

INTRODUCTION TO MINING

A Basic Mining Course

Introductory learning material for training, orientation and digital learning demonstrations.

Mining fundamentals • Exploration • Mine planning • Extraction • Processing • Safety • Environment • Closure

1. Mining Fundamentals

What is mining?

Mining is the process of locating, extracting and handling useful materials from the Earth's crust. These materials may include metallic ores, industrial minerals, construction materials and other geological resources.

The mining cycle

A simplified mining cycle includes exploration, evaluation, mine planning, development, extraction, processing, transport, sale or use, and eventual closure and rehabilitation.

Ore, mineral and waste

A mineral is a naturally occurring material with characteristic properties. Ore contains valuable material that may be economically recoverable. Waste rock is material removed that is not part of the intended economic product.

Why geology matters

Geology helps teams understand the location, shape, depth and characteristics of deposits. Geological information supports exploration, resource estimation and mine design.

2. Exploration and Mine Planning

Mineral exploration

Exploration seeks evidence of a mineral deposit before major mining investment. Activities can include mapping, sampling, geophysical surveys, drilling and laboratory analysis.

Drilling and sampling

Drill holes provide information about rocks beneath the surface. Samples are logged and analysed to estimate the distribution and quality of mineralisation.

Resource evaluation

Technical teams estimate the size and characteristics of a mineral resource and investigate whether parts of it could potentially be mined economically.

Mine planning

Mine planning considers the deposit, equipment, production targets, workforce, infrastructure, costs, environmental constraints and safety requirements.

3. Surface and Underground Mining

Surface mining

Surface mining removes material from near-surface deposits. Common approaches include open-pit mining and quarrying.

Open-pit mining

An open pit is developed in stages. Waste material is removed to expose ore, while benches and haul roads provide access.

Quarrying

Quarries commonly produce aggregates, limestone and dimension stone. Methods vary according to the product and geology.

Underground mining

Underground mining provides access to deeper deposits through shafts, declines, adits or other openings. Method selection depends on orebody geometry, rock conditions, depth and production requirements.

4. Drilling, Blasting, Loading and Hauling

Drilling

Drilling creates holes for exploration, blasting, ground control or other operational purposes. Equipment and patterns vary with rock type and the task.

Blasting

Controlled blasting fragments rock. Design may consider hole spacing, burden, depth and timing. Blasting must be planned and controlled by appropriately trained personnel.

Loading

Excavators, loaders and other machines move fragmented material into trucks, hoppers or stockpiles.

Hauling

Haulage moves ore and waste between working areas, stockpiles, waste facilities and processing plants. Roads require suitable design, drainage, traffic control and maintenance.

5. Mineral Processing

Why processing is needed

Extracted material often contains valuable minerals mixed with unwanted rock. Processing separates or concentrates useful material.

Crushing and screening

Crushing reduces material size. Screening separates particles into size ranges and prepares feed for later stages.

Grinding

Grinding reduces particle size further to help liberate valuable minerals. Grinding circuits can consume significant energy.

Separation

Depending on the ore, processing may use gravity separation, magnetic separation, flotation or other techniques. The selected process depends on mineral properties and the desired product.

Tailings and concentrates

A concentrate is enriched in valuable minerals. Tailings are the remaining material after processing and require appropriate handling and storage.

6. Mining Safety and Environmental Management

Safety culture

Mining involves heavy equipment, slopes, explosives, electrical systems, dust, noise and other hazards. Safety requires planning, training, supervision and reporting.

Risk assessment

A basic risk process identifies hazards, considers who or what could be affected, evaluates risk and establishes controls.

Personal protective equipment

Depending on the task, workers may use helmets, safety footwear, high-visibility clothing, eye and hearing protection, respiratory protection and other task-specific equipment.

Environmental management

Mining can affect land, water, air, biodiversity and communities. Management may include water monitoring, dust control, waste management and rehabilitation.

7. Mine Closure and Key Learning

Mine closure

Closure planning considers what will happen when mining ends. Measures may include dismantling facilities, stabilising disturbed areas, managing water, rehabilitating land and monitoring sites.

Rehabilitation

Rehabilitation aims to return disturbed areas to a safe and stable condition suitable for an agreed future use.

Continuous improvement

Mining operations collect information about production, safety, equipment, geology and environmental performance. Reviewing this information helps improve future work.

Key learning

Mining is a complete lifecycle rather than simply digging rock. Geology supports exploration and planning; engineering determines how material is accessed and moved; processing creates usable products; safety and environmental controls support responsible operations; and closure is part of planning from the beginning.