadway profile.

Adv

- ① Very strong - withstand high rock pressure etc
- ② fire-proof and durable compared timber
- ③ provide continuous supports along the road.
- ④ Can be stressed.

Use

- In deep mines where heavy roof pressure
- In coal and metal mines for long-term roadways haulage, drives, and mine entries.

2 Roof bolting

Roof bolting is a systematic method of supporting mine roof by inserting long steel bolts into boreholes drilled in the roof strata

- principle: Bolts clamp together the rock layers making the roof act as a single self supporting beam.

Adv

- ① Economical - use less material than timber
- ② provide max working space

Use

- Most common support in modern coal mines and hard rock mines
- Applied in longwall panel based and pillar working and development heading.