

# MEASUREMENT OF ROCK MASS DEFORMATION MODULUS USING GOODMAN'S JACK IN PONGKOR UNDERGROUND GOLD MINE, INDONESIA

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## ABSTRACT

*In situ measurement of rock mass deformation modulus has never been done in the Pongkor gold mine. Estimation of the rock mass deformation modulus was made by using the elasticity modulus of intact rock obtained in the uniaxial compression test in the laboratory. In situ measurement of rock mass deformation modulus is therefore required, which can provide important additional data.*

*In this research, a Goodman's Jack was used in bore holes with depths up to 7.5 m and diameters of 75 mm. The tests were carried out in the same depth for every bore hole and made in the part of borehole where no crack occurred. At each point the tests were conducted in four different directions.*

*The in situ tests revealed that the deformation modulus of the Au-Ag ore was 5.88 GPa and that of the footwall rock mass (breccia tuff) was 6.75 GPa and 5.63 GPa. The elasticity moduli of the Au-Ag ore and the footwall rock resulted from laboratory uniaxial compression tests were 10.45 GPa, 19.70 GPa and 13.78 GPa, respectively.*

## INTRODUCTION

Deformability is capacity of rock to strain under load or without load caused by an excavation that can be expressed quantitatively as elasticity or deformation modulus (Goodman, 1989). Being obtained through an in situ test, the rock mass modulus is one of the mechanical properties of the rock mass that represents loading condition experienced by the rock mass. Under equal stresses the stress-strain curve of a rock mass is dissimilar with that of an intact rock. The rock mass modulus and peak strength are lower compared to those of intact rock. It could therefore be said that approaches of predicting the rock mass modulus using laboratory test results still have limitation that leads to inaccuracy. Regarding this, in situ determination of rock mass modulus must be considered as a priority, especially in a large underground excavation project.

In this research, rock mass deformation modulus obtained through Goodman's jack test ( $E_{field}$ ) was compared to rock mass deformation modulus estimated from rock mass classification ( $E_m$ ) and elasticity modulus ( $E_{lab}$ ) resulted from laboratory test. There is an expectation that the outcomes of this research can be utilised in determination of deformation modulus of Pongkor rock mass, which will be obviously of use in next stages of design and development of the underground mine.