Relationship between CBR values (un-soaked) and undrained shear strength of artificial CH soils

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Abstract: Determining the engineering properties of soils using various non destructive test methods are becoming popular. In this study, relationship between CBR values (un-soaked) and undrained shear strength of artificial CH soils were investigated to determine the correlations. Analyses of the test results showed that there was a nonlinear relationship between CBR values (un-soaked) and the undrained shear strength of compacted soils.

1 Introduction

In the past decade researchers have developed many correlations between soil parameters and testing methods for a variety of soil types. In order to get a better estimate for preliminary design, the correlation between CBR values and S_u for artificial soil mixtures like bentonite, kaolinite and sand mixtures will be helpful. Sivaruban and Vupulanandan (2008) correlated the Houston area clays with kaolinite, bentonite and sand mixtures and developed correlations. Osman Sivrikaya (2008) correlated the compaction energy with compaction parameters like maximum dry density and optimum moisture content. Eventhough many correlations have been done, the literature has very limited information on correlation between CBR values and S_u. In this study bentonite, kaolinite and sand mixture were examined and the correlation between the CBR values and Su was found.

2 Objectives

The objective of this study was to investigate the correlation between the CBR (un-soaked) values with Su of artificial soil mixtures prepared by the standard compaction method.

3 Methods and Materials

Commercially available kaolinite and bentonite were used in preparing the sandy clay samples. Based on the ASTM standards, compaction, moisture content, unconfined compression (UCC), and Atterberg limits tests were performed to determine the geotechnical and strength properties of the selected artificial soil mixes.

Table 1. Index and strength properties of soils used

Soil Mix	USCS	Sand (%)	Clay (%)	LL (%)	PL (%)	PI (%)	MC (%)	Dry Unit Weight (pcf)	S_u(psi)	CBR-UnSoak (%)
							15.48	112.01	20.12	12.77
							17.46	109.42	7.92	3.96
B10K40S50	CH	50	50	51.17	15.79	35.38	19.06	105.09	3.88	2.18
							13.96	102.63	28.59	24.31
							15.3	111.26	25.24	16.34
							16.96	110.45	12.26	6.14
B15K35S50	CH	50	50	69.58	17.65	51.94	18.68	106.04	6.83	2.72
							16.85	109.96	19.26	11.23
							18.79	107.19	8.05	4.85
B20K30S50	CH	50	50	90.99	20	70.99	20.84	102.68	6.88	2.37

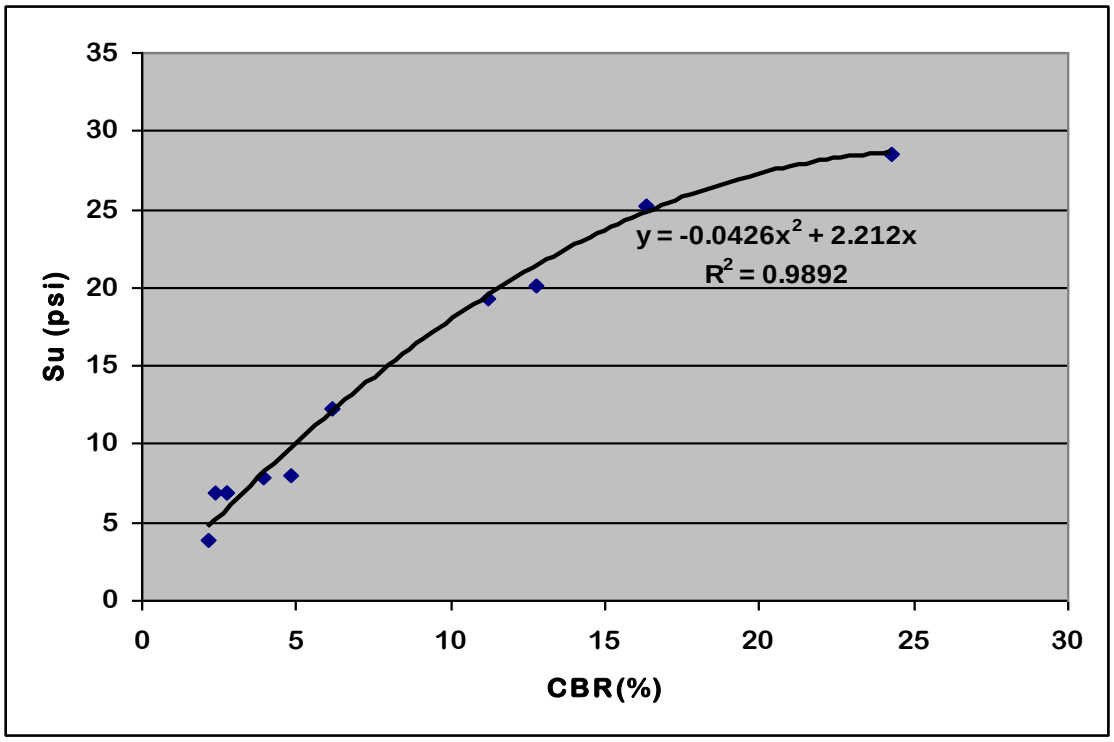

Fig. 1 The variation of S_u with CBR values

4 Results and Analysis

Correlation between undrained shear strength (S_u) and CBR values was investigated for artificial soil mixtures(CH clays). The variation of S_u with CBR values was represented by a polynomial relation (Fig 1). The polynomial relationship is represented in equation (1). In this relation, correlation coefficient (R) was equal to 0.99. This correlation is valid in the range of CBR between 0% to 25%.

$$S_u = - 0.0426 (CBR)^2 + 2.212 CBR \quad \text{----------} \quad (1)$$

5 Conclusions

A set of artificial clayey soil mixes were prepared using commercially available kaolinite, bentonites, and sand to represent the CH type of soils based on their index properties. These artificial clays have good correlation with their CBR values and Su for the CH soils. The maximum dry densities and optimum moisture content were within the range of 110- 112.5 pcf, 15.8- 17 % respectively.

6 Acknowledgements

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7 References

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