Underground Mining of Metalliferous Deposits
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Lecture 52
Square Set Stoping

SQUARE-SET STOPING

The term “Square-set stoping” is applied to that method of mining in which the walls and back of the excavation are supported by regular framed timbers forming a skeleton enclosing a series of connected, hollow, rectangular prisms in the space formerly occupied by the excavated ore and providing continuous line of support in three directions at right angles to each other. As the timbers form the block sets of square shape – it is called square-set-stoping.

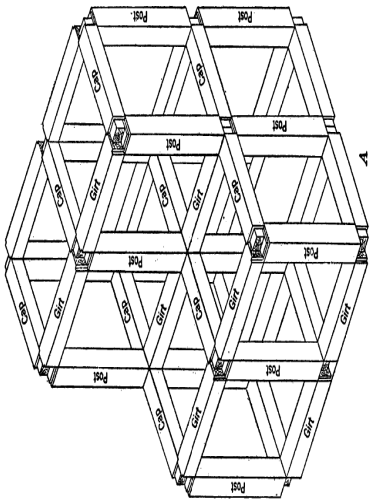

Figure 1. Square-set timbering

Philip Deidesheimer was born in Darmstadt in 1832 and graduated from the Freiberg University of Mining, emigrated to California during the gold rush, arriving in Georgetown in 1852. The Ophir Mine brought him to Virginia City in 1860 to find a means of keeping these vast ore bodies available.

Besides the loose ground predominant in the mines, there were great seams of clay that were under tremendous pressure. When the miners punched into one of the seams, the drift or shaft would close off within a matter of hours as the clay filled all open areas. It was a constant battle to keep those mines open and productive.

Deidesheimer is credited with creating **square set timbering**, which allowed the mines to fully develop the stopes. Large timbers, some as thick as twelve by twelve, most were ten by

tens, were fitted into cubes and as the miners progressed, they would build another cube, eventually a stope would look more like a bee hive than a mine.

Application

1. Where the walls of the ore body and back of the stope are weak and so not stand without support even for a week.
2. For recovery of fractured remnants and pillars.
3. Can be used in almost any size of deposits regardless of its shape or depth.
4. Ore should be of high grade to pay for the method of mining as square set stoping is costly and labour intensive method.

Development work

The chronology of level operations:

1. Construction of x-cut/haulage roadway – First the access way or X cut needs to be excavated from the shaft to the nearest point of ore body.
2. Construction of Haulage drifts – On completion of X-cut, Haulage drifts are constructed.
3. Construction of X-cuts between drift and orebody–On completion of Haulage drifts, X-cuts between the drift and orebody are constructed.
4. Construction of Raise/winze–Raise/Winzes are constructed to connect the two levels.

The ore is excavated in small, rectangular blocks just large enough to provide room for standing a set of timber. The essential timbers comprising a standard square-set are respectively termed “posts”, “caps”, and “grit” (or “ties”). The posts are the upright members, and the caps and grits are the horizontal members. The ends of the members are framed to give each a bearing against the other two at the corners of the sets where they join together. The stopes usually are mined out in floors or horizontal panels, and the sets of each successive floor are framed into the sets of the preceding floor.

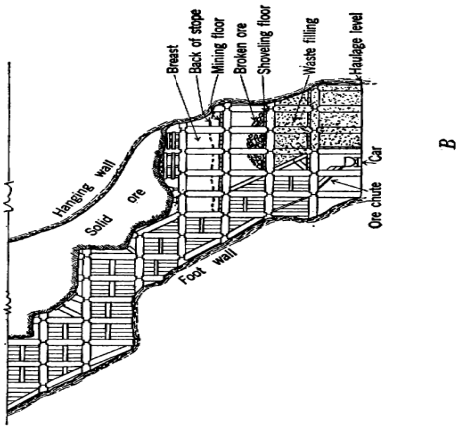

Figure2. Vertical transverse section through typical square-set stoping.

Sometimes, however, the sets are mined out in a series of vertical on inclined panels. Square-set stoping usually is accompanied by filling of the stoped ground, and often in heavy ground the sets are filled with waste shortly after they are put in, leaving only a small volume of unfilled stope at any one time.

Advantages

1. Irregular ore bodies of any shape can be worked by this method.
2. It can be adopted where ground conditions are bad.
3. Waste rock can be sorted out and allowed to remain in the stope.
4. The grade of the ore can be controlled as each new face can be sampled and assayed before the ore is drilled. In those mines, where the ore varies greatly in value, this flexibility of the square set stoping is an advantage.
5. If the sets are filled with waste rocks as soon as possible after they are erected, only a small space is open at a time.

Disadvantages

1. A large quantity of timber is required. It constitutes a fire hazard.
2. Production of the ore is slow and the O.M.S is poor.
3. It is a labour intensive method with a high cost of mining.
4. Square set stoping has a high accident rate compared to other method of stoping.