Underground Mining of Metalliferous Deposits
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Lecture 27
Selection of Mining Methods-II

Qualitative Ranking Systems

<u>Boshkov and Wright (1973)</u>

- One of the first qualitative classification schemes developed for underground method selection.

- Their system, which assumes that the possibility of surface mining has already been eliminated, uses general descriptions of the ore thickness, ore dip, and strength of the ore and walls to identify common methods that have been applied in similar conditions.

- The results of this classification provide up to four methods that may be applicable.

Boshkov and Wright classification system

Type of Ore Body	Dip	Strength of Ore	Strength of Walls	Commonly Applied Methods of Mining
Thin beds	Flat	Strong	Strong	Open stopes with casual pillars
				Room-and-pillar
				Longwall
		Weak or strong	Weak	Longwall
Thick beds	Flat	Strong	Strong	Open stopes with casual pillars
				Room-and-pillar
		Weak or strong	Weak	Top slicing
				Sublevel caving
		Weak or strong	Strong	Underground glory hole
Very thick beds	NA*	NA	NA	Same as for "Masses" below
Very narrow veins	Steep	Strong or weak	Strong or weak	Resuing
Narrow veins (widths up to economic length of stull)	Flat	NA	NA	Same as for thin beds
	Steep	Strong	Strong	Open stopes
				Shrinkage stopes
				Cut-and-fill stopes
			Weak	Cut-and-fill stopes
				Square-set stopes
		Weak	Strong	Open underhand stopes
				Square-set stopes
			Weak	Top slicing
				Square-set stopes

Wide veins	Flat	NA	NA	Same as for thick beds or masses
	Steep	Strong	Strong	Open underhand stopes Underground glory hole Shrinkage stopes Sublevel stoping Cut-and-fill stopes Combined methods
			Weak	Cut-and-fill stopes Top slicing Sublevel caving Square-set stopes Combined methods
		Weak	Strong	Open underhand stopes Top slicing Sublevel caving Block caving Square-set stopes Combined methods
			Weak	Top slicing Sublevel caving Square-set stopes Combined methods
Masses	NA	Strong	Strong	Underground glory hole Shrinkage stopes Sublevel stoping Cut-and-fill Combined methods
	NA	Weak	Weak or strong	Top slicing Sublevel caving Block caving Square-set stopes Combined methods

Figure 1. Boskov and wright classification system

Hartman (1987)

- Selection process for defining the mining method is based on the geometry of the deposit and the ground conditions of the ore zone.

- The system is similar to that proposed by Boshkov and Wright but is aimed at more specific mining methods.

- The method is qualitative and should be used as a first-pass approach.

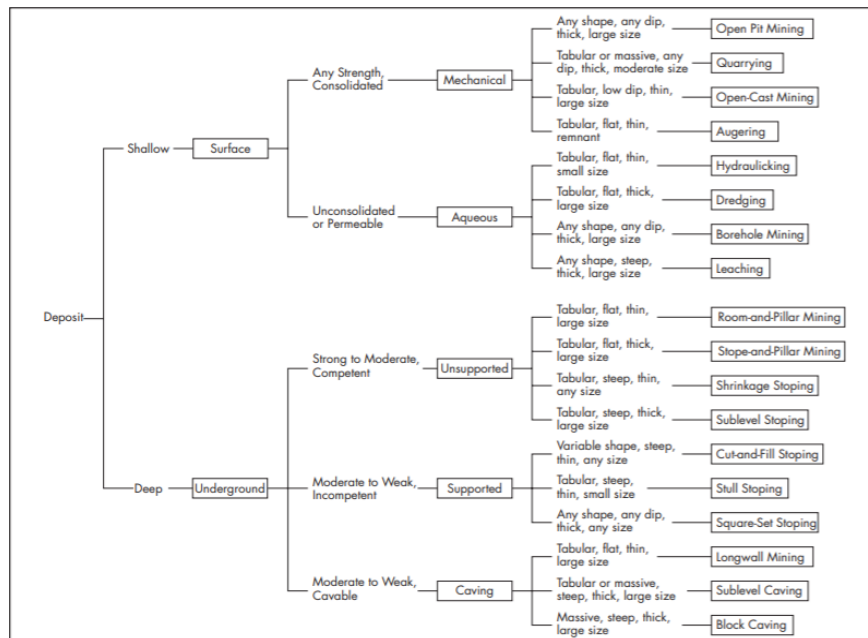- The classification includes surface and underground methods, coal, and hard rock.

Figure 2. Hartman Classification system

Morrison (1976)

- The classification system proposed divides underground mining into three basic groups:

GROUP A - Rigid pillar support

GROUP B - Controlled subsidence

GROUP C - Caving

- General definitions of ore width, support type, and strain energy accumulation are used as the criteria for determining a mining method.
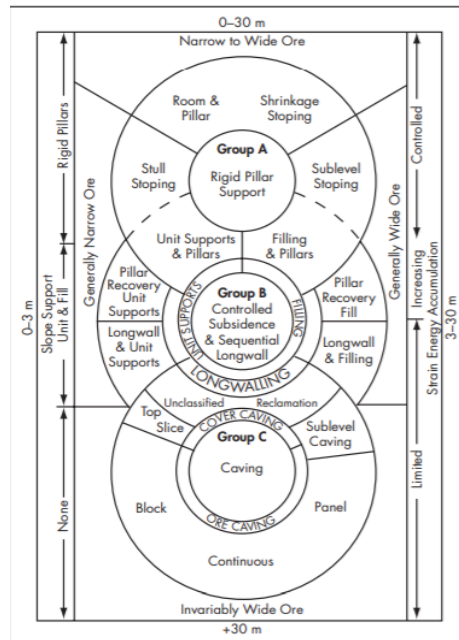

Figure 3. Morrison classification system

- Demonstrates the selection of one method over another based on the various combinations of ground conditions.

- In this system, the ground conditions have already been evaluated to determine the type of support required.

Laubscher (1981)

- The selection process is based on his rock mass classification system, which adjusts for expected mining effects on the rock mass strength.

- Laubscher's scheme is aimed at the mass mining methods, primarily block caving versus stoping, and his main emphasis is on cavability.

- The parameters that determine whether a caving system is preferred to a stoping system are :

➢ The degree of fracturing

➢ RQD

➢ Joint spacing

➢ The joint rating (which is a description of the character of the joint - i.e. *waviness, filling, and water conditions*)

- This scheme puts emphasis on the jointing as the only control for determining cavability.