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An Experimental Analysis based Improvement in CBR Value Using Geosynthetic Material

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ABSTRACT- The utilization of modern technologies ensures the durability of the constructed structures in a cost friendly manner. A new building material, reinforced earth was developed approximately 40 years ago. The use of reinforced earth enhances quality of the soil by using Geosynthetic material. Recently, the modern Geosynthetic materials are used extensible due to their robust properties which help to strengthen the soil while using building material. In this work, the tensile strength of a geotextile has been examined on the California bearing ratio (CBR) at different penetration levels in an experimental pavement layer. The impact of geogrids reinforcement on CBR results are studied by adding a layer of a specific geogrids within the sample height. Further, the effectiveness of using unreinforced, all-natural gravel soil is evaluated. Finally, the experiment outcomes reveal the effectiveness of the Geosynthetic material which improves the CBR value for 2.5mm and 5mm penetration up to 5.86 and 6.57 respectively.

KEYWORDS- CBR test, Geosynthetic material, Geosynthetic, Penetration test, Particle size analysis, Soil particle,

I. INTRODUCTION

Geosynthetic are primarily used for a variety of applications, including "separation, reinforcement, filtration, and drainage" [1]. Geosynthetic are fabricated from a variety of polymer types such as "Geotextiles, Geogrids, Geomembranes, Geosynthetic Clay Liners, Geonets, and Geo-pipes" are some of the most widely used Geosynthetic [2]. The usage of Geosynthetic as reinforcing materials is one example of a possible application [3]. Many civil engineering projects benefit from the use of Geosynthetic with high tensile strength in conjunction with soil that has a high compressive strength. Numerous studies [4] outline the ways in which Geosynthetic may be used in different aspects like "geotechnical, transportation, hydraulic, and geo-environmental engineering". The Geosynthetic' performance when combined with subgrade such as those found in paved and unpaved roads, has been the subject of a number of recent experimental and field investigations [5]. Studies utilizing geogrids at the top of the third layer of a soil specimen with a distinct plasticity index compared well with unreinforced soil in both wet and unsoaked circumstances [6], supporting the widespread usage of geotextiles with foundation soil. Several modified CBR tests were conducted on both "unreinforced and reinforced soil systems" as part of the experimental research. The "geotextile, biaxial geogrids, or geonet" is frequently utilized at the soil-layer boundary during the preparation of reinforced soil assemblies. The standard CBR moulds used in the studies has a diameter of 150 mm, a height of 175 mm, and a collar of 50 mm; these dimensions are chosen so that the influence of mould dimensions on the load-penetration behaviour of "unreinforced and reinforced soil systems" can be understood. The purpose of this research is to bring attention to the effectiveness of Geosynthetic in enhancing the durability and stability of sub grade soil. Soil performance may be improved by using either "natural or synthetic Geosynthetic" materials. When the soil's carrying capacity is poor, the inclusion of Geosynthetic material improves the road's stability. The "Textile, raft, mat, cell, and membrane structures" may all be made using Geosynthetic materials. These days, it's common for modern Geosynthetic materials to resist deterioration from biological and chemical processes, making them ideal for use in road building and maintenance. CBR testing is conducted on a soil sample that has been fortified with Geo synthetic materials like "Geo-textile and Geo-grids" in both wet and dry situations. The current research examines Geosynthetic material in sub grade soil via laboratory and site studies. In order to perform the experimental analysis utilizing the synthetic material to increase the soil's durability, this research primarily focused on the following factors

- To examine the various aspects of Geosynthetic material
- To determine the properties of reinforced soil.
- To analyse the C.B.R value for different penetration levels using Geosynthetic material.
- To explore the merits of Geosynthetic material using CBR test.

Rest of the paper is organized as section 2 describes the literature review, section 3 presents the methods and materials used in the proposed work, section 4 provides the result and discussion and finally, the section 5 discussed the conclusion and future scope of thework.

II. LITERATUREREVIEW

There are a number of different CBR-based road design methodologies that may be found in the literature. Many academics have examined at the applications of geosynthetics which may boost the CBR value of subgradesoil.

A. Chien, A., et al.(2014)

Geotextile tubes are most often used in the field of maritime engineering. It has a wide range of potential uses, from jetty to underwater breakwater. A revetment that is simple to set up, friendly to the environment, and affordable. This strategy's has increased rapidly in recent years. The Al Aqah Beach located in Fujairah, UAE was the site of this undertaking. Two rubble groins were built for this project, one on the north side and one on the south side, to keep the beach in front of the hotel safe from erosion. The groins' sand-intercepting function diminished over time due to wave action and hurricane damage that significantly lowered the groins' effective height and length. This project planned to construct a 200m long groin. Then, at the apexes of the groins, a 225m long underwater breakwater has been constructed in a PIE shape. The tourist business in the area was severely impacted by the recent calamity. To fulfill the goal of beach replenishment, the customer decided to use geotextile tubes to reconstruct the groin and submerged breakwater in light of tourist points of interest, the project's finances, and environmental standards. Good environmental bonding was achieved by using geotextile tube. Fast-growing surface algae may establish a biome in specified time. The final outcomes consider a geotextile tube construction instead of a rubble one. This demonstrates that the use of geotextile tubes is an alternative to the traditional technique [7].

B. Rajesh, U., (2016)

Road embankments built on soft subgrade soils can benefit from the use of coarse-grained soils. Recently, geosynthetics have been used more often to boost the bearing resistance of softer subgrades. Construction on soft subgrade presents unique challenges, although previous studies have addressed these issues and given solutions, such as the use of geosynthetics and coarse fill. Bulk exploitation of locally accessible weak soils, however, might be a realistic option given the shortage of fill material and the expense of the project. Small size projects may benefit from improved engineering performance and efficient use despite building challenges and other obstacles. These enhanced soils may be utilized as a cheaper alternative to filling up soft subgrades. This research aims to investigate the engineering performance CBR of geogrid-reinforced soil subgrades for a variety of soil types. Soil is subjected to both laboratory and field tests to establish its CBR value. Soil plasticity, geogrid tensile capacity, and soaking/unsealing times are some of the characteristics studied for their effect on CBR property. Geogrids are used for reinforcement, and their effectiveness in wet environments is measured in both the laboratory and the field. These findings highlight the potential role of geogrid in enhancing wet CBR performance, which is severely lacking without the use of grid [8]

C. Katte, V. Y., et al. (2018)

When sizing flexible pavements in hot climates, the CBR is the most common measure of bearing capacity used. Several regression analyses "(single and multiple) were investigated between the soil's index attributes (liquid limit, Plastic limit, and Plasticity index), compaction features (maximum dry density, and optimum moisture content), percentage of particle sizes (gravel, sand, and clay/silt), and CBR" to help alleviate the test's high cost, high effort, and high time commitment. In this work, thirty-three soil specimens were taken from a construction zone near an active highway and sent for laboratory investigation. To evaluate the connection between these index qualities, compaction test and the experimental CBR achieved. The MLRA did boost the R2 from 0.772 to 0.841, but adding more properties only marginally increased the R2, which is a symptom of poor correlators of CBR and makes using them in pavement design impractical and expensive [9].

D. Balamaheshwari, M. et al. (2022)

This research examines the optimal depth of placement of reinforcement by observing the impact of depth of reinforcement using a single layer of geogrid in a CBR test. To further investigate the anchors' interlocking impact with the soil, a CBR test is conducted at the optimal depth of installation for the anchored reinforcement scenario. Therefore, it may be suggested that a thorough field research be conducted to quantify the site's attributes and reach the desired results. The subgrade sample was divided into three groups, each of which underwent a standard proctor test to identify the optimal moisture level and maximum dry density for carrying out the CBR test. CBR evaluations are performed using a single geogrid reinforcement layer. The outcomes showed that 0.528 kN and 0.856 kN loads experienced by the sample at u/h = 0.17 at a penetration depth of 2.5 mm and 5.0 mm, respectively. Standard loads are 1370 kg (or 13.44 kN) for a 2.5 mm penetration and 2055 kg (or 20.15 kN) for a 5.0 mm penetration [10]

E. Othman, K., et al. (2023)

This research examines the optimal depth of placement The primary aim of this research is to create reliable prediction models for determining the CBR value of subgrade soil samples in Egypt. Therefore, several prediction models are developed using the ANN technique, and their results are then compared so that the model with the best predictions can be selected. Specifically, 240 unique ANNs are evaluated, each with its own unique architecture and set of hyperparameters. Prediction models are built using data like as grain size distribution, Atterberg limits, and compaction parameters. In addition, the ANNs were tested on two additional datasets taken from the literature in an effort to choose the best ANN for generalization. The study's key findings may be summed up as follows:

Prediction of the CBR value using the hyperbolic tangent activation function is inefficient in general.

However, the linear and sigmoid activation functions reliably forecast the CBR value, and they do so in a time- efficient manner to follow a predictable pattern for either the hyperbolic tangent or the sigmoid activation functions. However, ANNs using the linear activation function have better results when hidden layer is increased.

The CBR value can be accurately predicted with only four, top-tier ANNs. With an R2 of up to 0.945, RMSE of 2.5, and MAE of 1.93, these ANNs can accurately predict the CBR value. By successfully predicting the CBR value for two additional datasets from Pakistan and Cameron, we have shown the generalizability of the four ANNs. The validation procedure reveals, however, that the best ANN has a linear activation function, has two hidden layers, and 20 neurons in each hidden layer. In comparison to the classic MLR method, the findings demonstrate that ANNs can achieve superior performance even if the hyper parameters are not tuned. According to the findings, deep neural networks with numerous hidden layers perform better than shallow ANNs with just one. As a result, we may infer that the deep neural networks method is an effective tool for predicting the CBR value [11].

III. METHODOLOGY AND MATERIAL

In this section, we focus on techniques used to construct and test geosynthetic material. Tests and experiments should be carried out to arrive at appropriate conclusions regarding the selection of the appropriate mixture for material. The CBR value is best determined by conducting the series of experiments.

Tools used in CBR test and Proctor compaction test are mentioned as followed:

- Compaction mould, capacity 1000ml.
- Detachable baseplate
- IS sieve, 4.75mm
- Oven
- Desiccator
- Weighing balance, accuracy1g
- Large mixing pan
- Straightedge
- Spatula
- Mixing tools, spoons, trowels, etc.
- Cylindrical mould with inside dia 150 mm and height 175 mm, provided with a detachable extension collar 50 mm height and a detachable perforated base plate 10 mm thick.
- Spacer disc 148 mm India and 47.7 mm in height along with handle.
- Metal rammers. Weight 2.6 kg with a drop of 310 mm (or) weight 4.89 kg a drop 450mm.
- Loading machine. With a capacity of atleast 5000 kg and equipped with a movable head or base that travels at an uniform rate of 1.25 mm/min. Complete with load indicating device.
- Metal penetration piston 50 mm diameter and minimum of 100 mm in ength.
- Two dial gauges reading to 0.01mm.
- Miscellaneous apparatus, such as a mixing bowl, straight edge etc,
- Expansive soil specimen
- Geosynthetic material

IV. TESTS

A. Particle size Analysis test

Compressive strength testing was performed in general accordance

Objective: To determine the Particle size distribution of soil by grain analysis

Scope: The Grain size analysis is widely use in the classification of the soils. The data obtained by grain analysis distribution curves is used in the design of filters for the earth construction, field etc. It also used to determine the water movement although permeability tests.

Materials and equipment: The “Sieves of sizes 4.76 mm, 2.36mm, 1.18mm, 600µ, 425µ, 300µ, 150µ, 75µ”. The “Mechanical sieve shaker.” Equipments used to shake the set of sieves.

Knowledge of Equipment: The balance to be used must sensitive to the extent of 0.1% of total weight of the sample is taken. The “I.S 460-1962” is used .The sieves for soil tests: 4.75mm to 75 microns.

Observation and Recordings: Weight of soil sample:”1000gm, Moisture content: 2.4%, the moisture content of the soil if above 5% then it is be measured” and recorded.

Table 1: Particle size analysis test

S. No.	I.S sieve size in mm	Wt. Retained d in each sieve(g m)	% on each sieve	Cumulative % retained on each sieve	% Fine r
1	4.75	16	1.6	1.6	98.4
2	2	33	3.3	4.9	95.1
3	1.18	124	12.4	17.3	82.7
4	0.6	134	13.4	30.7	69.3
5	0.42 5	206	20.6	51.3	48.7
6	0.3	218	21.8	73.1	26.9
7	0.15	208	20.8	93.9	6.1
8	0.07 5	18	1.8	95.7	4.3

In Table 1, the particle size analysis test has been performed which helps to examine the compressive strength of the material. In performed test, the moisture content has been evaluated in the soil. Therefore the % of soil retained on 75 micron sieve = 1.8% and cumulative % of soil retained on 75 micron sieve =4.3%.

B. Liquid Limit Test

Object: To determine the liquid limit test of the soil samples.
Scope: To understand stress and general soil qualities, it is necessary to understand the liquid limit. The settlement analysis will benefit from the value of the compression index. Soil is deemed soft if its inherent moisture level approaches its liquid limit. The soil is regarded to be soft if its moisture content is lower than the liquid limit. The earth has become more rigid and brittle.
Material and Equipment's are used:

- Mechanical liquid limit device
- Grooving tools
- Spatula
- Balance: 10kg capacity-sensitively 0.01gm
- Sample container
- 425 micron IS sieves Observations and recordings:
- Wt. of the soil sample:120gm
- Natural moisture content:2.4%
- Room temperature: 25-270C

The moisture content of the soil sample is more than 5% then it will be recorded and measured.

Table 2: Liquid Limit Test

Determination number	1	2	3
Numbers of blows	18	24	28
Container No.	1	2	3
Weight of container,w0 gm	20.8	21.47	24.38
Wt.of container +wet soil w1 gm	38.14	36.20	40.24
Wt. of container +oven dry soil w2 gm	33.42	32.56	36.53
Wt. of water (w1-w2) gm	4.72	3.64	3.71
Wt. of oven dry soil(w2-w1) gm	13.34	11.09	12.15
Water content=w1 -w2/w2-w1*100%	35.38	32.82	30.52

In Table 2, quality of the soil has been examined using the liquid limit test and the level of moisture content absorbed by the soil is calculated. In the performed test, the Average Liquid Limit=32.90%

C. Plastic Limit Test

Object: To determine the plastic limit of the soil samples.
Scope: Soil is used for the making of bricks, tiles, soil cement blocks, in addition to its use for the foundation for the structures.
Materials and equipment are used :

- Metallic rod ; 3mm diarod
- Evaporating dish
- Oven controlled
- Sample container

425 micron IS sieve Observations andReadings:
Compare the diameter of thread at the intervals with the rod. When the diameter is reduces to 3mm to note the surface of the thread for the cracks.

- Weight of the soil sample :120gm
- Moisturecontent:2.4

Table 3: Plastic Limit Test

Determination number	1	2	3
Container No.	1	2	3
Weight of container,w0 gm	26.1	21.86	23.91
Wt. of container +wet soil w1 gm	32.29	34.74	30.15
Wt. of container +oven dry soil w2 gm	31.2	32.51	29.06
Wt. of water (w1- w2) gm	1.09	2.23	1.09
Wt. of oven dry soil(w2-w1) gm	5.1	10.65	5.15
Water content=w1 -w2/w2-w1*100%	21.47	20.94	21.17

In Table 3, the plastic limit test has been performed and the various parameters have been computed in order to understand the strength of the soil for building the structures. Therefore, the Average Plastic limit=21.16%

- Plasticity Index
- Calculation: Plasticity Index=Liquid Limit-Plastic Limit, 32.09-21.16=11.74%

Therefore, the Plasticity Index= 11.74%

D. Compaction test

This procedure involves determining the correlation between soil moisture and density by dropping a 2.5 kg rammer from a height of 30 cm into a mold of a known size. Apparatus:

- Proctor mould having a capacity of 944 cc with an internal diameter of 10.2 cm and a height of 11.6 cm.
- The mould shall have a detachable collar assembly and a detachable base plate.
- Rammer: A mechanical operated metal rammer havinga 5.08 cm diameter face and a weight of 2.5 kg. The rammer shall be equipped with a suitable arrangement to control the height of drop to a free fall of 30 cm.

- Sample extruder.
- A balance of 15 kg capacity.
- Sensitive balance.
- Straight edge.
- Graduated cylinder.
- Mixing tools such as mixing pan, spoon, towel, spatula etc.
- Moisture tins.

E. CBR Test

To determine the subgrade strength of a road or pavement, a California bearing ratio (CBR) test may be conducted. The thickness of pavement and its sub layers may be calculated using the test results and the corresponding empirical curves. In the world of adaptable pavement design, this is the gold standard.

This document details the laboratory procedure for measuring C.B.R. in uncompact and compacted soil samples, as well as in its soaked and unsaturated forms.

Equipment and tool required:

- Cylindrical mould with inside dia 150 mm and height 175 mm, provided with a detachable extension collar 50 mm height and a detachable perforated base plate 10 mm thick.
- Spacer disc 148 mm in dia and 47.7 mm in height along with handle.
- Metal rammers. Weight 2.6 kg with a drop of 310 mm (or) weight 4.89 kg a drop 450mm.
- Weights. One annular metal weight and several slotted weights weighing 2.5 kg each, 147mm in dia, with a central hole 53 mm in diameter.
- Loading machine. With a capacity of atleast 5000 kg and equipped with a movable head or base that travels at an uniform rate of 1.25 mm/min. Complete with load indicating device.
- Metal penetration piston 50 mm and minimum of 100 mm in length.
- Two dial gauges reading to 0.01mm.
- Sieves. 4.75 mm and 20 mm I.S. Sieves.
- Miscellaneous apparatus, such as a mixing bowl, straight edge, scales soaking tank or pan, drying oven, filter paper and containers.

V. RESULT ANDDISCUSSION

A. Test Result on Materials

Soil is the most common and the least expensive resources utilized as a building material. Reinforced Earth soil referred to the building technology created by combining soil with the reinforced. Geosynthetic strengthening to a cost-effective solution in the case of bad fringe soil condition. Geosynthetic help to improve the soil quality, boost the projects safely factor and lower the projects construction costs.

Experimental Setup:

The apparatus used to conduct the experiments in this study. A box measuring 600mm × 600mm * 400mm is the basis of the system. The box's bottom and sides, which are made of plates, are 6mm thick so that they can withstand the loading pressure. These measurements are in accordance with the ASTMD-1196 standard for plates. The footing settlement was measured using two dial gauges that had a range of 25 mm and an accuracy of 0.01 mm. As can be seen in Figure 1, a loaded jack capable of supporting 10 tons was used for the plate load test.

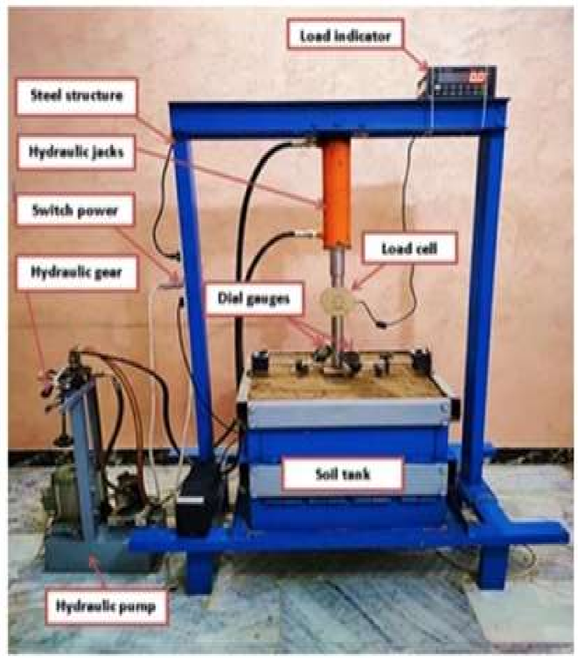

Figure 1: Experimental setup

- Woven Soil

The soil sample for the test was taken from the depth of (1.0-1.5) m below the existing ground level. The engineering properties of the soil are given:

Table 4: Soil Properties specification

Soil property	Specific gravity	D 10 (mm)	D 60 (mm)	D 30 (mm)	L L P L	Cohesion (KPa)	Friction angle	Y field (k N/ m	Water %: soil %	Fines content %
Val ue	2.58	0.0011	0.1	.061	24.62	7.06	27	17.88	14:58.7	41.3

In table 4, examine the soil properties under different conditions, the sieve analysis and hydrometer are also performed on the soil sample and to calculate the distribution curve particles sizes.

- Geotextiles

Lists the mechanical and physical characteristics of the Woven geotextile soil in this investigation.

Table 5: The characteristics of Woven Geotextiles

Elongation %	Tensile strength (kN/m)	Thickness (mm)	Mass /unit area
15	80	1.1	370

The Table 5 presents the features of the Woven Geotextiles in terms of tensile strength, thickness and mass and distribution of the soil particle size which further helps to evaluate the grain size distribution as shown in Figure 2.

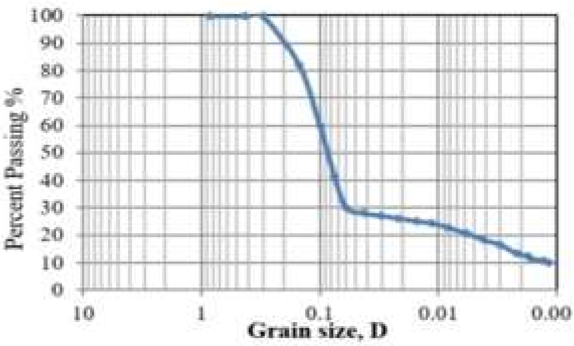

Figure 2: The soil particle size distribution

The Figure 2 depicts the distribution of the Soil particles which are grain sized and examine the passing percentage of the particles during the experiment. The preparation of CBR test has been shown in Figure 3 and Penetration test setup shown in Figure 4.

Figure 3: Preparation of soil specimen for C.B.R Test

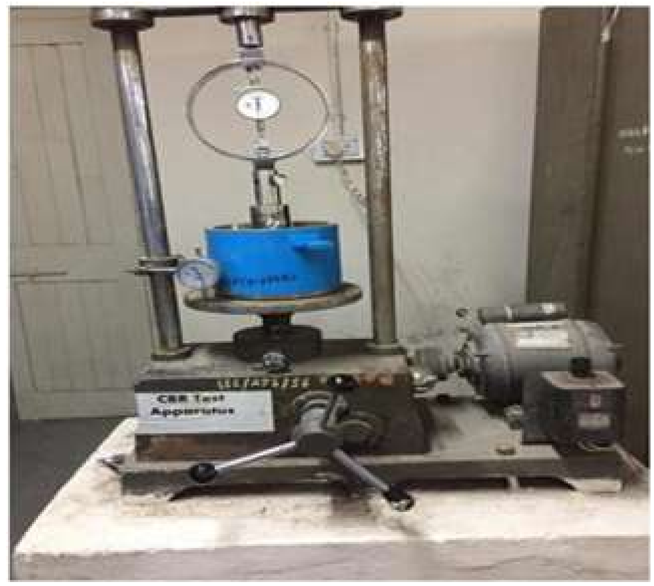

Figure 4: Penetration test procedure

Result of Compaction test Test procedure

- Collect a typical oven-dried sample, say 5 kg in the provided pan. Combine the sample with enough water to make it wet, but not dripping, around 4%-6% below its ideal moisture level.
- Without the base plate and collar, weigh the proctor mould. Restore the base plate and collar to working order. Compact the dirt in the Proctor mold in three layers, using the 2.5 kg rammer to deliver 25 blows each layer.
- Weigh the dirt after removing the collar and trimming it to the same height as the top of the mold using the straightedge.
- Take a tiny sample out of the mold, slice it vertically, and then measure its moisture content.
- The remaining stuff has to be crushed until it can be visually sorted using a No. 4 sieve. Increase the soil sample's moisture content by one or two percentage points at a time by adding water and following the steps outlined above. Keep going until you find that the moist unit weight of the compacted dirt has decreased or stopped changing.

Figure 5: Compaction Mould

Figure 6: Preparation of soil specimen

After performing this experiment, we got the following values of soil properties OMC=14.68% MDD=1.57.

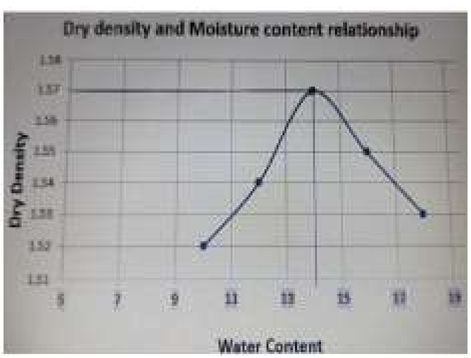

Figure 7: Graph between dry density and water content

Standard loads selected for various penetrations for the reference material with a C.B.R. value of 100% are detailed in the table below. Both original and remolded samples, compressed statically or dynamically, may be tested in this way. Untouched sample Just clip the blade onto the mold and plant it carefully. Clean the outside of the mold, which has been forced within, of dirt. When the mold is full with dirt, you may either weigh the soil in the mold or use a field technique conveniently located nearby to empty the mold. Try to calculate the density Specimen recast in clay Proctor Maximum Dry Density or Water Content should be used to prepare the remolded specimen.

Dynamic Compaction

Combine the recommended amount of water with 4.5 to 5.5 kg of dirt and stir well. Attach the base plate and the extension collar to the mold. Put the spacer disc on top of the base (see diagram). Cover the spacer disc with the filter paper. Light or heavy compaction may be used to pack the soil mixture into the mold. Light compaction requires compacting the earth in three equal layers with 55 strokes using a 2.6 kg rammer. Compact the soil in 5 layers, giving each layer 56 blows with the 4.89 kg rammer, for maximum density. Trim away any excess dirt and take off the collar. Flip the mold over to get to the base plate and displacer disc. Compacted dirt in the mold will be weighed to establish bulk density and dry density. Clamp the perforated base plate onto the filter paper that has been placed on top of the compacted dirt (collar side). The sluggishness of the penetration tester's weights. The penetration piston should be seated at the specimen's center with as little force as possible (but no more than 4 kg) to ensure complete contact between the piston and the sample. Make sure the dial gauge for tension and strain is set to zero. Piston load should be used to achieve a penetrating velocity of roughly 1.25 mm/min. Take readings of the force exerted at 0, 5, 10, 15, 20, 25, 30, 40, 50, 75, 100, and 125 millimeters. If the penetration is less than 12.5 mm, record the maximum load and penetration. Separate the mold from the loading apparatus. Get 20-50 grams of dirt from the top 3 centimeters and check its moisture level.

The properties of the soil have been discussed in Table 6 which has been used for the experimental analysis.

Table 6: Characteristics of the soil

Particulars	1	2	3	4	5
Volume of Mould	1000	1000	1000	1000	1000
Weight of Mould(g)	4533 g	4533 g	4533 g	4533 g	4533 g
Weight of Mould+Compacted soil	6220	6260	6331	6344	6356
Wt. Of Compacted soil	1687	1727	1798	1811	1823
Bulk Density	1.687	1.727	1.798	1.811	1.823
Water Content	10%	12%	14%	16%	18%
Dry density	1.527	1.5419	1.5772	1.5612	1.545

Result of CBR Test

It is the ratio of the force needed to enter a standard material at a rate of 1.25 mm/min with a circular piston to the force needed to pierce a soil mass at the same rate.

C.B.R=Test load/Standard load × 100

C.B.R for 2.5mm penetration = 80.32/1370 × 100

= 5.86

C.B.R for 5mm penetration. = 135.135/2055 × 100

= 6.57

After performed C.B.R test for 2.5mm penetration and 5mm penetration we got CBR value 5.86 and 6.57 corresponding to the penetration. For the typical material shown in Tables 7 and 8, the following table details the loads used at various penetration depths.

Table 7: Standard parameters for penetration and load test

Penetration (mm)	Standard Load	Test Load (soil)	Test Load (33%) depth of Geosynthetic	Teat Load(50 %)depth of Geosynthetic	Test Load(66%)of depth of Geosynthetic
2.5	1370	80.32	89.62	86.167	89.778
5.0	2055	135.135	137.236	139.943	138.77

Table 8: Test for standard load for penetration

Penetration of plunger(mm)	Standard load(kg)	Test load(kg)
2.5.	1370.	80.32
5.0	2055.	135.135
7.5	2630	
10	3180	
12.5	3600	

VI. CONCLUSION AND FUTURE SCOPE

The expansive soil have property of swelling and shrinking in contact of water it's very harmful for Pavement life. The various tests are conducted in order to find the optimal value of soil specimen. The performed tests on used soil specimen compaction test, Normal CBR test, Modified CBR test using Geosynthetic material etc. the CBR value improved by using Geosynthetic material in different Percentage. The long-term durability of the specific designed resin being used to produce the Geosynthetic must be ensured by employing correct additives like antioxidants, UV screeners, and fillers, however these tests have some limitations owing to diverse environmental circumstances. Since Geosynthetic are polymeric, their exposed lifespan is less than when they are soil backfilled. For certain soil types or exceptional circumstances, it might be difficult to design for clogging or bioclogging of geotextiles, geonets, geopipe, and/or geo-composites. Careful inspection and quality certification are required throughout handling, storage, carrying, and installation. To stable the soil and improvements in CBR value by using different types of Geosynthetic materials which has various advantages such as:

- Cheaper in product,
- Transport and installation
- Can be installed quickly
- Can be designed (predictability)
- Flexible during construction in shortperiod
- Consistent over wide range ofsoil
- Space saving
- Material quality control
- Easy material deployment

Better construction quality control at site Apart fromthis, From the experimental analysis, it is concluded that reinforcement makes soil durable and increases its strength but upto a limit.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest

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