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2011-10-21
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Rockfall Risk: Quantification of the consequences of rockfalls

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Though the significance of investing in safety spending is appreciated, it is generally viewed as an expensive overhead cost. In lean economic times particularly, this mind-set places productivity first before safety. However, because of compromised safety conditions, there may be rockfalls. The consequences of rockfalls are numerous, some direct and others indirect. While these losses can be significant, there appear to be no records of evaluation of such losses on the mines. The financial evaluation of risk mitigation systems is therefore currently based only on the cost of implementing a support system and does not take into account the losses resulting from accidents or failure of the system.

When a fall of ground occurs in a stope the method of remediation depends largely on the size of the rockfall. Very small rockfalls will be simply cleaned up and the area made safe, larger rockfalls will require the installation of additional support, or the panel may need to be re-established in the case of the largest rockfalls. Losses are incurred as a result of dilution, re-supporting, reduced productivity and loss of sweepings. Pillars and remnants may also be left behind, which reduces the available reserves. The findings of this research suggest that the full distribution of rockfall sizes should be considered.

In this dissertation, an investigation into rockfall risk has been carried out. This is based on the definition of risk, where risk is the product of the probability of occurrence of a rock fall and the consequences it causes. The research was conducted on two case study operations, AngloGold Ashanti (Mponeng Mine) and Implats (Impala Platinum 12 Shaft). On each operation the probability of occurrence of rockfalls was determined from the mine's rockfall database and where joint data was available; a key block generating software, JBlock, was used.

Extensive studies were then carried out to determine the consequences and costs of rockfall damage and as a result, a generic methodology of calculating these was developed. This methodology is presented in this dissertation. This methodology enables the calculation of risk in monetary terms, a language well understood by management. Management can therefore be involved in the design of risk mitigating systems as they can set the acceptable risk criteria. The ability to calculate risk and set acceptable risk criteria implies that while productivity is maintained, safety is not compromised.

Filename: MSc Abstract - Rockfall Risk - Quantification of the consequences of rockfalls
Directory: C:\Users\Lawrence.Rwodzi\Documents\Masters_2010
Template: C:\Users\Lawrence.Rwodzi\AppData\Roaming\Microsoft\Templates\Normal.dotm
Title:
Subject:
Author: Lawrence.Rwodzi
Keywords:
Comments:
Creation Date: 4/4/2011 8:19:00 AM
Change Number: 1
Last Saved On: 4/4/2011 8:21:00 AM
Last Saved By: Lawrence.Rwodzi
Total Editing Time: 2 Minutes
Last Printed On: 4/4/2011 8:21:00 AM
As of Last Complete Printing
Number of Pages: 1
Number of Words: 401 (approx.)
Number of Characters: 2,288 (approx.)