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Validation of the current support design methodology at mine A using keyblock analysis

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ABSTRACT

Support is crucial for ensuring that Falls Of Ground (FOG) injuries are minimized. FOGs are the leading cause of fatalities and injuries in South African Mines. Not only do FOGs result in loss of life, but they also cause damages, which result in loss of revenue and loss of time (due to additional loading of waste material). Most FOGs are observed within the high risk zone, which is between the first line of support and the face. Most of these FOGs occur during face preparation and drilling activities. The falls at Mine A are mainly bound by geological discontinuities - structures such as joints, faults, pothole structures and sympathetic jointing associated with faults.

Various support design methodologies are being employed within the South African platinum industry. The current support design method used at Mine A is the fall out height method. It involves a statistical back analysis on past FOGs, and provides a thickness of hangingwall that corresponds to the height of 95.0 % of the FOGs. Several limitations of this method were observed during the research investigations. One major limitation is that it does not explicitly consider geological discontinuities, their properties, orientations and exposures with reference to the excavation. It is for this reason that further research on the support design was done at Mine A.

The research, described in this report, investigated the current support design at Mine A, and explored ways to optimize the design. A keyblock analysis method was found to be the most applicable to the shallow depth

environment at the Mine. The keyblock analysis was done using the JBlock modelling program (Esterhuizen, 2003), which is a statistical package that determines possible block sizes that can form as a result of geological discontinuities. The package considers the orientations of structures with respect to the excavations, the number of joint sets, the spacing of the joints within each set and the geomechanical properties of the discontinuities.

Several models were constructed for various support Scenarios and the results allowed the following conclusions to be made:

1. The current support design at Mine A will not reduce injuries occurring in the working areas to tolerable levels;
2. Injuries can be reduced to international standards/norms if 2.5 m long bolts are used on a 2.5 m X 2.5 m spacing (34 kN/m^2) with suitable Wire-mesh and Osro straps (45 kN); and
3. Bolts of a length of 1.5 m installed on a 2.0 m X 2.0 m spacing (30 kN/m^2), with Wire-mesh and suitable straps, will adequately reduce the current risk of FOG injury in most areas, provided it is accompanied by a Triggered Action Response Plan.

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