# Underground Mine: Introduction, terminologies, Layout and Planning

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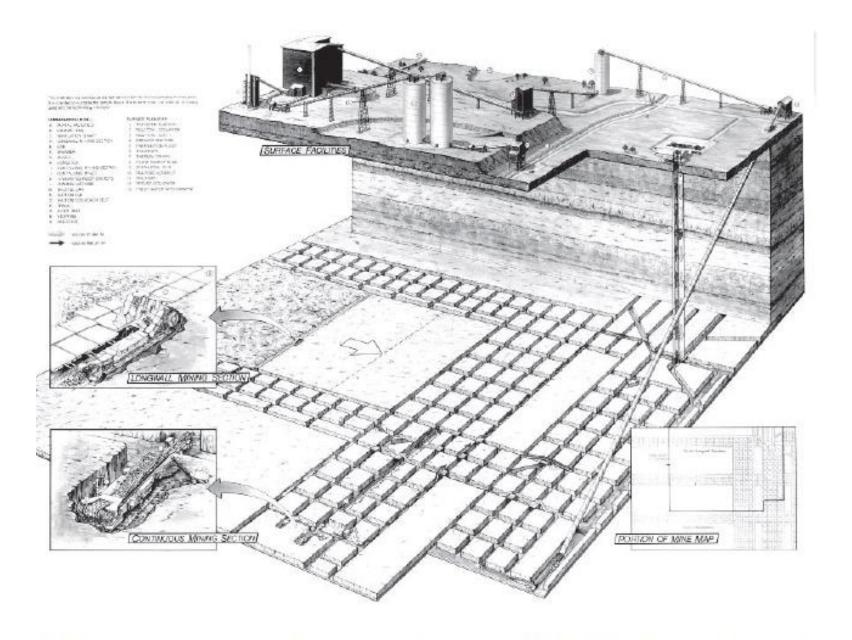


FIGURE 3-5 A conceptual representation of the general layout of a modern mine, the methods of mining, and the technology used. SOURCE: CONSOL, Inc. (now CONSOL Energy, Inc.)

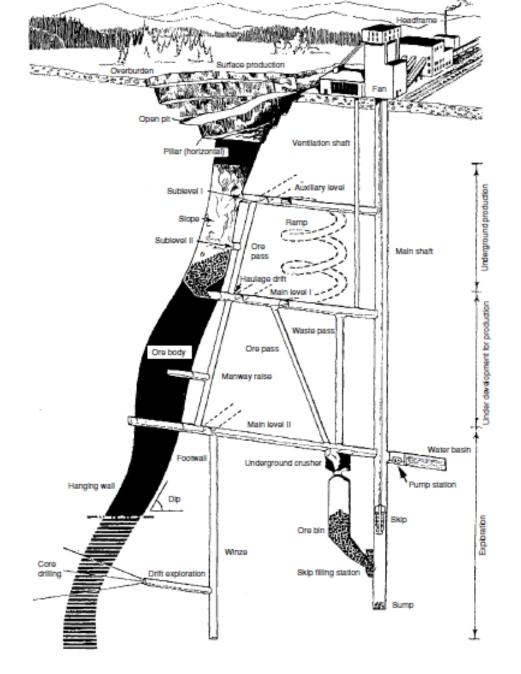
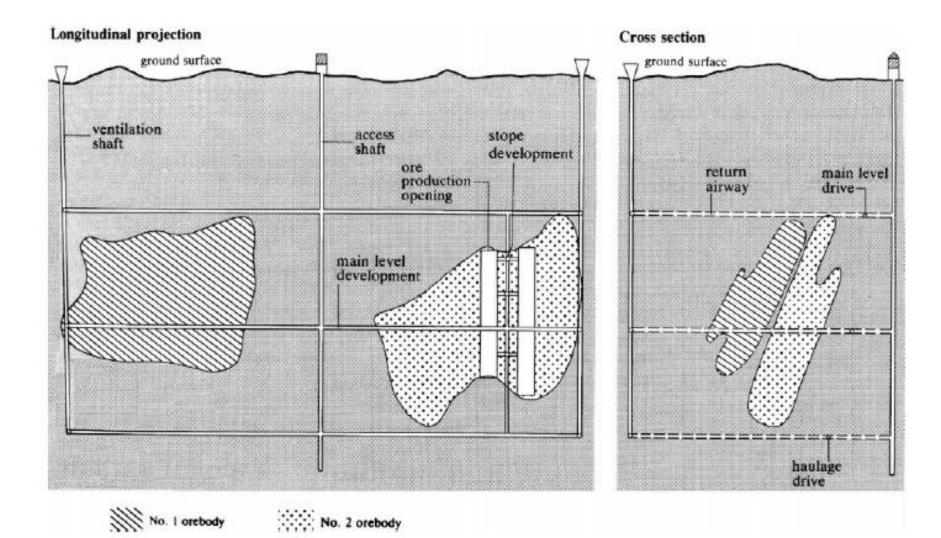


FIGURE 3-6 Sample layout of an underground mine, identifying various mining operations and terms. SOURCE: Hustrulid, 1982.



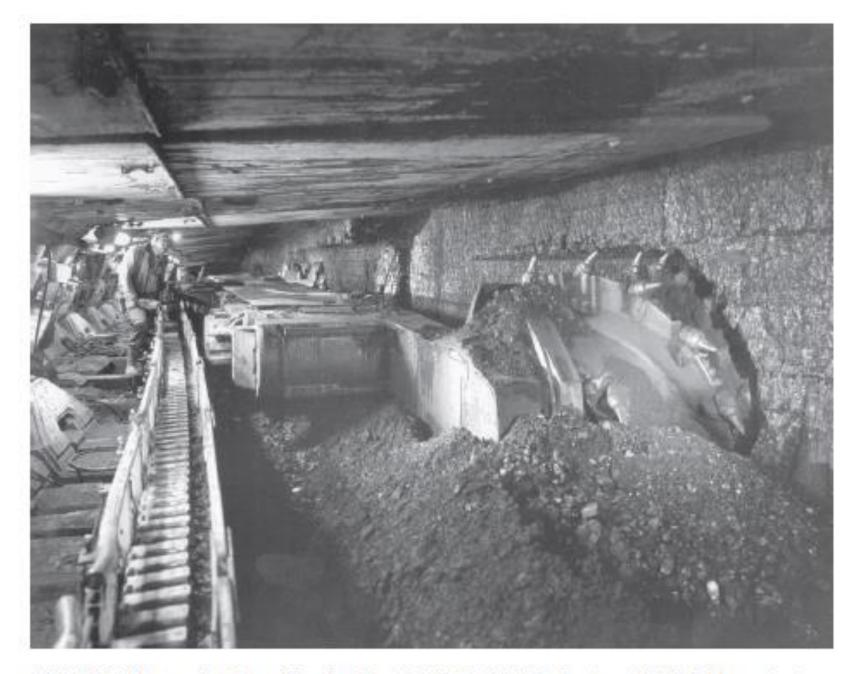


FIGURE 3-7 Photograph of longwall coal mining. SOURCE: CONSOL, Inc. (now CONSOL Energy, Inc.)

# mine access stope-and-pillar layout stope or block mining sequence extraction system ore handling and transportation mine services mine development

mine site layout

ventilation system.

# Engineering studies technical studies general arrangement drawings optimisation studies equipment selection

# Tabulation of physical quantities tons of ore length of drifting cross cut length of drilling tons of waste installed material equipment list

### Production schedule ore production schedule waste production schedule development schedule installation schedule

### Cost calculations Cost schedule by period capital cost equipment maintenance cost operating cost manpower number, class. pre-production pay rates, daily costs production consumable supplies cost. power and fuel installed materials cost freight, insurance, taxes, contracts

Figure 1.5 Definition of activities and functions in underground mine engineering (after Folinsbee and Clarke, 1981).

## Engineering design

one or several mining options are used to generate estimates of ore, waste, development, etc. for scheduling and costing

rock mechanics and integrated studies may eliminate some options before scheduling and costing

### by stope, pillar or bench, and by time period revenue by time period identification of key dates production start-up equipment deliveries performance

calculations

Work schedules tons of ore and grade

### Cost estimates costs for expense items daily cost expanded to month and year

Cost schedule overall summary of project for financial evaluation

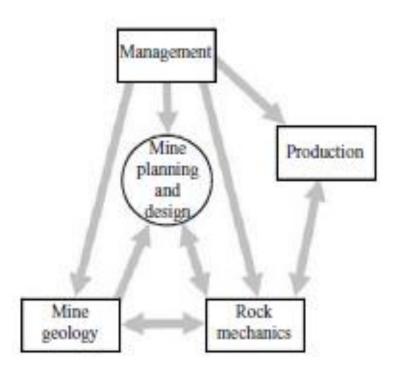


Figure 1.6 Interaction between technical groups involved in mine engineering.

- Management
- Geology
- Planning
- Rock Mechanics

# Implementation of a rock mechanics program

- to ensure the overall stability of the complete mine structure, defined by the main ore sources and mined voids, ore remnants and adjacent country rock;
- (b) to protect the major service openings throughout their designed duty life;
- to provide secure access to safe working places in and around the centres of ore production;
- (d) to preserve the mineable condition of unmined ore reserves.

## Implementation of a rock mechanics program

## Site characterisation

definition of hydromechanical properties of the host rock mass for mining

### Mine model formulation

conceptualisation of site characterisation data

### Design analysis

selection and application of mathematical and computational schemes for study of various mining layouts and strategies

### Rock performance monitoring

measurement of the operational response to mining of the host rock mass

### Retrospective analysis

quantification of in-situ rock mass properties, and identification of dominant modes of response of mine structure