Gold Ore Characteristics Before Crushing

KEY ENGINEERING CONTROLS

- Quartz Content
- Host Rock Competency
- Abrasiveness
- Fracture Pattern
- Feed Gradation
- Moisture / Clay

GOLD MINERAL HARDNESS

- Native gold is soft (Mohs 2.5–3)
- Distributed in quartz veins and sulfide minerals
- Limited influence on crusher wear and breakage

VS.

WHOLE-ROCK CRUSHING BEHAVIOR

- Controlled by all rock components
- Governed by hardness, abrasiveness, structure, and moisture
- Determines breakage, product size and equipment wear

Crusher selection should be based on the complete ore, not the Mohs hardness of native gold alone.

Gold Ore Feed Size Reduction

1 ROM Gold Ore
Up to about 0–600 mm
Reference only

2 Primary Jaw Crushing
Approximately 80–160 mm
Typical coarse-crushing reference

3 Secondary / Tertiary Crushing
Approximately 12–25 mm
Common grinding-preparation reference

4 Grinding
Tens to low hundreds of micrometres
Testwork-dependent

No universal Gold Ore final particle size.

Final grinding size is controlled by mineral liberation and the selected downstream recovery process.

All size ranges shown are reference / indicative only. Project-specific confirmation is required.

Primary and Secondary Gold Ore Crushing

Two-Stage Compression Crushing for Hard Rock Gold Ore

1. PRIMARY JAW CRUSHING

Handles the largest ROM feed and reduces it to a manageable size for the next crushing stage.

- Large Irregular ROM Rock
- Compression Crushing
- Large Feed Opening
- Primary Reduction

2. SECONDARY CONE CRUSHING

Receives pre-crushed material and further reduces it with continuous compression for controlled product size.

- Smaller Pre-Crushed Feed
- Continuous Compression
- Controlled Secondary Reduction
- Hard / Abrasive Ore Duty

FEED SIZE
Up to about 0–600 mm
Reference / Indicative

DISCHARGE SIZE
Approximately 80–160 mm
Typical coarse-crushing reference

DISCHARGE SIZE
Approximately 12–25 mm
Common grinding-preparation references

FEED SIZE HIERARCHY

The jaw crusher receives the largest ROM lumps.
The cone crusher receives smaller, pre-crushed material.

CRUSHING PRINCIPLE

Both stages use compression crushing, suited to hard and abrasive gold ore.

ENGINEERING NOTE

Selecting the correct crusher and chamber depends on ROM size, ore hardness, abrasiveness and required product size.

IMPORTANT Equipment selection and circuit design must be based on actual project data and metallurgical requirements.

Closed-Circuit Gold Ore Crushing and Screening

Secondary cone crusher in closed circuit with vibrating screen to produce controlled grinding-feed size.

FROM PRIMARY CRUSHING

Pre-crushed Gold Ore

SECONDARY CONE CRUSHER

Continuous compression reduces the material to target size.

VIBRATING SCREEN

Separates material into qualified undersize and oversize.

OVERSIZE (Return to Cone Crusher)

Particles larger than screen cut are returned to the cone crusher for further reduction.

QUALIFIED UNDERSIZE (Grinding Feed)

Material passing the screen cut reports to the grinding feed conveyor / bin.

CRUSHER DUTY EQUATION

Crusher Duty = Fresh Feed + Circulating Oversize

The cone crusher handles both the new feed and the returning oversize.

KEY CIRCUIT CONTROLS

Crusher CSS

Closed Side Setting controls the product size distribution from the cone crusher.

Screen Cut

The screen aperture defines the separation point for undersize and oversize.

Screen Efficiency

Screen performance affects the accuracy of separation and circuit stability.

Feed Gradation

The size distribution of incoming material affects crusher load and screen performance.

Circulating Load

The amount of oversize returning to the crusher impacts capacity and power draw.

CSS DOES NOT EQUAL GUARANTEED FINAL PLANT PARTICLE SIZE

Final product size at the grinding-feed conveyor is controlled by the combination of crusher CSS, screen cut, screen efficiency, feed gradation and the amount of circulating load in the closed circuit.

ENGINEERING NOTE

Proper control of CSS, screen cut and circuit balancing is essential to achieve a stable closed circuit and consistent grinding-feed size for hard rock gold ore.

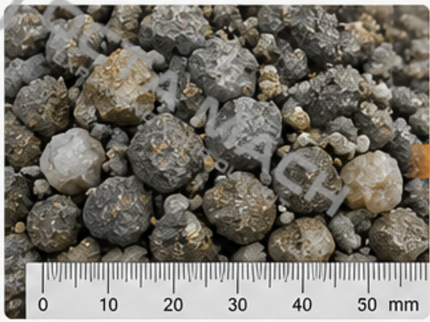
Closed-circuit crushing and screening are fundamental to efficient hard rock gold ore processing and optimized grinding performance.

Grinding Preparation and Mineral Liberation

From controlled crushed ore to mineral liberation for downstream recovery.

1. CONTROLLED CRUSHED GOLD ORE

Approximately 12–25 mm reference
(Grinding preparation size)



Uniform, controlled size supports stable grinding and efficient energy use.

2. BALL MILL GRINDING

Impact and abrasion reduce ore to finer particles.

Grinding liberates valuable minerals from host rock and sulfides.

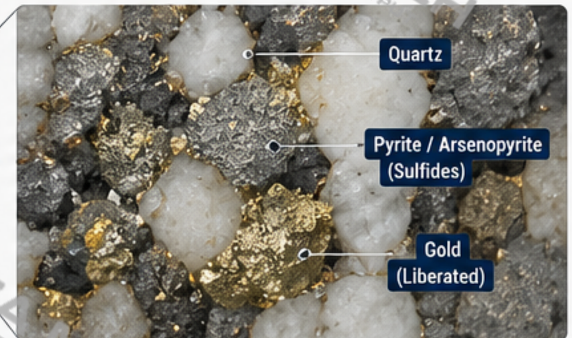
3. GROUND ORE

Tens to low hundreds of micrometres
(Testwork-dependent)

Finer particles provide greater liberation potential.

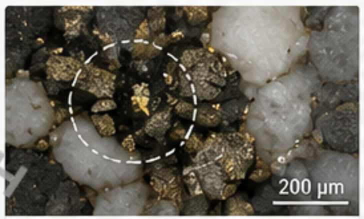
4. ENLARGED MINERAL-LIBERATION CUTAWAY

Progressive exposure of gold-bearing minerals from quartz and sulfide hosts.



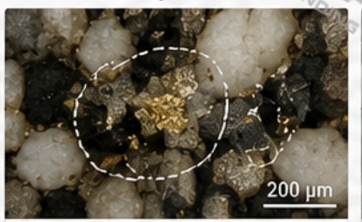
MINERAL LIBERATION PROGRESSION (Illustrative)

Locked Gold



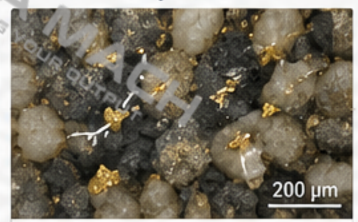
Gold locked within sulfide or quartz. Not accessible for recovery.

Partially Liberated



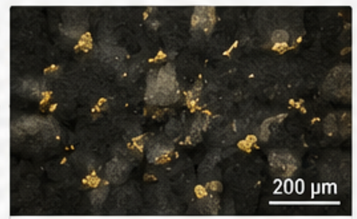
Some gold particles are exposed, but many remain locked.

Mostly Liberated



Most gold particles are liberated and available for separation.

Fully Liberated



Gold particles are fully liberated and easily recoverable.

Gold → Gold | Pyrite / Arsenopyrite | Quartz → | Gangue / Host Rock

GRINDING TARGET DEPENDS ON:

- **Gold Particle Size** — Native gold size distribution influences required grind.
- **Mineral Association** — Gold associated with sulfides demands finer grinding.
- **Liberation** — Target liberation level controls necessary fineness.
- **Grindability** — Ore hardness and abrasiveness affect achievable grind.
- **Downstream Recovery Route** — Gravity, flotation, or leaching drive the optimal grind size.

CRUSHING REDUCES ROCK SIZE
It prepares the ore for efficient grinding.

GRINDING DEVELOPS MINERAL LIBERATION
It exposes valuable minerals for downstream recovery.

GRINDING FINER IS NOT AUTOMATICALLY BETTER.
Excessive grinding increases energy and costs without guaraateed improvement in gold recovery.
Optimize grind size based on testwork, liberation and the chosen recovery route.