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RESEARCH ARTICLE

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ANALYSIS OF CALIFORNIA BEARING RATIO UNDER SOAKED CONDITION FOR RDFS

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ABSTRACT

One of the latest ground improving techniques is randomly distributed fiber reinforced soils (RDFS)in which fiber of desired types and quantity are added in the soil, mixed randomly and laid in position after compaction. The study aims at analysing the effect on California Bearing ratio for RDFS under soaked condition. The fibre that was utilised in determining the effect on CBR was polypropylene fibre. The clay was utilised as sample of soil to be tested while fibres were added to the clay at a rate of 0.1%, 0.2% and 0.3%. A control specimen with no fibre content was tested to serve as datum for determining the effect on RDFS.

Keywords: California Bearing Ratio, Randomly Distributed fibre soil, Soaked, Polypropylene fibre.

INTRODUCTION

Soil has been used as a construction material from time immortal. Being poor in mechanical properties, it has been putting challenges to civil engineers to improve its properties depending upon the requirement which varies from site to site. During last 25 years, much work has been done on strength deformation behaviour of fiber reinforced soil and it has been established beyond doubt that addition of fiber in soil improves the overall engineering performance of soil. Among the notable properties that improved are greater extensibility, small loss of post peak strength, isotropy in strength and absence of planes of weakness. Fiber reinforced soil has been used in many countries in the recent past and further research is in progress for many hidden aspects of it. Poly propylene fibre has been widely used in concrete to increase the tensile strength. Saman Khan and Roohul Abad Khan 2014). The study will employ polypropylene fiber to determine its effect on polypropylene fiber.

Fletcher and Humphries (1991) conducted compaction as well as CBR tests on silty, clay reinforced soil. The results of compaction tests for silty, clay soil specimen reinforced with fibres indicate that increasing the volume of fibres in the soil generally causes a modest increase in the maximum dry unit weight, and a slight decrease in the optimum moisture content. Also reinforcement of micaceous, silty soil specimens significantly enhanced the California Bearing Ratio (CBR) values, with an increase in CBR values from 65% to 133% over that of the unreinforced soil specimens. The micaceous, silt soil specimens containing fibrillated fibres yielding 16% higher CBR values than soil specimen containing monofilament fibres. Nataraj and McManis (1997) performed a series of laboratory tests on a clay and sand reinforced randomly distributed fibrillated fibres to investigate the strength and deformation characteristics of soil.

They used polypropylene synthetic fibre as a reinforcing material. The laboratory tests performed include compaction, direct shear test, unconfined compression, and CBR test. In this study, the influence of test parameters such as normal stress, the amount of reinforcement, specimen size, and the moisture content is addressed. Results showed that, the compaction characteristics of the fibre reinforced soil were similar to that of the unreinforced soils. The maximum dry unit weight reached a maximum value at fibre content of 0.2% for clay specimens and 0.1% for sand specimens. The CBR values increases significantly with the addition of reinforcing fibres.

Methods and Methodology

A total of 10 California Bearing Ratio tests were conducted to study the effect of influence of fibre content and fibre length on CBR percentage value of RDFS. All 10 tests were conducted in soaked condition. Out of 10 tests one was conducted without reinforcement for soaked condition. And remaining eighteen tests were conducted with different percentages of fibres viz. 0.1%, 0.2%, 0.3% and for each percentage of fibre with different lengths of fibres viz. 6mm, 12mm, 18mm. For the experimental study locally available “clay” soil from Sultanpur was used.

California Bearing Ratio test

1) Without Fibre reinforcement
2) Clay + 0.1 % Fibre
3) Clay + 0.2 % Fibre
4) Clay + 0.3 % Fibre

RESULTS AND DISCUSSION

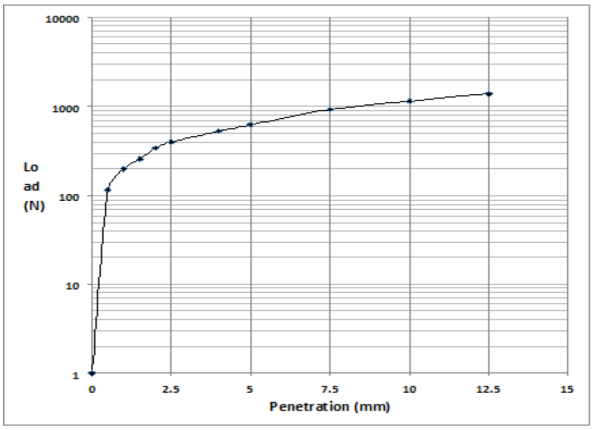

Figure 3.1 C.B.R Test Curve Soaked (Soil=100%,FC=0%,FL=0mm)

The graph represents the California bearing test results for the soil sample with 0% fibre content.The results from this graph will serve as reference point to determine the percentage increase or decrease in CBR value

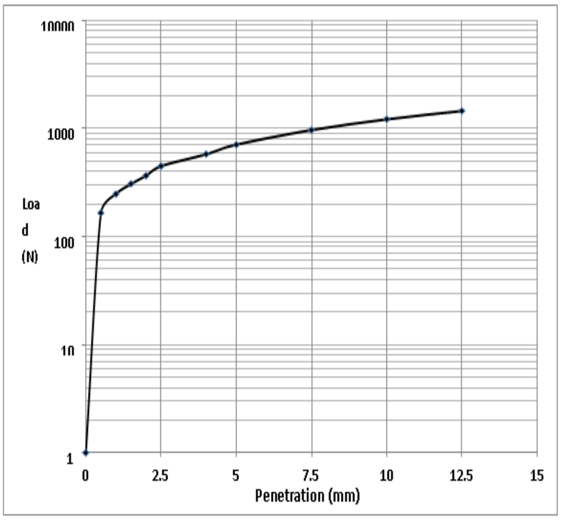

Figure 3.2 C.B.R Test Curve Soaked (Soil=100%,FC=0.1%,FL=6mm)

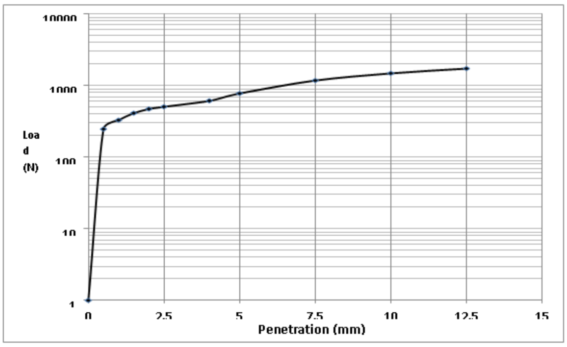

Figure 3.3 C.B.R Test Curve Soaked (Soil=100%,FC=0.2%,FL=6mm)

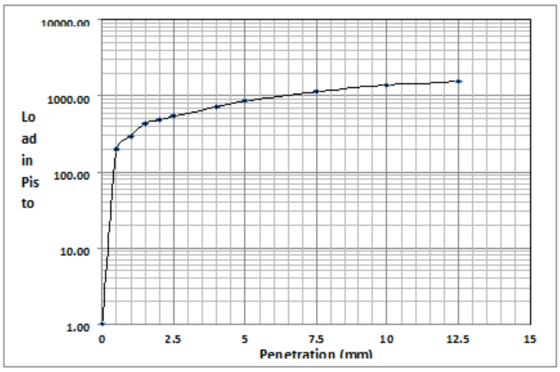

Figure3.4 C.B.R Test Curve Soaked (Soil=100%,FC=0.3%,FL=6mm)

The graph 3.2-3.4 represents the soil sample reinforced with 6 mm length polypropylene fibre at the rate of 0.1%, 0.2% and 0.3 %. A significant increase in CBR value was achieved by addition of Polypropylene fibre. At 0.1% there was an increase of 13.20 % in CBR value, at 0.2% of fibre content 24.75% of CBR value was increased and at 0.3% 37.95% of increment in CBR value was depicted.

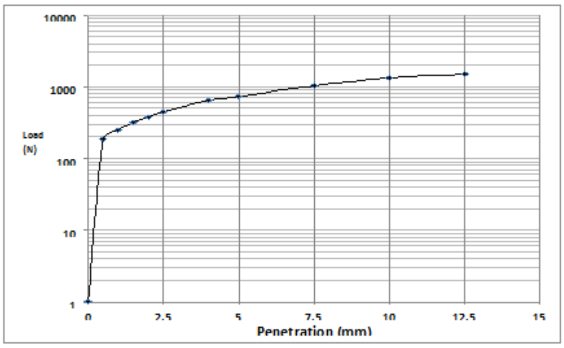

Figure 3.5 C.B.R Test Curve Soaked (Soil=100%,FC=0.1%,FL=12mm)

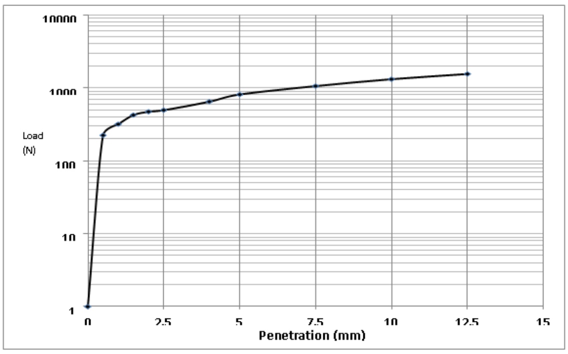

Figure 3.6 C.B.R Test Curve Soaked (Soil=100%,FC=0.2%,FL=12mm)

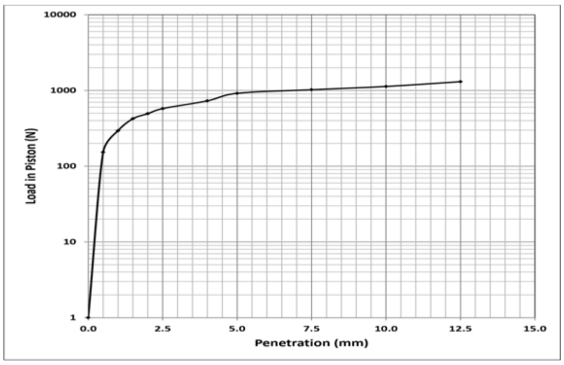

Figure 3.7 C.B.R. Test Curve Soaked (Soil=100%, FC =0.3%,FL=12 mm)

The graph 3.5-3.7 represents the soil sample reinforced with 12 mm length polypropylene fibre at the rate of 0.1%, 0.2% and 0.3 %. A significant increase in CBR value was achieved by addition of Polypropylene fibre. At 0.1% there was an increase of 17.16 % in CBR value, at 0.2% of fibre content 30.36% of CBR value was increased and at 0.3% of fibre 47.19% of increment in CBR value was depicted.

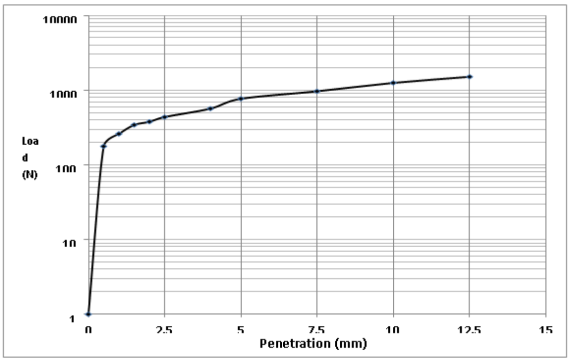

Figure 3.8 C.B.R Test Curve Soaked (Soil=100%,FC=0.1%,FL=18mm)

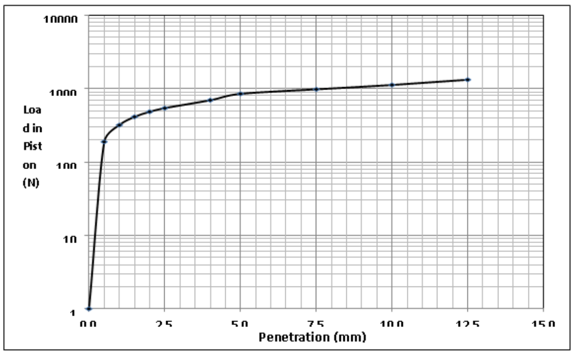

Figure 3.9 C.B.R Test Curve Soaked (Soil=100%,FC=0.2%,FL=18mm)

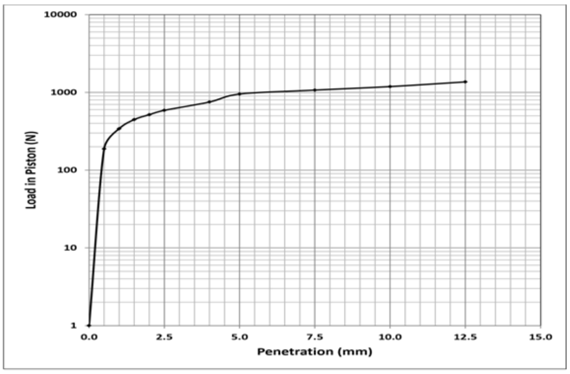

Figure 3.10 C.B.R. Test Curve Soaked (Soil=100%, FC=0.3%,FL=18mm)

The graph 3.8-3.10 represents the soil sample reinforced with 18 mm length polypropylene fibre at the rate of 0.1%, 0.2% and 0.3 %. A significant increase in CBR value was achieved by addition of Polypropylene fibre. At 0.1% there was an increase of 22.77 % in CBR value, at 0.2% of fibre content 35.98% of CBR value was increased and at 0.3% of fibre 53.14% of increment in CBR value was depicted.

CONCLUSION

The C.B.R. value of RDFS is more than that of unreinforced clay. C.B.R. value considerably increases with increase in fibre content from 0.1% to 0.3%. A variation of increase in C.B.R. with fibre content shows maximum value of percentage increases in C.B.R. of RDFS as that of unreinforced clay.

The C.B.R. value of randomly distributed reinforced fibre soil also increases with length of fibre. C.B.R. value increases with increase in fibre length from 6mm to 18mm length of fibre. Variation of C.B.R. value with fibre length shows similar linear trend as that of with fibre content. At 18mm fibre RDFS shows maximum percentage increase in C.B.R. value as that of unreinforced clay. From both trend, it leads to conclude that at 0.3% FC with 18mm fibre shows maximum value of RDFS.

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