

Some Critical Issues in Underground Mining with Backfill

Li Li, ing. (Engineer), Full Professor,

Scientific Director, Research Institute on Mining and Environment (RIME UQAT-Polytechnique)
Department of Civil, Geological and Mining Engineering
Polytechnique Montreal, Canada

Mining industry is indispensable to maintain the growth and development of almost all other industries. While producing useful minerals, mining industry also produces mine wastes in terms of waste rocks and tailings. Conventionally, these materials are stored on the ground surface as waste rock piles and tailings storage facilities, with possible generation of acid mine drainage or contaminated neutral drainage when the mine wastes are chemically reactive. Disaster to environment, infrastructure and loss of lives associated with the breach of a tailings storage facility is another well-known problem of surface disposal of mine wastes. On the other hand, underground mining with backfill has become almost a must in the modern mines worldwide due to its advantages and resource exhausting on the ground surface or in shallow depths. Application of backfill made of mine wastes reduce the amount of mine wastes to be stored on the surface and environmental footprint, increases ore recovery rates, reduces mineral dilution, improves ventilation efficiency, and enhances ground stability.

Despite the numerous advantages, the successful application of underground mining with backfill depends on the design and manufacture of backfill. From the economic point of view, it is better to have a backfill with binder (cement or/and other binding materials) content as low as possible. When the binder content is too low or poorly manufactured, the backfill mass can fail and collapse upon side- or base- exposure during or after the excavation of a neighboring stope, resulting in undesirable consequences. Another critical element for the success of mining backfill is the design and construction of barricades, a retaining structure built at the base of stopes near the entrances (draw-points) to maintain backfill slurry in the stopes. Several disasters associated with barricade failure have been reported in Canada and Australia. Backfill transportation is another critical issue that needs to be properly addressed to ensure a successful use of mining backfill in underground mines.

In this lecture, these critical issues, along with some recent developments of underground mining with backfill will be presented and discussed.