STABILITY ANALYSIS OF FILL SLOPE AT SMK SONG NO. 2'S PROJECT USING SLOPE/W

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A report submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Engineering (Civil Engineering)

Faculty of Civil Engineering
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January 2015

To Allah S.W.T. who allow me.

My dearest wife, children and all my family members; you are my love and inspiration.

ACKNOWLEDGEMENT

I wish to express my high appreciation to UTM and the lecturers, especially my supervisor, Associate Professor Dr Nazri Bin Ali for his guidance and motivation during the development of this masters project.

My sincere thankful extends to my fellow postgraduate course mates for your cooperation. Lastly but not least, thanks to all who are not listed here for helping me in this masters project; I appreciate it.

ABSTRAK

Kerja pemotongan dan penambakan tanah adalah scenario yang biasa. Oleh itu, analysis kestabilan cerun mesti dilakukan untuk memastikan cerun adalah selamat dan mengelak kejadian kegagalan cerun. Dalam kajian ini, aplikasi perisian daripada GEOSTUDIO 2007 (SLOPE/W) digunakan ke atas satu kes kegagalan cerun yang berlaku di kawasan pembinaan sekolah menengah di Song, Sarawak. Sebahagian kawasan cerun yang dibina dari kerja pemotongan dan penambakan telah gagal. Kegagalan cerun ini dimodelkan terlebih dahulu menggunakan applikasi SEEP/W dan kemudianya dengan SLOPE/W untuk menjana Faktor Keselamatan (FOS), didapati adalah 0.854. Seterusnya, kerja pembaikan dicadangkan menggunakan ‘sheet piles’ dan ‘soil nails’. Hasilnya, FOS didapati adalah 1.362 dan 1.021 masing-masing, Ini bermakna, cadangan menggunakan ‘sheet piles’ adalah lebih baik.

ABSTRACT

Cut and fill works around the slopes are common scenes. Hence, slope stability analysis must be carried out in order to assure the slope is safe and prevent the slope failure. In this study, software application approach by GEOSTUDIO 2007 (SLOPE/W) is used for the case study, an under-going secondary school project which is located at Song, Sarawak. A portion of the slope where is being constructed on a cut and fill area has failed. The failed slope is modelled first by using SEEP/W (as parent file) and then, by SLOPE/W, to generate the Factor of Safety (FOS), which is obtained at 0.854. The proposed remedial works are subsequently determined by using sheet piles and soil nails. The obtained FOS is at 1.362 and 1.021 respectively. Therefore, the proposal using sheet piles is more acceptable.

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LIST OF ABBREVIATIONS

LEM	-	Limit Equilibrium Method
FOS	-	Factor of Safety
M-P	-	Morgenstern- Price
L-K	-	Lowe-Karafiath
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LIST OF SYMBOLS

τ_f	-	resisting force or moment
τ_m	-	driving force or moment
X	-	interslice shear force,
E	-	interslice normal force,
λ	-	the percentage (in decimal form) of the function used
c’	-	effective cohesion
Ø’	-	effective angle of friction
U	-	pore-water pressure
N	-	slice base normal force
W	-	slice weight
D	-	line load
β, R, x,	-	geometric parameters
f, d, ω	-	geometric parameters
α	-	inclination of slice base

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Construction activities on hillside slopes have increased significantly in recent years due to the rapid development of buildings and infrastructure project. Cut and fill works around the slopes are common scenes. These constructed slopes are actually exposed to slope failures if they are not being proper designed and constructed or not well protected enough by weather event, such as heavy raining. As the result, these slope failures can cause losses of life and economic losses.

Slope failure can occur due to many factors, but it is more likely to occur in certain season if they are triggered by weather event, that is raining. A heavy intensity of raining can trigger a process that lead to the slope failure by infiltration, seepage and an increase of pore water pressure. It is normally observed that for a soil, there will be an increase of moisture content and reduction of shear strength. As the result, it affects the stability of a soil mass and thus the factor of safety (FOS) for the slope.

1.2 Statement of the Problem

The case study of the slope failure is located at Song, Sarawak, the under-going construction project of "Cadangan Membina dan Menyiapkan Sekolah Menengah Kebangsaan Song No. 2, Di Atas Lot 1615, Blok 17, Katibas Land District, Song, Sarawak Untuk Kementerian Pelajaran Malaysia (18 BD)". This school complex is being constructed on a cut and fill area, where is actually located at the centre of a valley area, flanked by hills on surroundings. A portion of slope at the project area has failed. It was observed that for a few days before the occurrence of the slope failure, Song area has been experiencing an intense rainfall. Therefore, it is important to study and doing the analysis of the case problem in order to determine the suitable action for the proposed remedial works.

1.3 Objectives of the Study

Followings are the objectives proposed for this study:

1) To generate the slope model by using SLOPE/W.
2) To simulate the failure mechanism of the failed slope.
3) To propose the remedial works for the failed slope.

1.4 Scope of the Study

This study covers the analysis of cut and fill slope failure at under-going construction project of "Cadangan Membina dan Menyiapkan Sekolah Menengah Kebangsaan Song No. 2, Di Atas Lot 1615, Blok 17, Katibas Land District, Song, Sarawak Untuk Kementerian Pelajaran Malaysia (18 BD)". The analysis is carried by a software application, GEOSTUDIO 2007 (SLOPE/W). The input data, such as soil properties are based on Soil Investigation (SI)'s Report, sourced from the consultant of the project and rainfall data, collected from Drainage and Irrigation Department (DID), Sarawak.

1.5 Significance of the Study

This study provides the understanding of the mechanism of the slope failure, specifically through the case study. Therefore, the subsequent remedial works can be proposed to resolve the slope problem by assuring the FOS and hence to build up the confidence level of the public.

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