

Pillar Recovery and Gob Area Processing in Mining

Xian, Shaanxi Mar 19, 2026 ([IssueWire.com](https://www.IssueWire.com)) - I. Importance of Pillar Recovery and Gob Area Processing

In underground mining, pillar recovery and gob area processing are critical and closely interconnected processes that leave profound impacts on the sustainable development of mines. Pillars are key structural elements to support the mind-out areas. Efficient recovery of these pillars directly influences the recovery rate of underground resources and determines the economic benefits of the mine. A large quantity of ore will be left behind in case they could not be recovered in time reasonably, resulting in immense waste and significant loss in overall profitability in mining.

At the same time, improper gob area processing can lead to a series of safety issues. Ground pressure accumulates with the expanding of gob areas, increasing risks of pillar deformation and failure under intense stress. This may trigger large-scale roof collapses, rock movements, surface subsidence, cracking, and collapse, causing catastrophic impacts on underground personnel and equipment.

Poor pillar recovery and gob area processing may lead to ecological problems like disrupted groundwater levels, damaged surface vegetation, and unbalanced the local ecosystem. Therefore, scientific and efficient pillar recovery and mind-out area processing is paramount for safe production, efficient resource utilization, and environmental protection. These processes require overall consideration for their interwoven relation in mining plans.

II. Pillar Recovery

(1) Common Methods

Pillar recovery methods include open stoping, backfill, and caving, each suited to specific conditions in correspond.

Open Stopping is an ideal option for orebodies with stable rock and significant exposure areas. It features simple mining processes and low costs but leaves many residual pillars. Delayed or unreasonable recovery can lead to concentrated stress, posing potential risks to further exploration.

Backfill is suitable for high-value ores or mines with strict surface subsidence requirements. It involves using fill materials to stabilize the surrounding rock, improve ore recovery rates, and reduce surface deformation. Advanced instruments, such as [online slurry density meters](#), help s monitoring strength of fill material through real-time density measurement. [Lonnmeter](#) provides intelligent instruments for automated mining solutions. [Contact us](#) for more on online slurry density meters. However, backfill incurs high costs and complexity.

Caving is applied to places where surrounding rock caves naturally or gob area issues could be handled through forced caving. It prevents stress concentration but may increase ore dilution and affect adjacent tunnels.

(2) Case Study

Take the room-and-pillar method serves as an example to illustrate the recovery process in detail. The mine employed vertical, fan-shaped drilling in inter-pillar sections, horizontal drilling for roof pillars, and

mid-depth drilling for floor pillars. Blast sequences were meticulously planned to manage ore collapse direction and scope. Ventilation systems ensured fresh air entered the lanes of the scraper via the bottom lanes; contaminated air is discharged through the upper ventilation well to ensure air quality. Then, caved ores are scraped out horizontally and hauled away by the lower mine car efficiently.

(3) Key Points in Recovery

It is essential to select recovery methods based on the specific characteristics of the pillars in flexible pillar recovery. Making sure the selected method enables both efficient recovery of ores and safe exploitation after overall weighing over all factors like size, shape, stability of the ore rock, and the spatial distribution of surrounding orebodies, etc. Stress and deformation of pillars should be monitored in real time for fear of any abnormality.

Protecting the stability of the pillars is critical during the recovery process. During the stope recovery stage, mining parameters must be strictly controlled to prevent excessive damage to the pillars. During recovery operations, the pillars' stress and deformation conditions should be monitored in real time. If any abnormalities are detected, the recovery strategy should be promptly adjusted. This can be achieved by installing equipment such as stress sensors and displacement monitors to ensure precise control of pillar conditions.

Preliminary mining design is the foundation for the successful recovery of pillars. Reasonable layout in roadway and chamber, as well as integral systems of ventilation, transportation, and drainage, all provide benefits to subsequent drilling, blasting, and ore extraction operations. For example, the precise design of the gradient and length of mucking drifts ensures the smooth transportation of ore.

Blasting and ore extraction operations should be arranged reasonably. Blasting parameters should be scientifically determined based on the structure of the pillars and the properties of the ore to prevent blasting from causing excessive impact on the pillars and the surrounding rock. The ore extraction process must be organized systematically to avoid ore accumulation, which could impede subsequent operations and reduce production efficiency. For example, optimizing the spacing of blast holes and the amount of explosive charges based on the thickness and hardness of different pillars can achieve efficient ore fragmentation and safe recovery.

III. Gob Area Processing

(1) Purpose

The primary goal of gob area processing is to redistribute concentrated stress, achieving a new equilibrium in rock stress for safe and stable mining operations. If left unaddressed, stress concentration in gob areas can lead to roof collapse, rock displacement, and other hazards.

(2) Common Methods

Rock Caving: Explosives collapse surrounding rock to fill gob areas, reducing stress and forming a buffer layer. The depth of caved material should exceed 15–20 meters to ensure safety. Advanced blasting techniques, such as deep-hole blasting, optimize efficiency.

Backfill: Suitable for high-grade ore mining and areas with stringent surface stability requirements.

Materials include waste rock, sand, tailings, and concrete. Strictly controlling backfill density and distribution maximizes support strength.

Sealing: Constructing thick isolation walls in access tunnels to absorb blast impacts. This is a secondary method, mainly for smaller gob areas.

IV. Correlation Between Pillar Recovery and Gob Area Processing

The processes are interdependent. Pillar recovery affects gob area stability, as removing pillars redistributes stress, potentially leading to roof collapses and other hazards. Conversely, the gob area processing impacts the safety and feasibility of pillar recovery. Properly managed gob areas reduce stress on remaining pillars, facilitating safer operations.

The implementation order depends on factors such as stress activity, orebody conditions, and production plans. For instance, intense stress requires gob area processing first, while weaker rock may necessitate simultaneous pillar recovery and gob area treatment.

V. Lessons Learned

Customize plans based on geological conditions, using advanced monitoring devices for real-time stress and displacement tracking.

Compare and optimize various recovery and gob area processing strategies with simulation software to predict outcomes, reducing risks and improving efficiency.

This ensures coordinated pillar recovery and gob area processing, enhancing mine safety, productivity, and sustainability.

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