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STABILIZATION OF BC SOIL IN ROAD CONSTRUCTION AND REDUCING MAINTENANCE BY USING FBF (FLY ASH-BC SOIL-FOAM) METHOD

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ABSTRACT

The Geotechnical engineering division in the Civil engineering department was established in the early 1960's. Geotechnical engineering is the study of the behaviour of soils under theinfluence of loading forces and soil-water interactions. This knowledge is applied to the design of foundations, retaining walls, earth dams, clay liners, and geo synthetics for waste containment. The goals of geotechnical engineers could range from the design of foundations and temporary excavation support, through route selection for railways and highways, to the increasingly important areas of landfill disposal of wastes and groundwater contamination. As such, the geotechnical engineer is involved in field and laboratory investigations to determine the engineering properties of site soils and other geo materials and their subsequent use in the analytical study of the problem at hand. This research taken road construction, road maintenance using BC soil and BC soil land. BC soil (other properties) and foam concrete mix with asphalt and concrete for the maintenance.

Keywords: BC Soil, Foam Concrete, Road construction, Lime, Flyash.

I.INTRODUCTION

There are small cracks in the pavement (side of the road) and the pothole-filled street is closed off for repairs. Some policy solutions just like building more roads are unlikely to hel. Scientists are working on materials that repair themselves and are focusing on two of the most important materials in infrastructure: asphalt and concrete. Asphalt is mainly used for road surfaces. It's easy to apply: you just warm it, mix it, apply it, and once it cools it becomes a hard road surface. It's often porous, because these pores absorb the noise and make the roads a little quieter. But the downside is that this porous asphalt is not durable; that's how you get cracks and potholes. This is more than an annoyance that causes bumpy rides and traffic congestion. Damage creates unsafe riding conditions, and poorly maintained roads may be responsible for up to a third of all highway fatalities. Bleeding occurs when the asphalt contains too much asphalt cement relative to the aggregate. In these cases, the

asphalt cement tends to "bleed" thorough the surface. These types of issues are typically still functional but present an unsightly appearance to the pavement. Typical repairs for these areas are to either apply a chip seal application using absorbent aggregate or to mill off the top layer of asphalt and apply a new course of hot mix asphalt that contains lower asphalt cement content and foam concrete.

Hypothesis: On the premise of research discovering, writing audits, master assessment and researcher's own particular comprehension of the issue, it was conjectured that the BC soil adjustment is vital for Roads in India.

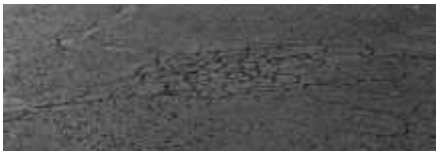
Objectives of the research

1. To road construction method through geo-technology schedule with precautions
2. To road maintenance with the analysis of soil type and causes of the damage
3. Need to provide BC soil based concrete mix for support BC soil land and other soil lands
4. Using foam concrete mix with BC soil concrete to provide one time maintenance solution

II.STATEMENT OF THE PROBLEM

In summer the dampness dissipates rapidly causing profound and wide shrinkage cracks. In the stormy season water enters the cracks and causes tremendous swelling.Highway embankments in such sort of soils endure serious harms and the asphalt gets disturbed, the soil the greater part of the state are primarily dark cotton soil, which is Block cotton soil that can tolerate no heap when wet. This makes the land disintegrate vigorously amid the blustery seasons and particularly the streets are harmed. The steady energy of sub review for the most part relies on the Shear quality, Bearing force and Penetration resistance of soil properties. Soil utilized as a thruway material should groups properties of the Stability, Incompressibility, Good waste, Ease in compaction, Minimum volume change, Permanency of quality and so on. Fundamental street development issues are recorded in beneath table,

Table 1: Asphalt Pavement Distress Summary Contents

TYPE OF DISTRESS	POSSIBLE CAUSE
Fatigue (Alligator) Cracking 	Excessive loading, Weak surface, base, or subgrade, Thin surface or base, Poor drainage and Any combination of 1-4.
Block Cracking 	Old and dried out mix, Mix was placed too dry, Fine aggregate mix with low penetration asphalt & absorptive aggregates and Aggravated by low traffic volume.

Edge Cracks 	Lack of lateral support. Settlement of underlying material. Shrinkage of drying out soil. Weak base or subgrade layer. Poor drainage. Frost heave and Heavy traffic or vegetation along edge.
Pot Hole 	Continued deterioration of another type of distress, such as thawing of a frozen subgrade, cracking, raveling, or a failed patch after pieces of the original pavement surface have been dislodged. Poor surface mixtures. Weak spots in the base or subgrade. Severity of the surrounding distress and traffic action accelerate potholes.
Settlement/Grade Depressions 	Settlement or failure in the lower pavement layers, Improper construction techniques

III.REVIEW OF RELATED LITERATURE

Foam concrete **[7],** has been utilized as a part of roadway construction in the United Kingdom (UK) since 1970, yet it took around 10 years for foam concrete to end up noticeably aggressive and a perceived building material. The best construction providers utilizing foam concrete innovation in the UK are the Foam Concrete Ltd and The Pump Engineering Ltd.

[10] From Northwest Highway (Route 14) construction, were used more than 13,000 cubic meters of thickness 590 and 410 kg/m3 foam concrete. There were thicknesses up to 1. 20 m, were they introduced to supplement prior foam concrete to crosswise over delicate soils in six zones along Route 14. Filled regions differed from 1 meter to 12 meters wide for both eastward and westward paths, including zones to help new tempest water channels. A few low territories were dewatered and precisely developed to counteract floatation because of rain and groundwater. Endless supply of foam concrete in these low tolerable ranges, the solidified foam concrete was immediately secured with the outlined layer of total subgrade of thickness 300 mm. This layer was then secured with concrete asphalt to completing roadway.

[6] Lightweight concrete (foam concrete) speaks to a blend of fastener (generally bond), water, admixtures, added substances and specialized foam, which make concrete as a building material with great mechanical quality, low warm conductivity and with basic, yet exceptionally innovatively requesting preparing. The capacity of the filler in the blend is to create the air bubbles, influencing it to fitting to deliver foam concrete specifically on the construction site utilizing unique mechanical gear planned for such generation. In the event

that the foam concrete was blended outside the site and transported there by versatile concrete blenders, it would cause a noteworthy decline of its volume.

IV.DEFINITIONS AND EXPLANATION TERMS

The Black cotton soil (BC soil) is burrowed from the beginning the embankment is to be built and hunks broken with pick-tomahawks to diminish them to a most extreme size of 50 mm. Then again circle harrows with tractor could be utilized. Soil blocks are spread over the arranged and compacted surface of unearthing and a smooth wheeled 8 ton control roller disregarded them various circumstances, joined by visit raking of the pounded material. Around 8 goes of the roller joined with raking ought to typically have the capacity to accomplish the level of pummeling. The level of pounding ought to be with the end goal that no less than 80 for each penny of soil goes through 475 micron sifter and there are no irregularities bigger than 25 mm estimate.

The pounded Black cotton soil (BC soil) is blended consistently in given extent by weight with cement and moorum in-situ field conditions by utilizing rotavator machine or engine grader. Portland cement or lime and Black cotton soil (BC soil) blended at the best possible dampness content has been utilized to fabricate balanced out bases under concrete asphalts for parkways/freeways and landing strips .Cement/lime-altered Black cotton soil (BC soil) is a blend that for the most part contains under 5 for each cent cement by volume.

This structures a semi-inflexible framework, enhances the engineering properties of the soil and diminishes the capability of the soil to grow by retaining water. OPC or lime, when blended with pummeled Black cotton soil (BC soil) decreases as far as possible (LL), the pliancy list (PI) and the potential for volume change. It expands as far as possible and shear quality. Because of the quality increment fused by the utilization of cement, the Black cotton soil (BC soil) cement blend can build the subgrade bearing limit and quality altogether. This system is moderately shabby and very powerful. At the entrance of dampness in cement settled dark cotton soil blend, the water builds the quality of cement lattice and gives quality to the blend.

Limitation: The realities examined in this investigation were construct totally with respect to the responses to the survey in this way, learning the validity of the responses was recognized as the constraint of the examination.

Delimitations: The mockups (BC soil, Lime and Fly ash)only collected from Peelamedu, Tamilnadu, India.Geotechnology survey selected for two different purposes first one is BC soil road construction and second one is maintenance of road/high ways using BC soil (also with Fly ash, foam concrete and Lime).

Secondary data: The secondary data has been collected from various journals, books and policy documents of the government.

Primary data

Stratified random sample technique has been followed to identify the respondents. A Structured Questionnaire was designed, tested and administered for collection of data.

V.SIGNIFICANCE OF THE STUDY

Stabilization of soils is a powerful technique for development of soil properties and the asphalt framework execution. Versatility Index is one of the essential properties of soil to decide the conduct of soil in nearness of water. The poorest soil among all is Black Cotton Soil (BC Soil). In Guntur range this BC Soil is spread over southern piece of District. Rich extent of montmorillonite is found in BC Soil from mineralogical examination. High level of montomorillonite renders high level of extensiveness. These property comes about cracks in soil with no notice. These cracks have once in a while degree extreme point of confinement like 1/2 "to 12" profound. Utilization of this kind of land may endure extreme harm to the development with the change in environmental conditions. In this proposal, BC Soil was tried utilizing three distinctive balancing out specialists froth concrete, Foam concrete + Lime Powder and Foam concrete + lime + Fly fiery debris. In the wake of fulfilling consequence of Plasticity Index, Cylindrical Samples of BC Soil with each of the three blends were set up to check the compressive quality of balanced out soil. Dampness content taken was the ideal level of plastic farthest point in every blend. The relations for these periods were built up among the utilization of every one of the three unique specialists. Compressive quality of Foam concrete settled BC Soil discovered more reliable.

VI.PROCEDURE & STATISTICAL ANALYSIS

Mix design and proportioning: The mix with ideal extent of (lime + fly fiery remains) to soil and furthermore proportion by weight of lime to fly powder should first be chosen in the lab by experimentation. The same ought to be embraced in the field. The extents of lime; fly fiery debris and soil in the aggregate blend communicated in parts by dry weight. Hence if the proportion : L : FA is 1 : 4 : the assignment by parts might be, Lime – 3 parts, Fly Ash – 12 parts, Soil – 85 Parts and Total (Dry and Weight) 1= 100).

Experience recommends that lime-fly fiery debris proportions of 1:3 to 1:4 give ideal quality for different soil sorts reasonable for lime-fly powder soil stabilization. Additionally increment in lime content does not show a proportionate increment in quality. Lime in addition to fly fiery debris content going in the vicinity of 10 and 30 for every penny by weight of the aggregate dry blend has been observed to be reasonable. Lime fly powder prerequisites, truth be told, rely on the level of fines in the aggregate blend. Fine durable sediments require a higher level of (lime-f fly cinder) contrasted with very much reviewed soils. Quality advancement calls for adequate network material (fines) to fill the voids in coarse materials. The Compaction test were conducted on Black cotton Soil with increasing percentage of lime to determine the optimum lime for the Black Cotton soil used in the present study (fig.2).

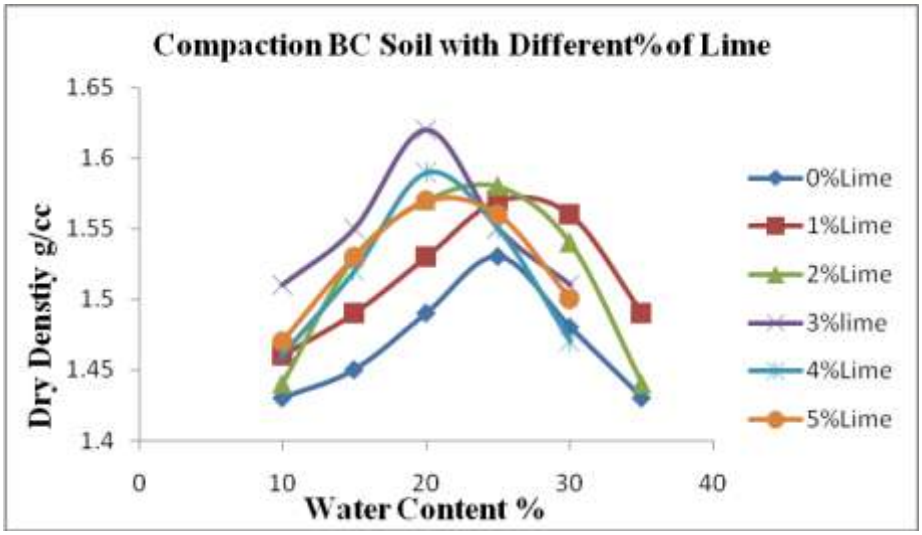


Figure 1: Compaction charecteristics OfBlack CottonSoil with Different % of Lime

Fig.2 shows variation UCC (Unconfined compression strength) with curing in days for both Black Cotton soil without lime & with lime & reinforced with treated fly ash at different percentages. It can be seen that the UCC (unconfined compression strength) becomes maximum at 7 days curing for both Black Cotton Soil without and with lime.

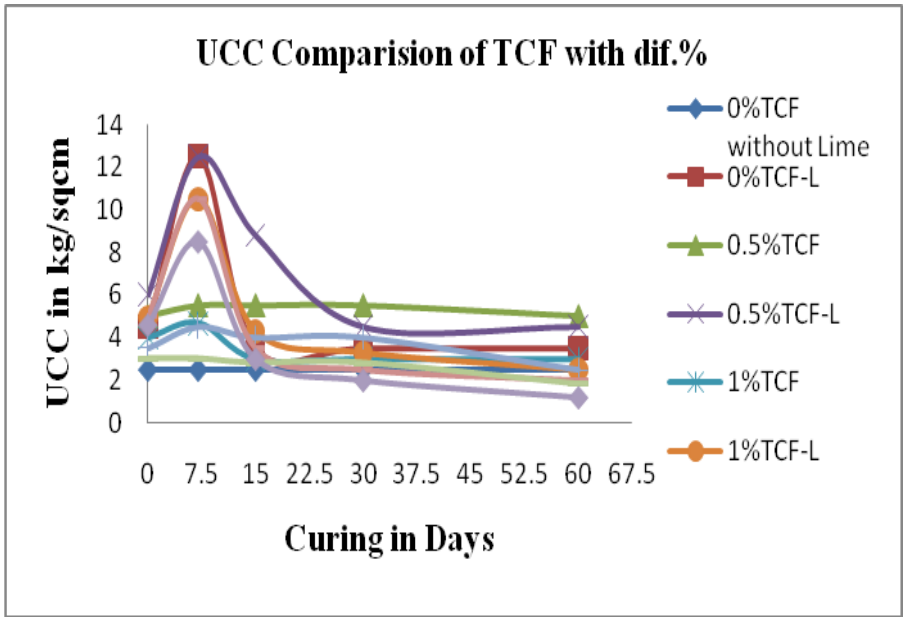


Figure 2: UCC Comparision of TCF with dif.%

The correct extents of the ingredients viz. lime fly fiery debris and soil, to be received at a specific area ought to be founded on the research facility blend configuration relying on the quality necessity. The base unconfined compressive quality and CBR values following 28 days curing and 4 days dousing ought to be 7.5 kg/cm2 and 25 for each penny separately. As far as seven days curing and four days splashing, the base unconfined compressive quality and CBR esteems ought to be 3 kg/cm2 and 10 for every penny individually. The curing might be done at a temperature extending from 30°C to 38°C. 5. Trial blends utilizing (lime-fly cinder) proportions of 1:2, 1:3, 1:4, are at first arranged. The accompanying general extents may as needs be utilized for setting up the mix for research facility tests:

Table 2: Lab Test Result

BC Soil + %5 Lime + 10% Fly Ash		**BC Soil + %5 Lime + 20% Fly Ash**		**CBR -BC Soil + %5 Lime + 10% Fly Ash**			**CBR- BC Soil + %5 Lime + 20% Fly Ash**		
Water Content	**Dry Density**	**Water Content**	**Dry Density**	**Penetration**	**Load (Unsoaked)**	**Load (Soaked)**	**Penetration**	**Load (Unsoaked)**	**Load (Soaked)**
19	1.625	18.34	1.63	0.5	20	12	0.5	24	15
23.61	1.657	21.25	1.685	5.0	116	84	5.0	132	96
28.57	1.69	25	1.75	10.0	132	96	10.0	152	115
33.33	1.63	29.165	1.68	15.0	140	102	15.0	158	120

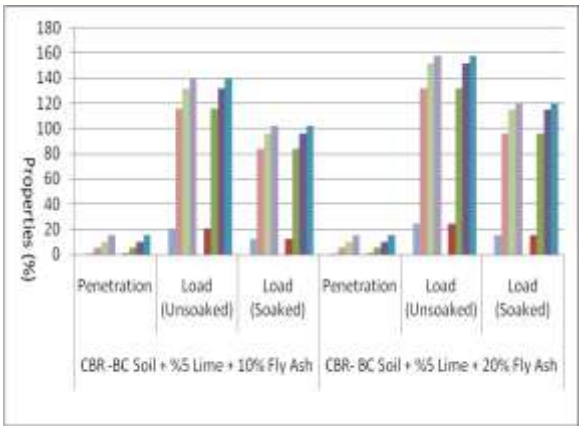


Figure 3: Result of Unsoaked and Soacked percentage of Mortal

Light weight filling material for road construction - Foam Technology

Foam concrete is a concrete mix that requires greater quality check to guarantee the total conveyance of its hugeness. The void filling application has turned out to be more conspicuous due to its associated arrangement of focal points like warm protection, its unbending nature, and controlled water ingestion properties. Ground flimsiness issue is an issue for the most part confronted by old mines and passages. They have now utilized foamed concrete to fill the voids as an answer for recover strength in sewers, benefit trenches and numerous expressway structures like in trams and culverts.

Applications of Foam Concrete for Trench Reinstatement

The excavations that are done by the service organizations are the fundamental purpose for the weakening of the street asphalts. At the point when there is a settlement of the inlay, there is harm to the surfacing of the asphalt, with age. Consistent Patching must be done to clear this issue. The foamed concrete is a decent arrangement, as it carries on as a superior inlaying system. It picks up the accompanying properties:

- The foamed concrete does not settle once put (in harm area)
- It does not require any compaction (specifically bond with BC soil concrete mix)
- No transmission of pivot burdens to the administrations in the trench
- The material is promptly accessible (Crystal based steel structure and rectangular steel structure utilizing for support)
- Easy Excavation are allowed
- No requirement for skilled labor or complicated equipment

VII.CONCLUSION

A compressive quality around 1N/mm2 is required (by the foamed concrete) to have acceptable compaction of the bituminous surfacing with the foam concrete. It is costly to utilize the traditional concrete mix to meet the reason for raising an old floor. In view of the stature that will be raised, the construction ends up noticeably costly. It is prescribed to lay a layer of foam concrete over the old floor at first. Over this foam concrete floor, the ordinary concrete can be laid. This is observed to be more cost sparing than the regular technique. In light of the thickness, the foam concrete of various densities is utilized.

The property of volumetric changes with the difference in climate conditions influences dark cotton to soil unsafe to the establishment of buildings. BC Soil chose from Peelamedu, Tamilnadu, India. It has an awesome affinity to water in chose territory.This inclination of soil is by virtue of the nearness of fine mud particles. The cracks accordingly shaped are now and then 15 to 20 cm wide and 2.5 to 4 m profound. Chosen investigate region have all sort of various climate condition.

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