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Performance of Black Cotton Soil Reinforced with Geo-Grid

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Abstract- Soil Stabilization can be done in many ways. Soil Stabilization is mainly done to improve the strength of soil and bear capacity of subgrade soil. Geo grid is used as a stabilizer in the stabilization of soil in flexible pavements. Geo grids are mainly used for the reinforcement of soils for different kinds of construction works.

INTRODUCTION:

Black cotton soil is a type of expansive soil that is found in many regions around the world. It is characterized by its high plasticity, swelling and shrinkage properties, and low strength, which makes it a challenging soil to build structures on. The performance of structures built on black cotton soil can be compromised due to the soil's instability, which can lead to differential settlement and damage to the structures.

To address these challenges, geo-synthetics such as geo-grids are often used to reinforce black cotton soil. Geo-grids are high-strength polymer materials that are designed to provide reinforcement and stability to the soil structure. They can distribute loads more evenly, reduce the risk of differential settlement, and improve the overall strength and stability of the soil.

The use of geo-grids as reinforcement in black cotton soil has been studied extensively, and it has been found an effective way to improve the performance of the soil. However, there are also limitations and challenges to consider, such as the quality of the geo-grid material, installation, cost, durability, and the specific properties of the soil being reinforced.

Overall, the use of geo-grids as reinforcement in black cotton soil has the potential to greatly improve the performance of structures built on this type of soil. Careful consideration of the limitations and challenges is necessary to ensure effective and long-lasting performance.

Point out the constructs of a Journal – constitutionally a journal consists of five major sections. The number of pages may vary depending upon the topic of research work but generally comprises up to 5 to 6 pages. following are:
1) Abstract
2) Introduction
3) Research Elaborations
4) Results or Finding
5) Conclusions

I. IDENTIFY, RESEARCH, AND COLLECTION OF IDEAS

It is the primary step for proceeding with any research work writing. While doing the study of research go through a complete study process of your Journal subject and research for its feasibility by following methods:
1) Read previously published research papers in the same work.
2) Search the information about the research on the internet.
3) Understand the scientific terms and jargon related to transportation work.

II. STUDIES AND FINDINGS

1. Some studies have shown that the use of geo-grid reinforcement increased the shear strength of black cotton soil by up to three times. Additionally, the use of geo-grid reinforcement has also been found to increase the stiffness of black cotton soil, reduce the settlement of soil, and improve the load-carrying capacity of the soil.
2. One study examined the performance of reinforced black cotton soil using polyester geogrids and found that the geogrid reinforcement reduced the settlements of the soil by up to 50%. Another study evaluated the effectiveness of geogrid reinforcement on the strength of black cotton soil and found that there was a 35% increase in the unconfined compressive strength of the soil.
3. Furthermore, studies have also shown that geo-grid reinforcement can improve the durability of black cotton soil by reducing the onset and progression of heave and cracking due to soil expansion and contraction.
4. Overall, the studies and findings suggest that the use of geogrid reinforcement is a viable and effective method to improve the performance of black cotton soil. The geogrid reinforcement can increase its strength, stiffness, and load-bearing capacity, and reduce settlement and heave.

III. EXPERIMENTAL PROCEDURE

MATERIAL SELECTION: Samples of black cotton soil were conducted from four places 1. AMBEGAON 2. JAMBHULWADI 3. KHADAKWASLA 4. DHAYRI, physical and engineering properties for laboratory tests, and geogrid for soil reinforcement were collected from MACCAFEERI PVT.LTD (Pune Plant)

TEST TO BE CONDUCTED

1. SIEVE ANALYSIS
2. LIQUID LIMIT
3. PLASTIC LIMIT
4. FREE SWELL INDEX
5. WATER CONTENT
6. STANDARD PROCTOR TEST
7. CALIFORNIA BEARING RATIO TEST(CBR)

Above mentioned tests, all are conducted for soil samples.

IV. RESULTS AND DISCUSSION

Sr. N0.	Penetration in mm(A1)	Proving Ring Reading s (A2) KN	ProvingRing Reading s in Div (A3=A2*5)	Load in Kilogram A4=A4*0.91
1	0.0	0.0	0.0	0.0
2	0.5	2.5	12.5	11.4
3	1.0	3.2	16.0	14.6
4	1.5	3.7	18.5	16.9
.5	2.0	4.7	23.5	21.5
6	2.5	5.4	27.0	24.7
7	4.0	5.7	28.5	26.1
8	5.0	6.1	30.5	27.9
9	7.5	6.3	31.5	28.8
10	10.0	6.8	34.0	31.1
11	12.5	7.0	35.0	32.0

Table 1. CBR test data without geogrid.

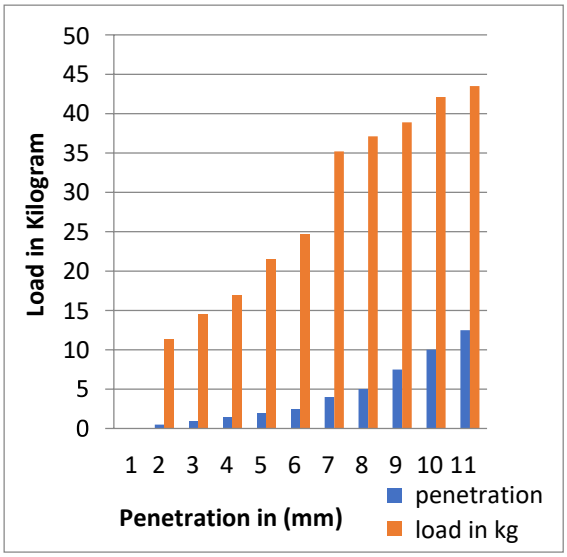

Fig 1. CBR graph without geogrid

SR. N0.	Penetration in mm(A1)	Proving Ring Readings (A2) KN	Proving Ring Readings in Division (A3=A2*5)	Load in Kilogram A4=A3*0.91
1	0.0	0.0	0.0	0.0
2	0.5	7.6	38	34.5
3	1.0	9.2	46	41.8
4	1.5	9.4	47	42.7
5	2.0	10.8	54	49.1
6	2.5	11.5	58	52.7
7	4.0	11.8	59	53.6
8	5.0	12.3	61.5	55.9
9	7.5	12.7	63.5	57.7
10	10.0	13.4	67.0	60.97
11	12.5	13.7	68.5	62.3

Table 2. CBR data with geo-grid at 3h/4

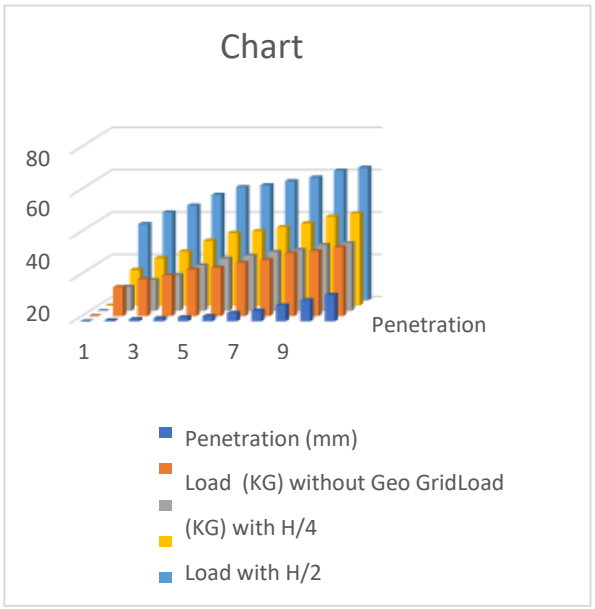

Fig 2. CBR contrast with geogrid application.

Description	CBR Value
Without geo-grid	1.67
With geogrid #3h/4 from the bottom	3.91

V. CONCLUSION

1. GEOGRID REINFORCEMENT INCREASES THE BEARING CAPACITY OF THE SOIL, WHEN THE GRID IS PLACED AT THE TOP LAYER OF THE SAMPLE THEN CBR VALUES ARE MORE.

2. CBR VALUE IN BOTH SOAKED AND UNSOAKED CONDITIONS INTERFACING SOIL WITH A GEOGRID MATERIAL INCREASES THE PENETRATION RESISTANCE

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VII. REFERENCES

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