DEVELOPMENT OF EMPIRICAL CORRELATIONS BETWEEN CALIFORNIA BEARING RATIO (CBR) AND SOIL INDEX PROPERTIES.

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Degree of Master of Engineering

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University of Moratuwa
Sri Lanka

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DECLARATION

I hereby declare that the work presented in this dissertation is my own research except as cited in the references. I also declare that this report has not been accepted for any other University or Institute and no part of this project report has been submitted earlier or concurrently for same or any other Degree or Diploma, to the best of my knowledge.

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Admission No.

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Certified By

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Dr. U.P. Nawagamuwa

(Supervisor)

DEDICATION

This dissertation is dedicated to my loving husband and my parents and family, for their endless love, support and encouragement. I won't be here without their love, patience, bear and understanding throughout my life. My wholehearted thanks go to all of you giving me strength to achieve my dreams and lightened up my spirit to finish this study and this thesis.

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ABSTRACT

The California Bearing Ratio is a penetration test for evaluation of the mechanical strength of road sub-grades and base-courses. This can be used as a mean of designing the road pavement required for a particular strength of sub-grade by comparing the strength of different sub-grade materials.

However; civil engineers always encounter difficulties in obtaining representative CBR value for design of pavement. Over the years, many correlations had been proposed by various researchers in which the soil index properties were used to develop these correlations.

A study was carried out to find correlations between CBR value with soil index properties those best suit the type of soils in Sri Lanka. Analyses were carried out based on the published correlations and soil data obtained from several Sri Lankan project sites. Based on the results, it is observed that the current published correlations are not in good agreement with Sri Lanka soils. In addition, no typical range could be found based on the soil index properties.

Mechanical Strength of soil depends not only on the soil type but also on the observable physical characteristics which significantly influence on a soil's behavior. Therefore, a method is proposed for correlating soaked CBR value and compaction parameters with such index properties, for Sri Lankan soils. This research covers the entire soil types according to Unified Soil Classification System which are generally used as sub-grades and base-courses.

Among the several soil index properties, Atterberg Limits and grain size distribution data are used in this regard as these tests are much more economical and rapid than Compaction and CBR tests. The correlations are established in the form of an equation as a function of different soil properties by the method of regression analysis. Finally, results of the laboratory test are used to compare with the results of regression equation for the compiled data for the validation of the correlation.

Key Words *: California Bearing ratio, Compaction Parameters, Index Properties, Regression Analysis*

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LIST OF ABBREVIATIONS AND SYMBOLS

CBR	-	California Bearing Ratio
CBR_{TOP}	-	CBR value at top face of soil sample
CBR_{BOTTOM}	-	CBR value at bottom face of soil sample
DCP	-	Dynamic Cone Penetrometer
D_{60}	-	Diameter at 60% passing from grain size distribution (mm)
D_{50}	-	Diameter at 50% passing from grain size distribution (mm)
D_{30}	-	Diameter at 30% passing from grain size distribution (mm)
D_{10}	-	Diameter at 10% passing from grain size distribution (mm)
LL	-	Liquid Limit
PL	-	Plastic Limit
PI	-	Plasticity Index
MDD	-	Maximum Dry Density
OMC	-	Optimum Moisture Content
SI	-	Suitability Index
$\gamma_{d\ max}$	-	Maximum Dry Density
γ_w	-	Density of Water
f	-	Fines Content (%)
MC	-	Moisture Content
SRA	-	Simple Regression Analysis
MRA	-	Multiple Regression Analysis
C	-	Fraction coarser than 0.425 mm sieve
WLM	-	Modified Liquid Limit, equal to LL(1 - C/100)
A	-	% retain on 2.4mm sieve
USCS	-	Unified Soil Classification System
Cu	-	Coefficient of Uniformity
Cc	-	Coefficient of Curvature
P 425	-	% Passing 0.425mm sieve
R 425	-	% retain on 0.425mm BS sieve
P2360	-	% Passing 2.4mm sieve
R2360	-	% retain on 2.36mm sieve
P075	-	% Passing 0.075 mm sieve
ASTM	-	American Society for Testing and Materials
BS	-	British Standards
AASHTO	-	American Association of State Highway and Transportation Officials
ANOVA	-	Analysis of Variance