# ROLE OF ROCK MASS CHARACTERISTIC AND ROCK TOUGHNESS ON PREDICTING CUTTING PERFORMANCE OF RAISE BORING MACHINE

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## ABSTRACT

*Vertical shafts at the underground Pongkor gold mine were developed using a raise boring of Robbins 73RM-DC. Assessment of the raise boring cutting performance was carried out in the Ciurug Raise Boring II, at three levels, such as 40 m, 70 m and 100 m. Core rock samples for laboratory tests were obtained from these three levels to determine the physical and mechanical properties. Relationship between cutting production against toughness index or specific cutting energy and also its relationship with RMR are discussed and established.*

## INTRODUCTION

Development at the underground Pongkor gold mine was based on total ore production of 370,000 ton ore /annum, and this was concentrated at the Ciurug vein. Bearing in mind a number of aspects such as, geology, geological structure, rock mechanics, hydrogeology and economics, it was decided to mine the ore by means overhead cut & fill method and using a combination of load – haul – dump and jumbo drill. Vertical shafts at a number of positions including Ciurug intake (CURB II) were developed for the purpose of ore and waste transportations, bringing down the filling materials to stopes and mine ventilation. The vertical shafts were excavated by a raise boring of Robbins 73RM-DC with the following features:

- Machine drive power 112 kW
- Two drive speeds; 0 – 70 rpm & 0 – 30 rpm
- Reaming rate 84 - 102 mm/minute
- Cutting head 12 button roller cutters

As rock mass strength properties differ to that of intact rock, assessment of the cutting performance of the raise boring against the properties of during the development of the vertical shaft at the Ciurug Raise Boring II (CURB II) is discussed and presented in this paper. The rock properties related in this assessment are RMR (Bieniawski, 1973), and Specific Cutting Energy or Rock Toughness (Farmer, 1986).

## PONGKOR GOLD MINE

### Rock Engineering Data

The research was carried out at the Underground Pongkor Gold Mining Business Unit of PT Antam Tbk., and it is located in Kampung Sorongan, West Java, about 150 km from Jakarta. The altitude of the mine area is in the range of 400 m – 700 m ASL, and surrounded by a mountainous region.

The gold veins were formed within the Miocene volcanic rocks and dominated by tuff andesitic, tuff lapilli and volcanic breccia. The ore reserve is distributed within three main veins, namely Ciguha vein, Kubang Cicau vein