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Study on stabilizing black cotton soil with over burnt brick powder and lime

Nikhil Tiwari[1], Shriyanka Prajapat[2], C.D.Prasad[3]

[1,2]M.tech scholar, Civil Engineering Department, UCE,
Rajasthan Technical University, Kota, Rajasthan, (India)
[3]Associate professor, Civil Engineering Department, UCE,
Rajasthan Technical University, Kota, Rajasthan, (India)

ABSTRACT

The objective of this investigation is to settle the Black Cotton soil (BC Soil) as it is being the weak soil among all soils and besides it is a expansive soil. An analysis examination is done to think about the impact of over burnt brick powder on building properties of the black cotton soils. The black cotton soil start swelling when it come to contact with moisture. In view of this property of soil the quality and distinctive properties of soil are greatly poor. To improve its properties it is major to stabilize the soil by appropriate stabilizers. It gives diverse sort of soil properties result with different kind of stabilizers. To stabilize the expansive soil, an examination is directed to assess the properties of soil mixing with various level of Burnt Brick powder of 10%, 20%, 30%, 40% and half by weight and after that the tests are performed. Tests directed for expansive soil blended with Burnt Brick powder and lime are Liquid Limit, Plastic Limit, Shrinkage Limit, Optimum Moisture Content and Maximum Dry Density, and California Bearing Ratio. A correlation between properties of expansive soil and expansive soil blended with Burnt Brick powder and lime is performed. It is discovered that the properties of expansive soil blended with Burnt Brick powder and lime are enhanced. This paper deals with the aggregate examination of the difference in soil properties and its stabilization using lime and burnt brick powder. Here leaving and positive results are gotten which is giving added substance quality to soil properties. An investigation examination is done to consider the effect of burnt brick powder and lime on building and quality properties of the black cotton soils. The properties of stabilized soil, for instance, atterberg limits, compaction characteristics, California bearing ratio and their assortments with substance of brick powder and lime were evaluated. Lab concentrates to look at the probability of utilizing burn brick powder and lime as stabilizing materials to upgrade the engineering properties of black cotton soil was done.

keywords: Black Cotton soil, stabilization, burnt brick powder, engineering properties, atterberg's limit, California bearing ratio.

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I. INTRODUCTION

Black cotton soil by virtue of their shading and their ability for creating cotton. They contain 'montmorillonite' earth mineral which has high expansive characteristics. Black Cotton soils have low shrinkage purpose of containments and high moisture content. It is exceptionally fragile to suddenness changes, compressible subgrade material. Issues related with black-top improvement end up being more fundamental when the subgrade involves far reaching soils. In India, wide soils cover around 0.8x106 Km2 locales, approximately one fifth of its surface zone. From this time forward the subgrade and its undesirable characteristics can be modified using a proper stabilization technique. Stabilization incorporates the systems used for modifying the properties of a soil to upgrade its planning execution. In the advancement of road and runway keeps, the essential focus of stabilization is to assemble the quality or soundness of soil and to diminish the improvement cost by making best usage of the locally available materials. From the present examinations it is watched that, solid waste materials, for instance, Burnt Brick powder with lime is used.

II. MATERIALS AND TEST INCLUDED

Materials used in this investigation are:

1. Black cotton soil,
2. Burnt Brick powder, and
3. Lime

2.1 Black cotton soil:

"Expansive soil is regularly known as Black cotton soil as a result of their shading and their appropriateness for developing cotton." It begins swell too much because of increament in moisture content. Its common properties are listed below,

Table 1 Properties of Black cotton soil

Moisture content	26.04
Liquid limit	55%
Plastic limit	16.92%
Plasticity index	38.08%
Linear shrinkage	35.01%
Specific Gravity	2.26
pH	7.2
Colour	Greyish black
CBR unsoaked	26.02
CBR soaked	1.43

2.2 Burnt brick powder:

It is a waste material obtained from furnaces and tile processing plants. Its physical properties are shown below.

Table 2 Properties of Burnt brick powder

Specific Gravity	2.67
Grain Size Analysis a) Gravel Size (%) b) Sand Size (%) c)Fines (%)	 0 4 96
Liquid Limit (%)	86
Plastic Limit (%)	45.6
Plasticity Index (%)	40.4
Differential Free Swell (DFS) Index (%)	100
Maximum Dry density (g/cc	1.36
Optimum Moisture Content (%)	33
Soaked CBR (%)	1.17

2.3 Lime:

It is used here as a binding material and is a potential material used for stabilization of soil its chemical compositions are given below

Table 2 Properties of Lime

CaO	73.22
P_2O_5	0.08
$CaSO_4$	0.12
Fe_2O_3	0.17
Aluminium oxide	0.11
Magnesium oxide	0.74
Loss on ignition	24.33

III. TEST INCLUDED

1. Unconfined compressive strength:

The ucs value increases with increament in brick powder and lime at 9% lime And 20 % burnt brick powder the value rises to 0.345n/mm^2 from 0.164n/mm^2.

2. Free swelling test:

It is found that by adding of lime and brick powder, the differential free swelling index of soil abatements to 3.47% due to the decrease in plasticity of the soil.

3. Atterberg's limit:

By the substitution of black cotton soil from the burnt brick powder with lime it is perceived that the estimations of attereberg's limits are reducing with extending the stabilizing agent . As same diminishing is recognized liquid limit, plastic limit.decreament in liquid limit of confinement of 20%BRICK POWDER+10%lime, 25%BRICK POWDER+ 5% lime& 35% BRICK POWDER + 5% lime are independently 44.56, 42.39, and 40.02 %. Plastic limit regards are concerning 30, 40, 50 % burnt brick powder are exclusively 25.82, 23.24, and 18.6%.

4. Compaction tests:

In modified proctor test the result obtained shows that maximum dry density of Black cotton soil was increased up to addition of 6% of lime and 25% brick powder and optimum moisture content decreases from 25 % to 18%. it is concluded that with the increasing amount of brick powder by percentage weight of black cotton soil dry density is increasing and optimum moisture content is decreasing.

5. California bearing ratio:

The CBR value of soil increases with the increment of brick powder. The CBR values increases up to 8%. It is watched that by development of lime and burnt brick powder at different rate of augmentations in the CBR of soil increases to 1187% from 311%up to extension of 9%lime and 20% brick powder further expansion of admixtures imperceptibly reduces the CBR of the soil.

IV. CONCLUSION

- From the results it is induced that the impact of burnt brick powder and, lime on black cotton soil is sure and positive.
- By supplanting soil by very nearly 35% of burnt brick powder and five % of lime of its dry weight it gives most extraordinary change in the building properties of black cotton soil. So use of burnt brick powder and lime is best for adjustment since it gives positive results as stabilizer and besides it is a waste utilization.
- The CBR esteem increments upto 1000%with the utilization of burnt brick powder and lime. It was found that there is a most outrageous change in quality properties for the mix of lime and block tidy when appeared differently in relation to lime/burnt brick powder only.
- The conclusions rely upon the tests finished on various burnt brick powder and lime mixes decided for the same. It has been seen that differential free swelling rundown and fluid breaking point decreases by including lime and consumed burnt brick powder to 6%lime&25% brick powder, The perfect estimation of most outrageous dry thickness and the unconfined compressive strength increments exorbitantly with expanding measure of block tidy and lime up to 6% lime &25 % brick dust.

- This to find an application for mechanical waste to improve the properties of sweeping soil both in embankments and asphalt developments So the perfect rates of lime and piece clean were seen at 6% lime and 25% burnt brick powder for upgrading the properties of expansive soil.
- Burnt brick dust and lime has awesome potential for use in geotechnical utilization of soils is an exhibited technique to save time and money on advancement wanders. Lime alteration artificially changes mud soils into friable, workable, compactable material. Burnt brick dust and lime alteration makes expansive soil more steady and expands its building properties.
- Their effect on it is positive utilized as stabilizers as burnt brick powder is a waste and it can be utilized ideally to build properties of black cotton soil.

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