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PERMEABILITY OF SAND-LIME-CEMENT MIXTURES

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Abstract— The permeability of mixture of sand and lime was recorded and tested. The constant head method was employed in this study. Different cement contents including 1%, 2%, and 3% in combination with lime with the same percentages were mixed with sand and tested. The permeability test results showed that addition of cement and lime reduced the permeability of the sand.

Keywords— Permeability Test, Sand, Lime, Cement

I. INTRODUCTION

Permeability is an important characteristic of the soil that shows the rate of flow in the soil [1-13]. The permeability value is high at the coarse-grained soil like sand and is very low at fine-grained soils like clay [14-28]. A high value of permeability can be a representative of a high flow in the soil and therefore a lower strength value for the soil in the long run [29-45]. Addition of cementitious agents such as lime and cement can be effective in reduction of the permeability however its amount is not clear [45-53]. This study investigates effect of addition of cement and lime on permeability characteristics of sand.

II. MATERIALS

The materials which were used in this study were:

a) Sand:

The employed sand had $C_u = 8.5$. The C_c of sand was 1.05. The G_s was 2.65.

b) Lime

Apparent density was calculated as 0.5 gr/cm^3 . The ignition loss was 19.8%.

c) Cement

Portland cement was selected in this study.

III. PERMEABILITY TEST

The tests were conducted in constant head device. The permeability of mixture were recorded with varying in lime percentage.

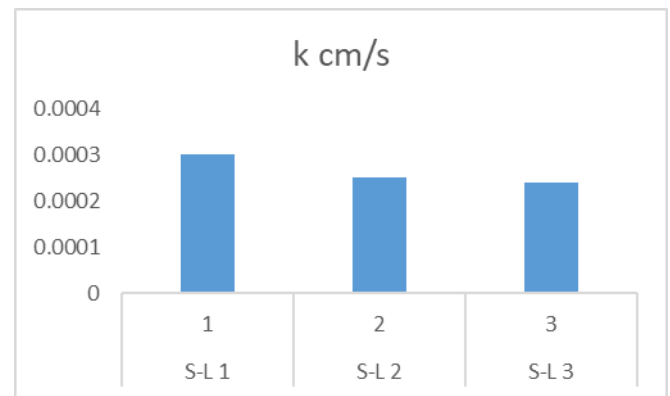


Fig. 1. Permeability of lime-sand mixtures

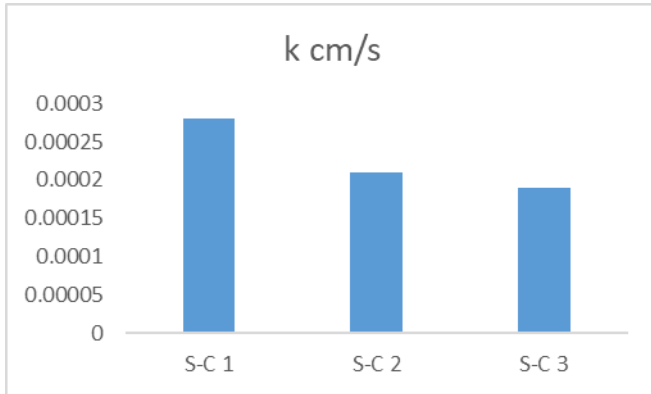


Fig. 2. Permeability of cement-sand mixtures

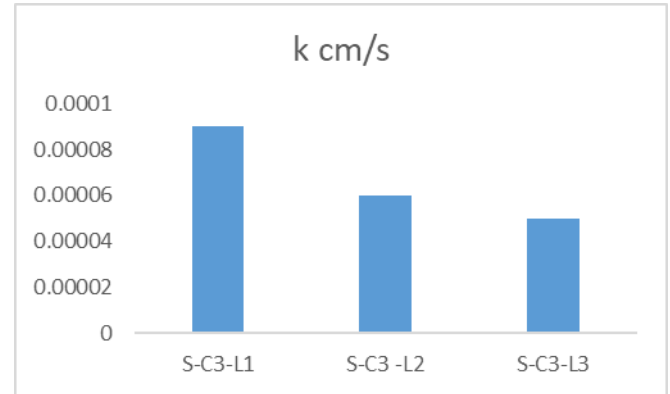


Fig. 4. Permeability of cement-lime sand mixtures with 3% cement.

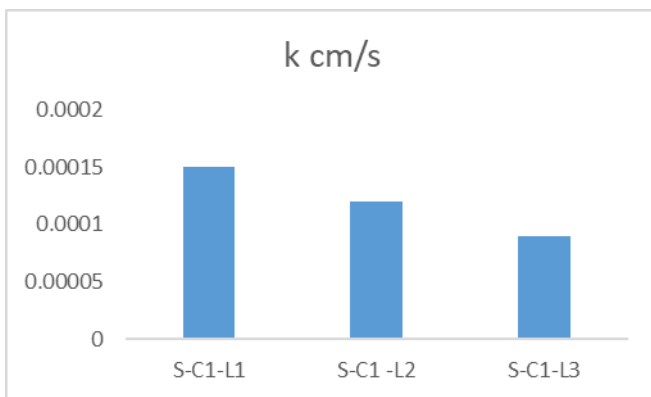


Fig. 3. Permeability of cement-lime sand mixtures with 1% cement.

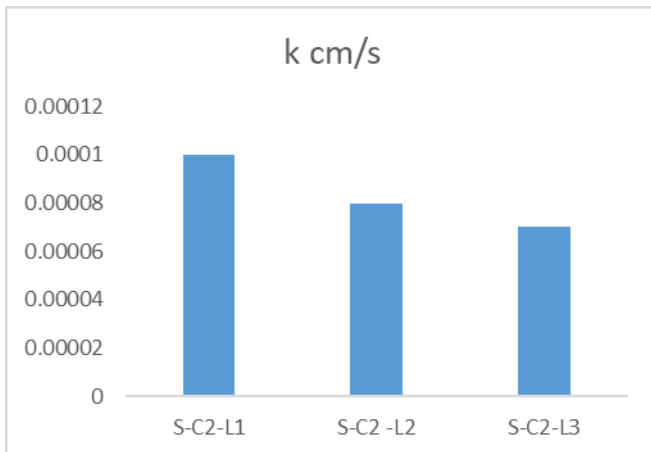


Fig. 4. Permeability of cement-lime sand mixtures with 2% cement.

IV. CONCLUSION

A series of permeability tests were conducted on mixtures of cement, lime and sand. Also, permeability tests were conducted individually on cement and lime. The results showed that addition of cement/lime reduced permeability of sand. Also, both cement and lime together decreased the permeability of sand.

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