MEASURING ROCK MASS MODULUS OF DEFORMATION IN A STOPING-AFFECTED CROSS-CUT IN PONGKOR UNDERGROUND GOLD MINE

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This paper explains a rock mass deformation modulus measurement conducted in a cross cut at Pongkor underground gold mine, where there was an active stope underneath the cross-cut. It is revealed that the resulted rock mass deformation modulus was controlled by the stoping progress. The larger the dimension of the underneath stope, the higher the rock mass deformation modulus obtained, which was due to the higher induced stress in the test location. There was a 20-30% increase of rock mass modulus of deformation when the stope was advanced vertically from one mining slice to two mining slices, where the height of the slice was four metre.

Keywords: Rock mass; modulus of deformation; underground mine.

1. Introduction

Deformability is capacity of rock to strain under load or without load caused by an excavation that can be expressed quantitatively as modulus of elasticity or modulus of deformation (Goodman, 1989). Modulus of deformation of rock mass is one of the important factors required for design work within the rock mass, especially the design of an underground structure. It can be determined indirectly by applying a reduction factor to the rock elasticity modulus measured in laboratory or by using a number of formulas relating it with the rock mass quality or directly from *in situ* measurement.

In Pongkor underground gold mine, the first *in situ* measurement of rock mass modulus of deformation was carried out just recently. As the development and mining in Pongkor underground gold mine progress continuously, the measurement was conducted in an area that was affected by the stoping activities. The work reported in this paper is aimed at the investigation of the influence of stoping on the rock mass modulus of deformation measured in a cross-cut located above the stope.

2. Determination of Rock Mass Modulus of Deformation

2.1. *Determination from intact rock modulus of elasticity*

After reviewing a number of papers where laboratory and modelling properties were given, Mohammad, *et al.* (1997) found that if the Young's modulus results from laboratory tests (E) were plotted with those used in the model (E_m), the equation of the fitted straight line was:

$$E_m = 0.469\,E \tag{1}$$

If the data were plotted as reduction factors, they also found a trend of increased reduction factors for low stiffness rock types and observed a number of very high reduction factors for very low stiffness rocks.