Parametric stability analysis of pillar performance at Nohyun limestone mine, South Korea—a case study

Kim, JG., Abdellah, W.R. & Yang, HS.

Abstract:

The objective of this paper is to evaluate the performance of pillars located on level #3 at Nohyun Limestone Mine that uses the room-and-pillar method. The mine is located at South of Cheongju city, North Chungcheong Province, South Korea. A series of two-dimensional elasto-plastic finite-difference models has been constructed using FLAC2D software. Factor of safety (FOS) is then calculated using fish-code (solve FOS), an internal command of FLAC built on a shear strength reduction technique. The results are presented and discussed in terms of stress state, deformation and factor of safety with respect to mining sequence, mining depth and mineshaft width. The results reveal that, the stability of pillars deteriorates when level #3 is entirely mined out after extracting level #2 (i.e. FOS =1.33 to 1.55). In addition, the safety of pillars is sharply dropped (i.e. FOS =1.16 to 1.33) when mining depth extends to 15m; and similarly, width of mineshaft increases by 2m. Also, a comparison of calculation of safety factor, FOS, employing numerical modelling (i.e. FOS =1.16 to 1.86) and analytical methods (i.e. FOS = 7.35 to 36.36) has revealed that numerical modelling is more conservative from a design point of view. The study also indicates that, the overall mine stability is influenced by the discordance in the pillar arrangement between adjacent levels. Therefore, it is recommended that, the pillar design should be dictated by the inclination of the orebody.

Keywords:

Room-and-pillar method, parametric stability analysis, factor of safety (FOS), Nohyun Limestone Mine.

Published In: