

A case study: Study on the optimization of waste dump design for open pit mine in Mundulkiri province, Cambodia.

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Introduction:

This research focuses on optimizing waste dump design to maximize the storage capacity while maintaining stability and reducing transportation costs in Okvau Gold Mine, Cambodia's biggest open pit gold mine. The location of the waste dump is near the pit slope of 70° , with the plan of -340m dept. The buffer zone (BF) decreases as the pit wall is excavated. At the same time, a large proportion of waste rocks continues to be produced due to the increase in gold prices and the expansion of underground mining activity shortly. With limited space for dumping these rocks, challenges arise regarding the storage capacity, as well as the stability of the waste dump and pit slope. The stability and potential failure mechanism of slope and waste dump is investigated in this research.

The research objectives are 1) studying the stability of the future waste dump design, 2) Parametric studies such as the effect of pore pressure, buffer zone, the overall slope angle of the waste dump, compaction, and 3) Recommending an appropriate design.

Methodology:

The field observation was first performed to characterize the waste dump materials and geological foundation structure. The Photo analysis using the *Split-desktop* program for particle size distribution analyses was also performed. Failure criteria such as *Generalized Hoek-Brown* failure criteria and *Baton & Kjaernsli* failure criteria were used to estimate the strength of rock mass foundation and waste rock, respectively. Finally, the stability analysis and parametric analyses were conducted using *Strength reduction methods (SSR)* by Finite element method using the *Rocscience-RS2* program.

Result and Discussion:

Based on the critical analysis of the studied data, the appropriate for future design should be maintaining the water level at the bottom of the pit because high porewater pressure can cause instability for both waste rock and pit slope. The buffer zone should decrease to reduce transportation costs, but it connects the potential failure zone from the pit slope to the waste dump. The overall slope angle of the waste dump can be increased by at least 15° more to increase the dumping storage capacity. Compaction on both sides of the waste dump should be apply to increase the stability. A thin layer of large particles should be placed at the bottom of the waste dump to create a drainage system when compacted.

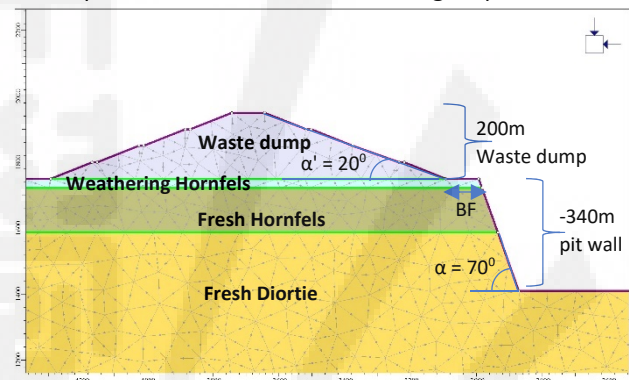


Fig.1: Future design of waste dump

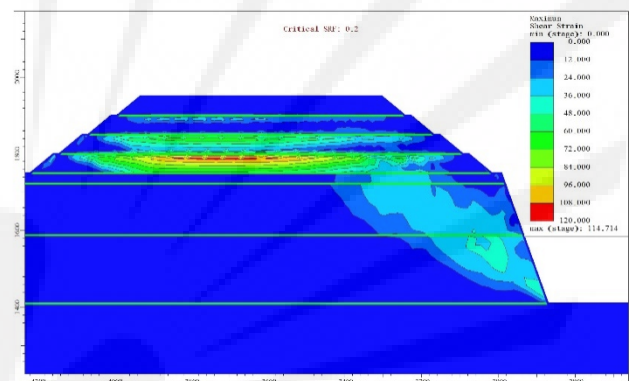


Fig.2: Parametric analyze

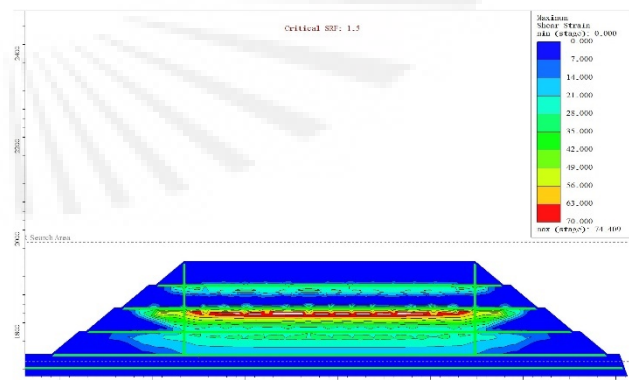


Fig.3: Compacted waste dump analyze
(Compacted on both sides)