STABILITY OF SLOPE CUTS IN THE DINDING SCHIST OF THE UKAY PERDANA AREA, SELANGOR DARUL EHSAN, MALAYSIA.

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ABSTRACT

In the Ukay Perdana area are found low grade regionally metamorphosed rocks that have been mapped as the Dinding schist of Lower Palaeozoic age. The Dinding schist comprises quartz-biotite-muscovite schist, quartz schist and meta-volcanics; the meta-volcanics being the predominant bedrock of the Ukay Perdana area.

Laboratory determinations, employing the recommended saturation and buoyancy technique of ISRM (1979), show fresh (unweathered) samples of the meta-volcanics to have apparent porosities of 2.5% and, average dry and saturated unit weights of 25.82 kN/m^3 and 26.08 kN/m^3 respectively. Samples of slightly weathered meta-volcanic rock material, however, have an apparent porosity of 8.2% with average dry and saturated unit weights of 23.99 kN/m^3, and 24.78 kN/m^3 respectively. Tilt tests involving diamond sawn surfaces (cut parallel to foliation) of the slightly weathered meta-volcanics yield a basic friction angle (Φb) of 23^o, whilst similar tests on diamond sawn surfaces of the fresh (unweathered) meta-volcanics yield a basic friction angle of 30^o. Schmidt hammer tests with Schmidt hammer model N were carried out on the bedrock, the granite veins, and the metasomatised rocks in the area. With more than 20 impacts conducted with a minimal separation of the plunger diameter between impacts locations, the results yield Schmidt hammer mean rebound number of 40 for slightly weathered bedrocks, 44 for cut but unpolished and unweathered bedrock, 51 for naturally exposed bedrock, 53 for metasomatised polished rock surface, and 62 for granite vein. The hammer rebound range of 40 - 62 corresponds to the dry density range of 2447 kg/m^3 - 2665 kg/m^3 obtained from standard method of IRSM, 1979.

Structural discontinuity planes in the meta-volcanics of the Ukay Perdana area comprise granite veins, joints of various sizes and shapes, and a northeast-southwest foliation trend. Granite veins and dykes that cut the bedrock are evidence of a subsequent phase of intrusion of granitic rocks and post-metamorphism. Indications of the rocks being subjected to the later disturbance are observed in the development of the northwest-southeast trend of joints in the bedrock.

Slope cuts in the study area expose both fresh (unweathered) bedrock as well as slightly to completely weathered bedrock. Weathering profiles over fresh bedrock show four broad morphological zones on the basis of differences in the colour, textures and degree of preservation of the original bedrock materials, textures and structures. The topmost zone is highly weathered, and the rock material is in the transitional stage to form soil. The material is completely discoloured to yellowish red, but the fabric is completely preserved. The moderately weathered rock shows partial discoloration of reddish yellow, but the mass structure and material texture are completely preserved. Discontinuity planes in the moderately weathered rocks are commonly filled by iron-rich secondary material, and the material fragment or block corner can be chipped by hand. In the slightly weathered bedrock material, there is reddish brown discoloration along discontinuity planes with the mass structure and material texture being completely preserved. However, the material is generally weaker and fragment corners cannot be chipped by hand. The lowest zone of unweathered bedrock shows no visible sign of rock material weathering, though there were some discolorations on major discontinuity surfaces.

A number of failures of slope cuts have occurred in the Ukay Perdana area and include failures in highly to completely weathered meta-volcanics as well as fresh (unweathered) bedrock. The failures involving the weathered materials are due to excavation and undercutting at the feet of existing slopes. Intense, short period rainfall and prolonged high rainfalls are major causal factors; the gradual disintegration of the bedrock encouraging infiltration and, starting with hair-line cracks that subdivide the weathered materials into angular fragments. The failures are thus triggered by an increase of the pore water pressure. Failures in the unweathered bedrock are mostly rock falls and topples. Though rainfall as a causal factor of these failures is sine qua non, inherent and adversely oriented structural discontinuity planes (including schistocity, foliation, cleavage, joints, unconformities, and flexural shears) are contributory causes. However, subsurface seepage, pore water pressures, and removal of the vegetation cover through erosion and drought are also contributing causal factors of rock falls and topples. Several methods to enhance stability of slope cuts in the area are discussed.

DEDICATION

This work is dedicated to my parents Hon. Chief & Lolo Augustine Ezeji Nkpadobi.

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TABLE OF CONTENTS

CHAPTER TWO: ENVIRONMENTAL SETTING OF STUDY AREA

Page

CHAPTER THREE: DINDING SCHIST - PETROGRAPHY AND GEOLOGICAL STRUCTURES

CHAPTER FIVE: STABILITY OF CUT SLOPES IN THE STUDY AREA

Page

LIST OF FIGURES

Page

Page

Page

Page

Page

LIST OF TABLES

Page

APPENDICES

Page