

Delineating Concern Ground in Block Caving - Underground Mine Using Ground Penetrating Radar

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Abstract : Mining by block or panel caving is a mining method that takes advantage of fractures within an ore body, coupled with gravity, to extract material from a predetermined column of ore. The caving column is weakened from beneath through the use of undercutting, after which the ore breaks up and is extracted from below in a continuous cycle. The nature of this method induces cyclical stresses on the pillars of excavations as stress is built up and released over time, which has a detrimental effect on both the installed ground support and the rock mass itself. Ground support capacity, especially on the production where excavation void ratio is highest, is subjected to heavy loading. Strain above threshold of the elongation of support capacity can yield resulting in damage to excavations. Geotechnical engineers must evaluate not only the remnant capacity of ground support systems but also investigate depth of rock mass yield within pillars, backs and floors. Ground Penetrating Radar (GPR) is a geophysical method that has the ability to evaluate rock mass damage using electromagnetic waves. This paper illustrates a case study from the Grasberg mining complex where non-invasive information on the depth of damage and condition of the remaining rock mass was required. GPR with 100 MHz antenna resolution was used to obtain images of the subsurface to determine rehabilitation requirements prior to recommencing production activities. The GPR surveys were used to calibrate the reflection coefficient response of varying rock mass conditions to known Rock Quality Designation (RQD) parameters observed at the mine. The calibrated GPR survey allowed site engineers to map subsurface conditions and plan rehabilitation accordingly.

Keywords : block caving, ground penetrating radar, reflectivity, RQD

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