Underground Mining of Metalliferous Deposits Professor Bibhuti Bhusan Mandal Department of Mining Engineering Indian Institute of Technology, Kharagpur Lecture 31 Breast Stoping

BREAST STOPING - OVERVIEW

- Breast stoping is usually followed in narrow orebodies of irregular mineralization (≤ 2m).
- The ore is broken by flat or slightly inclined holes drilled in a vertical face or Breast.
- The face is in dip rise direction and mining proceeds along the strike.
- Method lends itself to semi mechanization in drilling, blasting, loading and transport.
- The worked out space is supported by irregular pillar, timber cribs and props.
- With thick deposits the ore is broken in benches and then the method is called breast and bench mining (see STOPE & PILLAR)
- Handling of ore is by shoveling or using scrapers and drawn to lower level.

Applicability

- Applicability: Applicable to deposits of thickness up to 2 m, moderate depth. Foot wall mining is difficult in this method.
- Host rock/Hang wall: Strong
- Orebody: Strong
- Dip: Flat to moderately flat 20^o 40^o
- Deposit shape: Massive, tabular
- Deposit size: large extent not thick
- Ore grade: Practically any economic grade

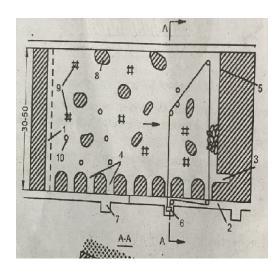


Figure 1. Schematic representation of Breast stoping

- \Box Stoping commences from raise(1) driven from haulage (2).
- ☐ Leading stope (3) is connected with haulage (2) by short ore chutes(4) prepared by drilling and blasting at 6 m intervals.
- ☐ The stope face advances along the strike.
- ☐ The ore is broken by blast holes(5) drilled along the stope.
- \Box The broken ore is slushed to ore chutes(4) by scraper hoist(6).
- ☐ The worked out space is supported by irregular pillars(8), timber cribs(9) and individual props(10).

Drilling & Blasting

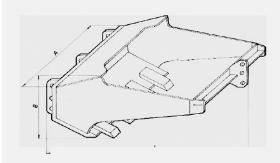
- ❖ Jackhammers are used for stope development drives, side stripping, Rock bolting.
- ♦ Hole length :~1.8 m 32mm dia. (during side stripping fanning round is preferred to create free face).
- ❖ Blasting: AN based slurry explosive sticks with Gelatin as bottom primer
- Stope must be well ventilated for comfort of working and quick clearing of smokes & fumes after blasting.

Mucking

A double hoist at the loading and transfer point moves both the cable with scraper bucket and empty cable through a pulley fixed at the face of heading.

The scraper bucket, which is open at the end facing conveying direction is automatically loaded by scrapping through the material like a prow, and is pulled by the haulage cable up to the loading platform to be emptied into a mining car.





Double-drum hoist/scraper (electric)

Scraper/bucket/hoe/shovel

A scraper loader is used for haulage in horizontal gently steep and trackless roadways with stable ground (not consolidated back fill, abandoned workings, etc.) as, e.g., in drifting, transport to chute, cutting of sills etc..

LIMITATION AND DISADVANTAGES OF SLUSHER

- Short haulage: Efficient for a hauling distance of 20-90m. Not practicable beyond a length of more than 150m.
- Lack of portability: Large slusher can weigh about 9000 kg and are installed on permanent or semi permanent concrete foundations.
- Mucking the edges and corners in a stope requires location of the tail block to be shifted quite often.
- Accessory wear: The rope and sheaves may require frequent replacement, specially with abrasive muck.

• Operator visibility: In long haulage and unlighted drifts, operator may have difficulty in seeing the scraper bucket.

Support

- ❖ In situ pillars as crown or level pillars (for support of levels) or stops control pillar and systematic timber supports are erected for control and warning against rapid closure of strata.
- * Rock bolting are widely used in the breast stoping.
- ❖ Main mode of support is by chock mats:
 - ➤ Compression chock mats and gradual settlement of H/w are catered for in a systematic manner. It can withstand increasing load without failure.
 - The area supported being more, it is considered to be safe.

ADVANTAGES

- 1. Simplicity and low prime cost of ore.
- 2. Possibility of mechanisation of drilling and loading at face.
- 3. Selective mining is possible with breast stoping.
- 4. Higher labour productivity.
- 5. Less development work is required.

DISADVANTAGES

- 1. **High ore loss** in randomly abandoned pillars for stability of ore and hanging wall.
- 2. Need to keep a constant watch on the conditions of the back.
- 3. Irregular shapes deposits require development work in unproductive country rocks.
- 4. Hauling by scraper and other haulage system is cumbersome.
- 5. Regular assaying is required to leave low grade portion of mineral body as pillar.
- 6. Low OMS.