



Dynamic Analysis of Tectonic Blocks 1 and 2 of Choghart Open-Pit Mines under earthquake: A Case Study

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Abstract

Rock slope stability for tectonic blocks 1 and 2 of Choghart open pit mine under seismic load was analyzed in 3-D using the finite difference technique 3DEC. The seismic load was from the 2005 Bafgh Earthquake with 0.13g PGA and 57 sec. duration. The mine is divided into 4 blocks according to tectonic and rock mass properties. Blocks 1 and 2 have a slope angle of 50 degrees and are expected to fail in wedge and planar failure types, respectively. Rock joint propagation patterns in FD models were generated using statistical methods to try to represent their natural form. According to the results from static analysis, blocks 1 and 2 are stable with safety factors of 1.6 and 1.5, respectively. For dynamic analysis, 6 seconds of the earthquake wave with the highest accelerations were applied to the model at 0.005 sec. time steps with 0.5% damping. The results showed that block 1 is unstable with a safety factor of 0.8, whereas block 2 has a safety factor of 1.2 and is stable.

Key words: rock slope stability, joint propagation, dynamic analysis, safety factor, open pit mine.

1. INTRODUCTION

Because Iran's plate is located on Alp seismic belt, analyzing seismic effects on rock structures such as rock slopes are so important in this country. The importance of this matter and probable economic and deathly dangers makes the responsibility for the engineers to predict and control the danger of seismic effects on rock slopes. The most experiences for this problem are two-dimensional analysis. For instance, Bhasin and Kaynia worked on static and dynamic stability of a rock slope in western Norway [1]. Also, Kveldevisvik studied on dynamic distinct-element analysis of the 800m high Aknes rock slope [2].

Choghart open-pit mine is one of the biggest mines in Iran. In this paper we attempt to analyze the static and especially dynamic behavior of two main blocks of this mine named tectonic blocks 1 and 2.

2. INTRODUCING TECTONIC BLOCKS 1 AND 2

In this section, characteristics of the hole mine and after that, a short introduction of blocks 1 and 2 will be proposed.

2.1. LOCATION AND GEOLOGY

Choghart open-pit mine has 10 km distance from Bafgh city in Yazd province. The iron and phosphor extracted from this mine, has been feeding the Zobahan factory since 1971.

Before static and dynamic analysis, the geometry of the slope should be defined. The elevation of the top of the mine is 1150 and the bottom of it is 812.5 meters with deferent berm widths varying from 10 to 20 and height of 10 to 37.5 meters. Figure 1 shows the final plan and figure 2 shows the longitude geological section of the mine