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IMPROVEMENT IN SOIL BY USING NATURAL MATERIAL JUTE & GYPSUM CASE STUDY RAJPURA PUNJAB

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ABSTRACT: As we know the clay shows the undesirable engineering properties like poor bearing capacity & higher compressibility .In order to improve the strength of soil we use stabilizers to improve the Strength of soil .The stabilizers we use to improve the strength of soli .The Stabilizers like jute ,Gypsum ,Fly ash ,Rice husk ash ,cement lime used rubber Tyres etc .In this experimental work we added jute &Gypsum as a stabilizer to improve the Strength of Soil the strength of soil & the six specimens are prepared to investigate the properties of soil & we added 2% of jute with varying length 1cm,2cm &3cm of jute .Standard proctor test & unconfined Compressive were used to conduct the optimum moisture content (OMC) & Maximum Dry Density (MDD) & Compressive Strength of soil mixture

Keywords: Bearing Capacity, Soil Stabilizers ,M D D ,O M C ,Standard Proctor Test ,Unconfined Compressive Test

I. INTRODUCTION

Soils: Naturally occurring materials that are used for the construction of all except the surface layers of pavements (i.e., concrete and asphalt) and that are subject to classification tests (ASTM D 2487) to provide a general concept of their engineering characteristics. Stabilization is the process of blending and mixing materials with a soil to improve certain properties of the soil. The process may include the blending of soils to achieve a desired gradation or the mixing of commercially available additives that may alter the gradation, texture or plasticity, or act as a binder for cementation of the soil.

When the construction work is executed on the clayey soil, it shows various problems in order to avoid those problems if we replace this type of soil ,it becomes costly .so in order to increase the capacity of clayey soil we add special types of stabilizers thus makes the cost less despite of replacing such types of soils ,we added gypsum & jute And came to know that the soil properties has been changed. Pavement design is based on the premise that minimum specified structural quality will be achieved for each layer of material in the pavement system. Each layer must resist shearing, avoid excessive deflections that cause fatigue cracking within the layer or in overlying layers, and prevent excessive permanent deformation through densification. As the quality of a soil layer is increased, the ability of that layer to distribute the load over a greater area is generally increased so that a reduction in the required thickness of the soil and surface layers may be permitted.

II. LITERATURE REVIEW

Before any Construction executed on the soil ,soil was stabilized from the ancient times also .If we go through Mesopotamian & Romans added limestone's & calcium to improve the weak soil .However some of the authors who worked on it and their work are as under Akhil Goyal [1] .The author came up with conclusion that the addition of jute percentages in the soil increases the maximum dry density up to 1% and the optimum moisture content decreases and soil jute & soil jute gypsum specimen fails by the formation of vertical cracks Rahman & Al [2] The author concluded that CKD is potentially useful and is used to stabilizing the soil like clayey ,Sandy and the authors also concluded that the mechanism of stabilizing the soil is three folds (i) Direct cementation (ii) promotion of cation –exchange process (iii) pozzolanic reaction between lime released by CKD. Ratan Raj And etal [3] The author concluded that the rice Husk ash in alluvial soil and clay soil increases the properties of soil and the maximum dry density increased from 16kn/m3 - 20.95kn/m3..In case of addition of 80% of rice husk ash to alluvial soil and the unsoaked CBR value of the soil increased from 3.2 % to 12% while as soaked CBR ranges from 2.4 %to 6.8 % .Tapas Dasgupta[4] The author concluded that the jute geotextile is placed on the weak subgrade it increases the strength of sub grade & it also reduces the road thickness and is therefore quite economical. Jain [5]The author concluded that With the addition of jute percentage in the soil the maximum dry density increases up to 2% and the optimum moisture content decreases. But with further addition of jute percentage in the soil the maximum dry density starts to decreases with an increase in optimum moisture content. Tapas Dasgupta[6] In Regions Where Black Cotton Soil Is Encountered, The Construction Of Buildings And Roads Is Highly Risky On Geotechnical Grounds As The Soil Is Highly Compressible, Possessing Low Shear Strength And Is Susceptible For Volumetric Instability. Many Investigators Have Attempted To Improve The Engineering Behavior Of This Soil By Mixing Non Cohesive Materials, Chemicals, Like Lime And Cement Etc. Ramaswamy,S.D. and Aziz,M.A.(1989)[7] The Geotextile Is Expected To Contribute Towards Better Road Performance And Achieving Economy. The Reduced Road Thickness & Construction Time Are The Added Advantages. Ramaswamy,S.D. and Aziz,M.A[8] The Long Term Durability Aspect Of Jute Fabric Should Not Deter "Itsuse As A Geotextile For Various Applications In Road Construction. Jute Geotextile Materials Are Biodegradable And Their Uses In Various Geotechnical Engineering Applications Are Ecologically Safe.

III. EXPERIMENTAL WORK

3.1 MATERIALS REQUIRED

Following Materials were used in this experimental work.

1 SOIL

About 150 kg of locally available soil was collected from the Rajpura area and the soil was properly sieved through 4.75 sieve & the soil sample was then put in an oven in order to remove before the experimental work was conducted on the said sample

1.1 PROPERTIES OF SOIL

Table 1 Physical properties of soil

S.No.	Parameters	Results
1.	Light compaction test MDD(gm/cc) OMC(%)	 1.60 20.00
2.	Liquid limit (%)	51.10
3.	Plastic limit (%)	22.38
4.	Plasticity index (%)	27.72
5.	Specific gravity	2.51
6.	Indian soil classification	CH

2 JUTE

The Jute which was used in this experimental work was of length 1cm,2cm & 3cm with 2% by the dry weight of soil .And the jute was purchased from the rajpura town which was used in this experimental work

3 GYPSUM

The Gypsum Was also purchased from the Rajpura town

Table No 2. PHYSICAL PROPERTIES OF GYPSUM

	Information	Reference(s)
	Gypsum(13397-24-5)	
Physical state	White crystalline powder or lumps	IPCS (2004a)
Odor	Odourless	NIOSH (undated-c)
Melting Point (°C)	100	Registry(2005)
Density (g/cm3)	2.4	IPCS(2004a);Registry (2005)
Specific Gravity	2.32	NIOSH (undated-d)
Water Solubility	0.24g/100 mL @ 25 (°C)	IPCS(2004a)

IV. RESULTS AND DISCUSSION

4.1 Compaction on Parent Soil

The test is done on the parent soil first. The maximum Dry Density is found to be 1.66 gm/cc at Optimum Moisture Content of 20.04. The process of testing is followed as discussed earlier.

Table 3 Standard Proctor test on parent soil

SI no	1	2	3	4	5	6
Wt of empty mould+ compacted soil (gm)	6200	6175	6342	6395	6405	6403
Wt of empty mould (gm)	4393	4393	4393	4393	4393	4393
Wt of sample (gm)	1810	1868	1941	1991	1999	2005
Density of sample (gm/cc)	1.254	1.844	1.947	1.998	2.01	2.006
Container no.	16	81	321	309	11	48
Wt of empty container (gm)	9.14	9.156	10.160	10.309	10.0	10.33
Wt of empty container + wet soil(gm)	35.5	35.4	31.90	32.37	45.86	47.51
Wt of container+ dry soil (gm)	30.51	31.21	25.39	26.87	35.59	33.17
Wt of water in the sample (gm)	3.12	3.60	3.53	3.12	5.54	3.84
Wt of dry soil(gm)	22.21	20.228	19.00	16.55	28.00	22.81
Water content, in percentage	10.901	13.250	19.5734	20..0446	21.3211	30.4338
Dry density (gm/cc)	1.54	1.608	1.6306	1.5519	1.5455	1.576

Table 4: Standard proctor test on parent soil with 2%,1cm jute

SI no	1	2	3	4
Wt of empty mould+ compacted soil (gm)	6125	6186	6397	6398
Wt of empty mould (gm)	4397	4397	4397	4397
Wt of sample (gm)	1721	1761	1956	1765
Density of sample (gm/cc)	1.73	1.88	1.95	1.80
Container no.	13	82	325	328
Wt of empty container (gm)	10.413	10.00	22.32	26.57
Wt of empty container + wet soil(gm)	34.8	36.45	71.23	62.01

Wt of container+ dry soil (gm)	31.51	33.11	63.8	60.91
Wt of water in the sample (gm)	2.29	3.34	7.43	7.1
Wt of dry soil(gm)	21.021	22.96	39.48	30.34
Water content, in percentage	13.2913	22.70611	29.16009	26.6073
Dry density (gm/cc)	1.533676	1.557502	1.449989	1.43326

V. CONCLUSION

The conclusion of this thesis are as under ,when the jute-gypsum was used as a stabilizers in a clayey soils

- The length of 1cm ,2cm & 3cm was used with a gypsum of 2% and the maximum dry density of soil jute mixture and soil jute gypsum increases with OMC.
- In the case of UCS test the compressive strength increases gradually when the length of jute fibers increases ,while by adding gypsum in the soil mixture the compressive strength increases suddenly
- The maximum dry density of soil jute mixture & soil jute mixture increases with decreases of OMC
- By adding the gypsum it not only acts as activator but also reduces plasticity of soil

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