

## ABSTRACT

CV. Artha Pratama Jaya (CV. APJ) is a private company that is engaged in coal mining is located in Teluk Dalam Village, Muara Jawa District, Kutai Kartanegara Regency, East Kalimantan Province. The results of further exploration in 2012 showed that there are prospects coal seam for underground mine. Mining method was applied by CV. APJ is a shortwall method with retreating system. Coal mining with shortwall method has a main risk to the roof failure in mine openings and panels. With the existence of these problems required a geotechnical study of the stability in mine openings (main incline shaft (MIS), main vent shaft (MVS), and panel entries), pillar stability (chain pillar and barrier pillar), and the support system has used.

Properties of material parameters obtained from the results of laboratory testing of intact rock. Analysis of the stability in mine openings using the finite element method (FEM) with the failure criteria of the Mohr-Coulomb (1779). Geometry MIS and MVS is horseshoe-shaped with geometry of 3 m wide, total height 2,8 m, vertical height 1,8 m, and radius of arches of 1,5 m. The panel entry consists of the main gate and tail gate with a trapezoidal shape, upper widths 2 m, lower width 3 m, and a height of 3 m. The results of the analysis the overall MIS categorized as safe ( $FK > 1,5$ ), only the right wall  $FK 1,5$  critical. MVS overall stability categorized as safe ( $FK > 1,5$ ), only the roof  $FK 1,12$  failure. The stability of the main gate to the third level mining is safety ( $FK > 1,3$ ), only on the right wall and left  $FK$  failure caused due to undercut the coal seam. Tail gate to the third level mining is categorized safe ( $FK > 1,3$ ). Because there are some parts that failure, it is recommended to use a supporting system to strengthen and anticipates mine opening failure.

Chain pillar stability analysis using the formula Obert and Duvall (1967), and Bieniawski (1983). Chain pillar analysis results obtained chain pillar width ( $W_p$ ) and a minimum safety factor of each level, ie level 1 (5,94 m and  $FK 1,65$ ), level 2 (6,97 m and  $FK 1,34$ ), and level 3 (7,01 m and  $FK 1,34$ ). Overall width of chain pillar used by CV. APJ is 9 m and based on the value of  $FK$  categorized as safe ( $FK > 1,3$ ). Analysis barrier pillar using the formula of the Ashley (1930). The minimum width of the analysis results obtained level 1 (52,4 m), level 2 (57,3 m), and level 3 (58,2 m). The width of the barrier pillar used CV. APJ for all levels of 40 m, the conditions are not safe so that the width of the barrier pillar must be adapted to the results of the analysis.

The results of the analysis supporting system using the wooden timber class I kind Ulin wood, shear and bending stress analyzed did not exceed the allowable  $66 \text{ kg/cm}^2$  and  $660 \text{ kg/cm}^2$ . Analysis of support rigid steel arches produce section modulus  $W$  value of  $34 \text{ cm}^3$  by using specifications profile GI 70 profile I-beams DIN 21541  $W_x$  value of  $34,7 \text{ cm}^3$ , then it can be considered safe.