

Study on Design of Gateroad in Board and Pillar Punch Mining System in Angren Coal Mine, Uzbekistan

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Introduction

Coal is an important energy source for electricity generation and also forms an essential fuel for the production of steel. Sources show data as Uzbekistan Coal Production was reported at 5.400 Tonne mn in Dec 2022. The major coal mines in the country are Baysun and Shargun coal mines. However, the major coal projects and ongoing coal mine proposals are in process in Angren and Nishbash coal mines. Angren coal mine was chosen for this study. At Angren coal mine, the rapid expansion of this mine has caused the environmental issues due to the open pit mining activity, a transition from open pit mining to underground mining is being considered (see Fig. 1). The research objectives are to discuss the appropriate design of gateroad in board and pillar punch mining system in Angren Coal Mine.



Fig. 1 Satellite photos for comparison 2010 and 2022

Numerical Modeling

In Angren coal mine, transition from open pit to the underground mining was recommended using board and pillar mining method from the highwall due to the geological condition and economical points of view (see Fig. 2). The plan of the modeling was developed specifically to this mining location (see Fig. 3). The main point on modeling was on design of gateroad including the size of cross section, support system, the spacing between adjacent gateroads. The FLAC3D software was used for this research and elasto-plastic analysis with Moh-Coulomb failure criterion was conducted.

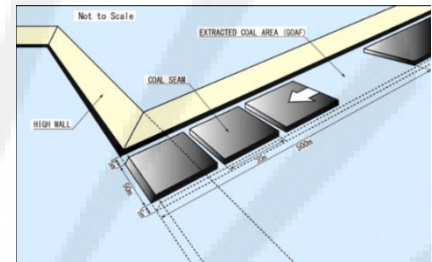


Fig.2 Board and pillar punch mining system.

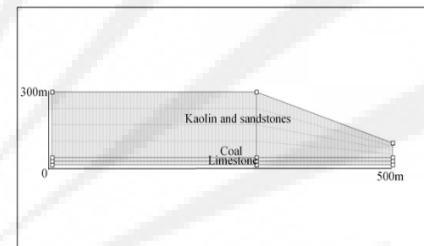


Fig.3 Numerical model.

Results and Discussion

From the results of a series of numerical analyses, the following conclusions were made:

- The cross section of goateroads is 5.0m height and 7.0m width.
- Rock bolt is used as the primary support system of gateroad. In case the depth is shallower than 150m, the gateroads can be maintained by installation of four 3m length bolts with 1.4m spacing as show in Fig. 4 (a). On the other hand, in case that the depth is larger than 150m, six 3.5m length bolts with 1.0 m spacing should be installed as shown in Fig.4 (b).
- The spacing between adjacent gateroads should be 50m or more (see Fig. 5).

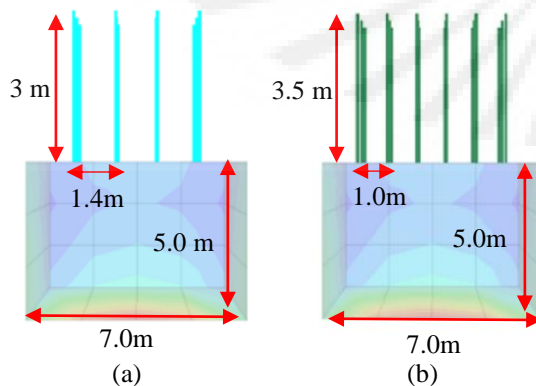


Fig.4 Support design for gateroad.

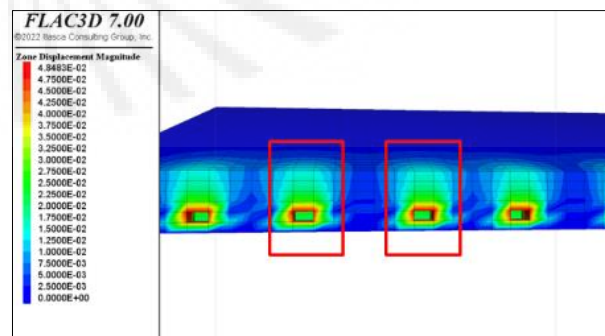


Fig.5 Displacement around gateroads with 50m spacing.