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A STUDY ON EFFECT OF SATURATION ON SUBGRADE STRENGTH

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Abstract: The design of road sections that will be placed on the ground floor begins by measuring the distance capacity and the traffic capacity to be made. A variety of cargo designs depends largely on the strength of the small soil where it will be placed. The strength of the sub-section is widely classified as the CBR (California Bearing Ratio). The low-grade grade requires the most powerful layers and the lowest level of distance flows through layers such as feet. Low grade is constantly changed at saturation level due to flooding, capillary action, flooding or flooding or water supply support. Changing the humidity level at low level makes the change in the strength of a small phase. And it is very important that the engineer really understands the reliance of energy under the temperature of the water. Understanding the dependence on CBR power in the soil environment of the water content will contribute towards better design and correction. CBR is usually a simple and widely accepted method for soil samples to measure low grade levels. However, many other tests are also considered to test the power of the sub-section. Solar energy, which is used for low grade may be largely different from the amount of water supply, i.e. the amount of water disclosed in the soil. Therefore, in this study the effort was made to change the level of entry and thus the level of filling of various types of soil and studying the engineering of soil engineering including the CBR at different saturation levels. It is apparent that on the sticky soil, the finest engineering elements are seen after three days of sewing and refined soil, the same is available at the end of four days.

Keywords: Sub grade soil, Moisture content, Compaction, Degree of saturation, CBR

I. INTRODUCTION

Assessment of Calibration Calibration (CBR Testing) is a state-of-the-art interior built by the California State Highway Department (U.S.A.) in order to monitor land management. The CBR test was started or built by O.J. The Porter at the California Highway in the 1920's. It is called a test-deformation test made in boxes or fields and these results are used to determine the size of the footprint, the basic course and other traffic parts provided to download using drawings drawing drawings. Initially it is designed for the design of unlimited and CBR-based systems today. The CBR determines the size of a variety of tracking elements. CBR testing is the energy rating in each area required for soil intersection with a circular of 50mm for a maximum of 1.25mm / min. It is considered between resisting the load and entering the plunger's entry. California bearing ratio, the CBR is shown as a standard sample load (sample load) provided for a 2.5mm or 5mm standard load, which is expressed by percentage.

CBR = (Test load/Standard load) × 100

The standard load for 2.5mm and 5mm penetrations are 1370 kg and 2055 kg respectively. The CBR test is carried out on a small scale penetration of dial reading with probing ring divisions.

The proving ring divisions are taken corresponding to the penetrations

At

0,0.5,1,1.5,2,2.5,3,3.5,4,4.5,5,5.5,6,6.5,7,7.5,8,8.5,9,9.5,10,10.5,11,11.5,12,12.5 and from which Test loads are calculated and hence CBR value of soil is being determined.

High load and importation are recorded in case of less than 12.5 mm inflation. The curve is very high as the first part of the cover may be mounted over because of the improper location of the site. So the correction is used by drawing a tangent to the line in a very large area. Targeted origin will be the point when the tangent is associated with abscissa. CBR values are usually counted 2.5 mm and 5mm intervals. Generally CBR prices at 2.5mm entrance will be more than 5mm inlet in such a situation as the CBR value for design. If the CBR value complies with the 5mm inlet over 2.5mm, the test is repeated. If the same results follow, the load ratio associated with the 5mm entry is taken to be made.

Considering the above, it is suggested in this project to study various types of energy sources made of various levels of humidity and quantity and also carry out common features of moisture conditions in determining the various boundaries of power, in order to achieve the most efficient and prestigious design of the foot.

II. LITERATURE REVIEW

Alayaki and Bajomo (2011) investigated the effect of moisture heat on soil energy later in Abeokuta, Ogun State, Nigeria. The result showed that the increase in the digestion of a combined soil sample from 1 to 5 days leads to a reduction in the CBR of the soil. He saw that the top surface of the digging surface had a larger amount of CBR than in the lower face. Jaleel (2011) learned the result of accessing the top and bottom value of the CBR for low-cost objects. He prepared 14 samples on CBR at 95% a limited amount of AASHTO equilibrium. The results showed that a significant decrease in the CBR above and above due to access was visible. Most decreases in making the CBR value reported on the first CBR days up and down. From the results of the experiments conducted in this study with the result of high-quality and lower-time traffic, he concluded that the low-cost load on the lower layer decreases the rise in the movement period.

Ampadu (2006) examined the effect of water content in the soil samples of ground sampling at the research station was co-operated by a co-operative of powerful water content using different levels of sympathy to obtain samples of various conditions. Resurrected samples are made of different levels of water retention and different levels of boiling and the CBR value was determined. From the laboratory clinic CBR results of low-quality test of different water content due to different diverse stresses, it may conclude that the conversion rate to each CBR per cent of water content changes while the OMC drying was 3 to 7 percent larger than the time to jump from WTO. Singh et al. (2011) are designed for the modeling of the California Bearing Ratio (CBR) models for the California Bearing Ratio (CBR) to produce well-cleansed soil .The soil that is found in the private area was collected in different parts of West Bengal. Samples are compiled into four different components (ie 50, 56, 65, and 75 dreams) and five different humidity levels on wet and wet content of moisture content (OMC) soil (± 2% OMC, ± 1) % OMC, and OMCs) Depression models are developed by analyzing different boundaries, namely, soil structures, competition levels, and humidity content. It realized that the number of CBRs, both infiltration and low transparency, was influenced by fluctuations in moisture content and collaborative efforts. Ningsih et al. (2012) has read the equality between the material and the PBanceric CBR tests (Indonesia) soil and without transportation. The study aims to compare between the CBRs to incorporate the CBR test results into a variety of earthenware materials and make the simpler comparison between the CBR climbing the CBR into the ground design. The results showed that there was equality between the CBR moving and the CBR into the body and influenced by the type of animal (soil areas). Rahman (2010) studied the correlation between CBR results and physical properties of soil. Correlation had been proposed in the study to predict the CBR values at top face of the soil sample for Malaysia's type of soil based on the collected soil data and results from laboratory works. These correlations were developed based on the Maximum dry density (MDD), Optimum moisture content (OMC) and the number of blows (of CBR test). Hussain (2008) correlated between CBR value and Undrained Shear Strength from Vane Shear Test. Several soil samples with different Plasticity Index and moisture content were compacted and tested using CBR test and Vane Shear test to obtain the data to establish the correlation. He found that CBR value and Undrained shear strength increases with increase of Plastic index. CBR value and Undrained shear strength from Vane shear test of soil samples are inversely proportional with the moisture content.Cokca et al. (2003) learned the effects of moisture processing in the power of exhausted clay. In this study, the effects of consolidation of humidity and the incorporation of unused shear water sources were assessed. Ratings are made to samples combined with good moisture content, on the dry side of the high and western high level .He found that the angle of friction decreases rapidly by moisture content, the head of the body's strength component, receiving its highest level of humidity content and descending.

III. METHODOLOGY AND EXPERIMENTAL INVESTIGATIONS

The entire study has been conducted on three types of soil,i.e. 1.Clayey Soil from Anantang District, 2.Clayey soil from kulgam District and 3. Red Moorum Soil from baramulla District.Initially, experiments were developed to identify different soil types such as index properties, distributing the size and split of free swell index. Later a powerful test was performed to determine the content of strong moisture and high-quality dryness. Then CBR tests are made of a variety of humidity elements including the OMC and the analysis of the CBR variation in relation to different days of entry, which is from an invalid date (0 day) to be inserted (5th day). Changes are made in respect of humidity in different areas and positions (east, west, north, and south, central) and the variation of humid content regarding different days of travel. The Shear Direct Shear Test is also being developed in soil samples.

IV. RESULTS AND DISCUSSIONS

TYPE 1 SOIL

Index Properties

The index properties such as Liquid limit, Plastic limit, and Plasticity Index value are presented in

Table-1 Index properties of type – 1 soil

Index property	Experimental Value
Liquid Limit	55.29%
Plastic Limit	34.04%
Plasticity Index	21.25%
Specific Gravity	2.65
Differential Swell Index	57%

Particle Size Distribution

The grain size distribution of this soil sample has been shown in Table 2.

Table-2 Grain size distribution of type - 1 soil

I.S Sieve no.	Weight retained in gm	Percentage Weight retained	Percentage weight passing
4.75mm	4.6	0.46	99.54
2mm	14.5	1.45	98.09
1mm	20.2	2.02	96.07
0.6mm	5	0.5	95.57
0.425mm	9.8	0.98	94.59
0.3mm	5.1	0.51	94.08
.212mm	21.1	2.11	91.17
.015mm	15.6	1.56	90.41
0.075mm	30.49	3.049	87.361

Based on the above properties the IS Soil Classification for the soil sample under test is 'OH'.

Modified Proctor Compaction Test
The results of modified proctor compaction test are represented in figure 1:

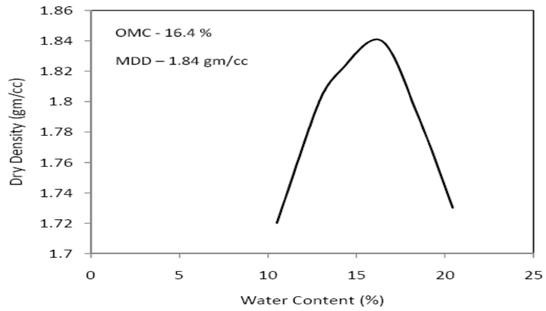

Fig 1: Modified proctor compaction test for type – 1 soil
1 Test-1(conducted under OMC (16.4%) and MDD (1.84g/cc)

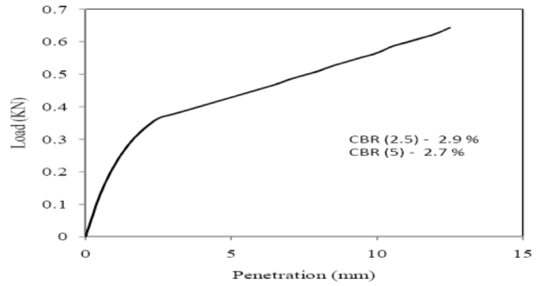

Fig 2 Load vs penetration graph for test –1, type – 1soil for soaked (day - 1) condition

Direct Shear Test Results
Direct shear test was carried out at different dry densities and moisture contents.
Type 1 soil
Results of direct shear test are:

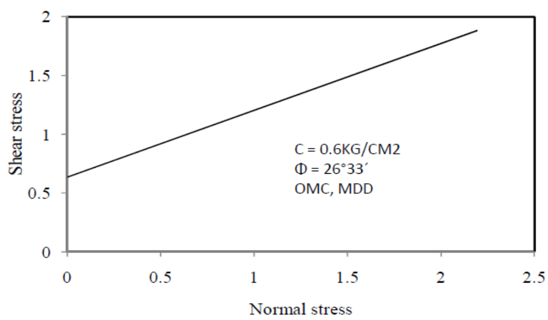

Fig 3Shear stress vs normal stress for test -1, type- 1 soil

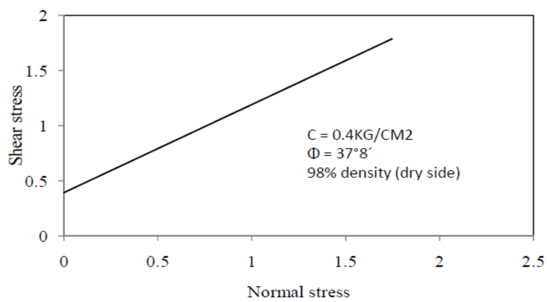

Fig 4Shear stress vs normal stress for test -2, type- 1 soil

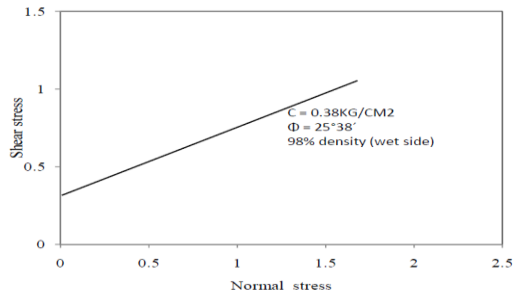

Fig 5Shear stress vs normal stress for test -3, type- 1 soil

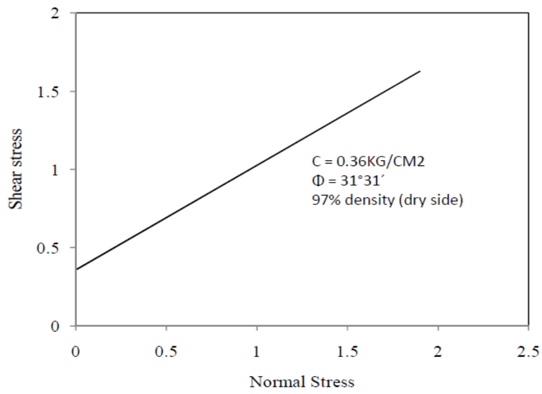

Fig 6Shear stress vs normal stress for test -4, type- 1 soil

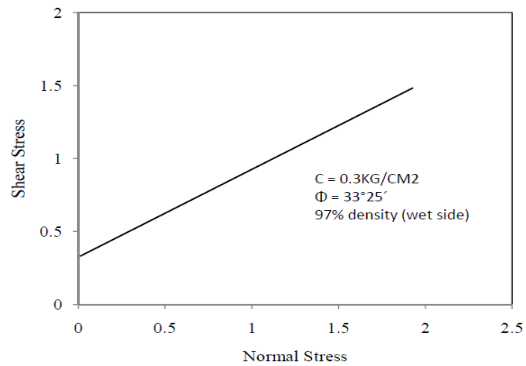

Fig 7 Shear stress vs normal stress for test -5, type- 1 soil

Therefore, in this study the effort was made to change the level of entry and thus the level of filling of various types of soil and studying the engineering of soil engineering including the CBR at different saturation levels. It is apparent that on the sticky soil, the finest engineering elements are seen after three days of sewing and refined soil, the same is available at the end of four days.

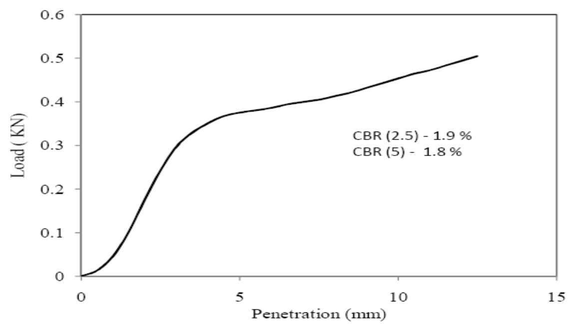

Fig 8 Load vs penetration graph for test –1, type – 1soil for soaked (day - 3) condition

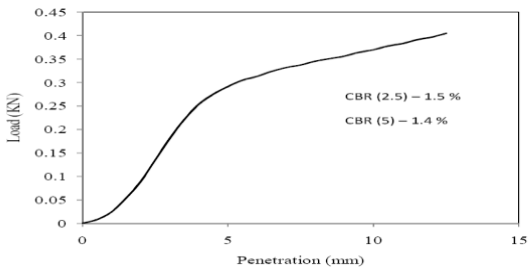

Fig 9 Load vs penetration graph for test –1, type – 1soil for soaked (day - 4) condition

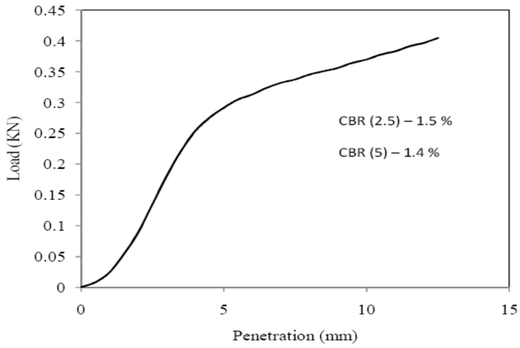

Fig 10Load vs penetration graph for test –1, type – 1soil for soaked (day - 5) Condition

V. CONCLUSIONS

An attempt has been made in this project work to explore the effect of saturation, i.e., soaking on the strength properties of subgrade soil, namely CBR which is widely used as a measure of design of all types of pavements. For this three types of soils have been considered. The effect of soaking on degree of saturation on different parts of the soil Sample has also been considered in this study. It is observed that the CBR value of the given clayey soil sample with BIS classification "OH" prepared at a particular density decreases rapidly with time of soaking up to 1day After which the rate of decrease is small. While the CBR value reduces by about 20 times Compared to the unsoaked conditions, the loss of CBR value in 4 days is about half Compared to that after 1 day. It is also observed that there are not much significant Variations in CBR values from 3rd day to 4th day of soaking.

REFERENCES

[1] Alayaki, F. M., Bajomo, O. S. (2011), Effect of Moisture Variation on the Strength Characteristics of Laterite soil. Proceedings of the Environmental Management Conference, Federal University of Agriculture, Abeokuta, Nigeria.

[2] Ampadu,S,I.K. (2006) , "Laboratory Investigation into the Effect of Water Content on the CBR of a Subgrade soil".

[3] Blazejcak,D.,Horn.R.,Pytka.J.(1995), "Soil tensile strength as affected by time, water content and bulk density".Int.Agrophysics,pp179-188.

[4] Cokca, E.,Erol,O., Armangil. (2004), "Effects of compaction moisture content on the shear strength of an unsaturated clay", Geotechnical and Geological Engineering22,p.p. 285-297.

[5] Chauhan.(2010)," a laboratory study on effect of test conditions on subgrade strength".Unpublished B.TechThesis,N.I.T Rourkela.

[6] ERES Division (2001), "Correlation of CBR values with soil index properties", Illinois.

[7] Hussain,N.A.B.(2008), "Correlation between CBR value and undrained shear strengthfrom vane shear test",Malaysia.

[8] Jaleel,Z.T.(2011), Effect of Soaking on the CBR-Value of Subbase Soil. Eng. and Tech.journal, vol.29.

[9] Kim,Y.T., Shin.H.,Park.D.K .(2011), "Variation of shear strength of weathered granitesoil with water content".pp253-258.

[10] Nugroho,S.A., Hendri,A., Ningsih,S.R.(2012), Correlation between index properties andcalifornia bearing ratio test of pekanbaru soils with and without soaked.Canadian Journalon Environmental, Construction and Civil Engineering Vol. 3,Indonesia

