

IPL Project, IPL-155 Annual Report 2015

1 January 2015 to 31 December 2015

1. Project Title:

Determination of Soil Parameters of Subsurface to be Used in Slope Stability Analysis in two Different Precipitation Zones of Sri Lanka.

2. Main Project Fields - Technology Development

Category B. Hazard Mapping, Vulnerability and Risk Assessment

3. Name of Project Leader : Eng. A A Virajh Dias;

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Core members of the Project

Eng.(Ms) S. S. I. Kodagoda(BSc(Hons)Eng,MEng.,CEng.- Geotechnical Engineer

Ms H.M.J.M.K. Herath(BSc(Geology Special).- Engineering Geologist

Eng.(Ms) M A S N Mallawarachchi (BSc Eng(Hons)-Civil Engineer

4. Objectives:

Determination of critical and other important insitu soil parameters for various soil types that are present in two different precipitation zones in Sri Lanka and comparison of the same. The selected two precipitation regions are based with:

- Heavily precipitated zone in wet zone with annual average rainfall above 4000mm
- Wet zone with annual average rainfall between 2500-3000 mm

5. Study Area:

- Heavily precipitated zone in wet zone with annual average rainfall above 4000mm-Watawala, Nawalapitiya
- Wet zone with annual average rainfall between 2500-3000 mm Haldummulla, Haputale, Ratnapura, Kalawana

6. Project Duration:

Originally proposed project duration is January 2010 to end December 2011. However, due to the requirement of further study project period extended until December, 2017)

7. Report

7.1 Progress in the project: -

The comparison of soil module E50 of residual soil slope failures in two different rainfall precipitation zones is an experimental study to formulate a relationship between the potential slope failure quantify shear strength characteristics of soils which could be easily discussed on scenarios of the first time occurrence failures and repetitive failures in residual soil formation. However, number of failures were recoded in rock or interface of rock-soil conditions . Therefore, series of weathered rock and medium weathered rock samples were tested and results are given in 7.4.

7.2 Planned future activities or Statement of completion of the Project

7.2.1 January 2011 to December 2015: 85% completed

- a. Evaluation of Soil Conditions at Site(Parametric Study). Several locations for soil sampling selected in both areas. The following comparisons were made.
 - i. Comparison of lab and insitu parameters: cohesion and friction angle
 - ii. Comparison of all the above parameters of each soil type
 - iii. Determination of possible values for parameters mainly for the critical of them such as cohesion and friction parameters for each soil type in both regions
 - iv. Comparison of values obtained in above and study the variation
 - v. Publications

7.2.2 January 2016 to June 2017

- b. Evaluation of Hydro-geological consideration and understanding the mechanisums of failures
- c. Conducting one day seminar on design parameters for slope stabilization in the hill country of Sri Lanka

7.3 Beneficiaries of Project for Science, Education and/or Society

Project proponents of development projects and residents in landslide prone areas, professionals, academics, design groups, planners

7.4 Results (resent Outputs):

Median values of data							
Rock Name	Weathering condition	Young's Modulus/ Mpa				Poisson's Ratio (ν)	
		Meadian Avarage Modulus (E_{av})	Std. Deviation	Median Secant Modulus (E_{70})	Std. Deviation	Medean value	Std. Deviation
CHG	FR	38.0	10.66	37.30	8.61	0.24	0.057
	MWR	25.0	10.56	25.05	11.87	0.22	0.069
GBG	FR	26.1	6.91	26.60	10.01	0.22	0.057
	MWR	22.8	12.48	22.80	10.46	0.22	0.056
MBL	FR	24.3	9.60	23.00	8.92	0.25	0.050
	MWR	17.5	9.14	20.30	8.42	0.26	0.068

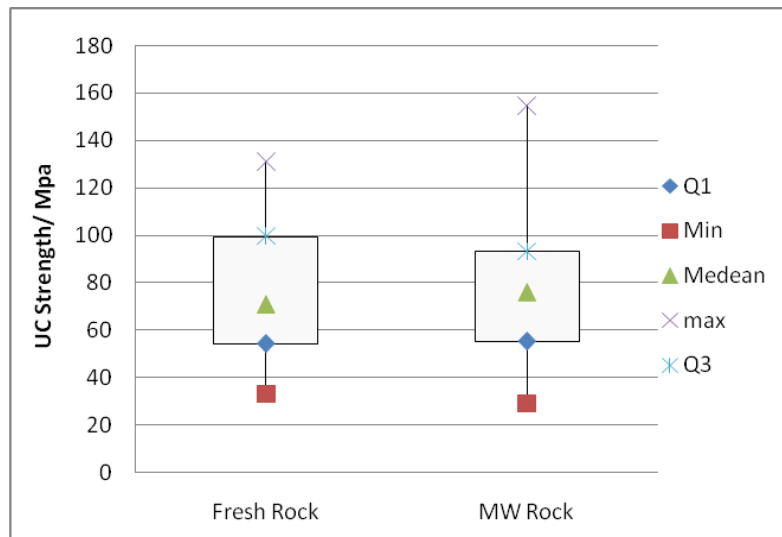


Figure 1: Unconfined strength of Charnoketic gneiss

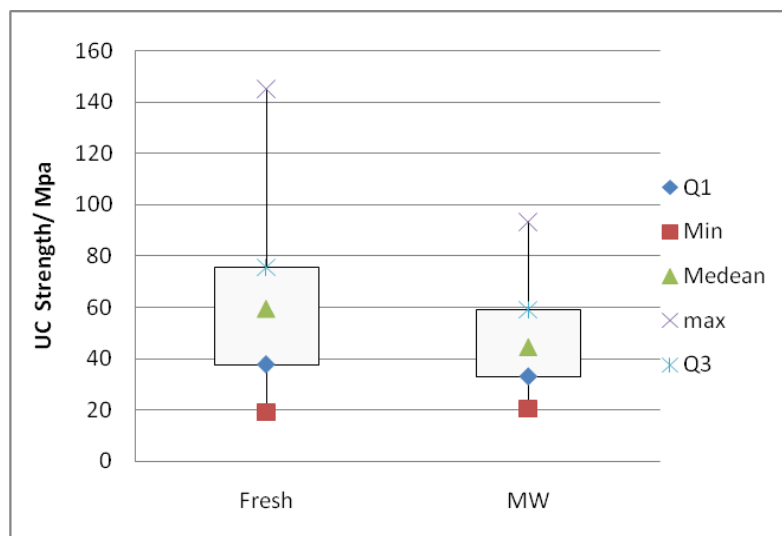


Figure 2: Unconfined strength of Crystalline Limestone

The study on evaluation of E50 (secant modulus) is an experiment setup to understand the behaviour of interface of rock under changing stress conditions at site due to various reasons such as prolong period of rainfall precipitations, movement of soils, unloading effects and re-loading effect caused by deposition. Therefore, it is advised to explore more sample representation in a detail study before the comparison or evaluation of the interdependence of sub coefficients of soils. Therefore, further tests are recommended with more representations of soil samples and also widening the range of test parameters to verify the interdependence capacity of soil parameters and to make it applicable over a wide range of actual failures of residual soils under prolong period of saturation.

8. Publications (Journal Papers and conference Papers)

1. "*Discrete Boundary Shear Strength of a Landslide at High Rainfall Precipitation Zone in Sri Lanka*"; Proceeding of the World Landslide Forum3 (WLF3), Beijing, China, 2-6 June 2014; Volume 1, Landslide Science for a Safer Geoenvironment, PP 101- 106. Authors were A AVirajh Dias, S B S Abayakoon and R K Bhandari; ISBN 978-3-319-04998-4; Springer.
2. "*Comparison of soil modulus E50 of residual soil slope failures in two different rainfall zones*"; Proceeding of the World Landslide Forum3 (WLF3), Beijing, China, 2-6 June 2014; Volume 1, Landslide Science for a Safer Geoenvironment, PP 135- 141.; Authors were M A S N Mallawarachchi, E M T M Ekanayake, S S I Kodagoda and A AVirajh Dias; ISBN 978-3-319-04998-4; Springer.
3. "*Empirical Relationships of Elastic Modulus and Uniaxial Strength of Intact Metamorphic Rocks of Sri Lanka*"; Proceeding of the International Conference of Geotechnical Engineering(ICGE) 10th – 11th August 2015 in Colombo, Sri Lanka; PP 515 -518; Authors were E M T M Ekanayake , H M J M K Herath and A AVirajh Dias; ISBN 978-955-1411-01-5.