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SOME USEFUL RELATIONSHIPS FOR THE USE OF DYNAMIC CONE PENETROMETER FOR ROAD SUBGRADE EVALUATION

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Philosophy in Engineering

By

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ABSTRACT

Title: Some Useful Relationships for the Use of Dynamic Cone Penetrometer for Road Subgrade Evaluation

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Dynamic Cone Penetrometer (DCP) is an instrument that can be used to evaluate California Bearing Ratio (CBR) value of road pavement subgrade. It is simple to use and inexpensive. Therefore it could be introduced to local road authorities that has limited budget, as an effective tool for road pavement evaluation. The DCP results primarily depend on the soil type. The main objective of this study was to develop a correlation between the DCP and the CBR for some selected soil types of Sri Lanka using a locally produced DCP. It also sought the ways to widen the usage of the DCP by introducing a method to obtain soaked CBR and some other important soil parameters used in the road subgrade evaluation using the DCP.

The study was carried out in three phases. Phase one focused to develop a generalized correlation between the DCP and the CBR for the Sri Lankan soils. Series of field DCP tests were carried out for selected rural road projects. Three correlations were established between the DCP and the disturbed unsoaked CBR, DCP and the disturbed soaked CBR and the DCP and the undisturbed unsoaked CBR.

The main objective of the phase two was to develop a correlation between the DCP and the soaked CBR in order to evaluate an existing ground condition. Series of laboratory tests were performed by varying the moisture content and the dry density. A significant relationship that allows calculating the soaked CBR was developed. In addition to that, some useful correlations between the DCP and the other soil parameters used in road subgrade evaluation were established.

Phase three attempted to introduce a method to obtain the soaked DCP value at the field and to develop a correlation between the soaked DCP and the soaked CBR. An attachment to the DCP was designed to release the water while carrying out the test. Series of field tests were conducted. The obtained relationship was compared with the relationship between the DCP and the disturbed soaked CBR, obtained in phase1.