EVALUATION OF STOPE SUPPORT USING A ROCKMASS STIFFNESS APPROACH

MARTIN JOHANNES PRETORIUS

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THESIS SUMMARY

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M.J. PRETORIUS

Supervisor: **Professor J.N. van der Merwe**

Department: **Mining Engineering**

University: **University of Pretoria**

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The study that is described in this thesis deals with stope support design from a rockmass stiffness approach. Three models were developed and combined into a single one in the third part of the study in an attempt to describe and quantify the stope support and rockmass interaction.

The first model describes stope support with all the factors having an influence on its performance, where this is referred to as the capacity of the stope support. The second model describes rockmass behaviour and is referred to as the rockmass demand. These two models are represented on a common load-deformation graph during the third part of the study. Here the demand of the rockmass is compared to the capacity of the stope support as a whole. In contrast to previous design attempts, both the demand and the capacity for any given situation are considered as variables. The demand varies according to the position relative to the abutments and the capacity varies according to the state of deformation of the support. Each combination of mining configuration, rock type and support type results in a unique base set within which variation is allowed according to position.

This is achieved by:

(a) comparing the energy released by the rockmass to the energy absorbed by the support system for a given deformation interval; and
(b) comparing the rockmass stiffness to that of the support system at any given point of deformation.

The methodology is tested by two case studies on Beatrix Gold Mine. In the first study the condition of unstable failure of the support was evaluated where the support failed and the stope collapsed in a relatively short span of time. This is referred to as unstable failure of the stope. The underground observations were confirmed by the outcome of this study. The energy released by the rockmass, that is rockmass demand, exceeded the capacity of the stope support after a given stage of mining. The absolute value of the rockmass stiffness was also less than the absolute value of the load-deformation curve of the stope support for the same mining interval.

During the second case study some elements of the stope support failed while the excavation remained open and stable. Underground observations again confirmed the model during this study. Here the Pencil Props failed some distance from the stope face. In this case the absolute value of the rockmass stiffness was less than the magnitude of the negative load-deformation curve of the Pencil Props, while the Matpacks have a positive load-deformation behaviour throughout the deformation process. In the latter case the total energy generated by the rockmass never exceeded the capacity of the permanent stope support. This is referred to as stable failure of the stope support.

The study proves that it is possible to evaluate stope support even when a combination of different supports is used as permanent support. The latter is achieved by adding the capacities of the stope support as deformation takes place and comparing that to the rockmass demand for the same mining steps.

KEY WORDS:

1. Stope support
2. Tabular orebody
3. Rockmass demand
4. Support capacity
5. Influencing variables
6. Stability analysis
7. Energy
8. Stiffness
9. Unstable failure
10. Stable failure

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