

A Review Paper on Stability of Soil Block using Bitumen Emulsion

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Abstract

Soil is used sub base and base material, If strength of soil is poor, then stabilization is normally needed. Subgrade is sometimes stabilized or replaced with stronger soil. Soil could be black cotton or as fly ash which could fly in contact with air. There are numerous stabilizers used for stabilizing the soil such as lime, cement, bitumen, fly ash etc., in this paper bitumen as stabilizer. Bitumen emulsion is costly material in road construction. So it's amount play crucial part to stabilize the soil. It increases the stability of soil mechanically. It does not react with soil. It is just fill the pores of soil.

Keywords: Black cotton soil, Fly ash, Bitumen emulsion, pores, Stabilizer

1. INTRODUCTION

The prime objective of soil stabilization is to improve the California Bearing Ratio of in-situ soils by 4 to 6 times. The other prime objective of soil stabilization is to improve on-site materials to create a solid and strong sub-base and base courses. In certain regions of the world, typically developing countries and now more frequently in developed countries, soil stabilization is being used to construct the entire road.

The soil in subgrade is normally stressed to certain minimum level of stresses due to the traffic loads. Subgrade soil should be of good quality and appropriately compacted so as to utilize its full strength to withstand the stresses due to traffic loads for a particular pavement. This leads the economic condition for overall pavement thickness. On the other hand the subgrade soil

is characterized for its strength for the purpose of design of any pavement.

Improvement of soil engineering properties is referred to soil stabilization. There are two primary methods of soil stabilization. One is mechanical method and the other one is chemical or additive methods. Soil is a gathering or store of earth material, determined regularly from the breakdown of rocks or rot of undergrowth that could be uncovered promptly with force supplies in the field or disintegrated by delicate reflex means in the lab. The supporting soil beneath pavement and its exceptional under course is called sub grade soil. Without interruption soil underneath the pavement is called regular sub grade. Compacted sub grade is the soil compacted by inhibited development of distinctive sorts of substantial compactors.

Presently every road construction project will use one or both of these stabilization strategies. The most well-known type of mechanical soil stabilization is compaction of the soil, while the addition of cement, lime, bituminous or alternate executors is alluded to as a synthetic or added substance strategy for stabilization of soil. American Association of State Highway and Transportation Officials (AASHTO) classification system is a soil classification system specially designed for the construction of roads and highways used by transportation engineers. The system uses the grain-size distribution and Atterberg limits, such as Liquid Limits and Plasticity Index to classify the soil properties. There are different types of additives available. Not all additives work for all soil types. Generally, an additive may be used to act as a binder, after the effect of moisture, increase the soil density. Following are some most widely used additives: Portland cement, Quicklime or Hydrated

Lime, Fly Ash, Calcium Chloride, Bitumen etc. But, mechanical soil stabilization alludes to either compaction or the introduction of sinewy and other non-biodegradable reinforcement of soil. This practice does not oblige compound change of the soil and it is regular to utilize both mechanical and concoction intends to attain detailed stabilization. There are a few routines used to accomplish mechanical stabilization like compaction, combining, soil reinforcement, expansion of graded aggregate materials and mechanical remediation.

2. LITRATURE REVIEW

Michael (1993)¹ had proposed about Bench-Scale Evaluation of Asphalt Emulsion Stabilization of Contaminated Soils. In this study, it was discussed about the application are discussed to the environmental fixation of soils contaminated by organic contaminants.

Razouki et al. (2002)² gives an experimental study on Granular Stabilized Roads. Bitumen was used as a stabilizing agent act as a binder or as a water-proofing material. Soil-bitumen systems had found the greatest used in road bases and surfaces.

Cokca et al.(2003)³ concentrated on the impacts of compaction dampness content on the shear quality of an unsaturated mud. The impacts of compaction dampness substance and soaking on the unsaturated shear quality parameters of mud were investigated. Experiments were carried out on specimens compacted at optimum dampness content, on the dry side of optimum and on the wet side. It was found that edge of erosion reductions quickly with increasing dampness substance, the union segment of shear quality attained its top worth at around optimum Moisture substance and afterward diminishes.

A. P. Chritz (2006)⁴ Proposed about performance evaluation of mixed in place bituminous stabilized shoulder gravel. Here it was showed an economical maintenance of gravel shoulders, a very common problem is facing by highway agencies.

Hussain (2008)⁵ carried out an excellent work to establish the correlation between CBR value and undrained shear strength value from Vane Shear Test. It was shown that un-drained shear strength value and CBR value increased with increasing plasticity index. Finally it was achieved that shear strength and CBR value is inversely proportional to the water content of that material.

Martinet al. (2009)⁶ developed a paper deals with foam bitumen stabilization. Foamed bitumen is a mixture of bitumen, air and water. Here 2 percent of cement and 3.5 percent of bitumen foam was used. From here it has been found that Rehabilitation using foamed bitumen had proved to be successful because of its ease and speed of construction, its compatibility with a wide range of aggregate types and its relative immunity to the effects of weather.

Chinkulkijniwat and Man-Koksung (2010)⁷ directed a test research on compaction aspects of nongravel and gravelly Soils using a little compaction device. The standard delegate test has been broadly utilized and acknowledged for characterizing soil similarity for field compaction control. Here additionally indicates about the influence of gravel size and gravel content on standard delegate test results. In this study a relationship developed between the summed up optimum water substance of the fine division in the gravelly soil and the gravel

content in standard molds using compaction results from the proposed little device.

Yuehuan et al. (2010)⁸ worked on foamed bitumen stabilization for Western Australian pavements. Currently, the popularity of soil cement stabilization had been challenged by a new innovative soil improvement technique, known as foamed bitumen stabilization. Very few of work have been done on it and application of this type of stabilization is currently applied in flexible pavement subgrade stabilization. Numerous Australian roadway and way offices have committed noteworthy investigation and stores to investigate this system so as to attain a more adaptable and weakness safe balanced out material suitable for an extensive variety of pavement conditions. Percent of froth bitumen utilized as 3 to 5 percent. It was one kind of mix design however here after the mix design process stabilization done and CBR quality tried.

L. Lauren (2011)⁹ performed an experimental take a shot at soil stabilization products like the polymer emulsion for having all the earmarks of being the stabilization executors for what's to come. Every one of the three polymer-emulsions was utilized as a part of this testing project performed eminently making solid examples that all gave suitable CBR qualities to ways. The CBR test was utilized for this venture on the grounds that it has been effectively related with quality capability of the subgrade, subbase, and base course material for utilization in street and runway development.

Paul et al. (2011)¹⁰ suggested an introduction to soil stabilization in pavement taking a mixture of bitumen

and well-graded gravel or crushed aggregate. After compaction it gave an exceedingly steady waterproof mass of subbase or base course quality. The fundamental system involved in asphalt stabilization of fine-grained soils is a waterproofing wonder. Soil particles or soil agglomerates were covered with asphalt that forestalls or abates the entrance of water which could regularly bring about abatement in soil quality. What's more, asphalt stabilization can enhance durability qualities by making the soil impervious to the unfavorable impacts of water, for example, volume. In non-iron materials, for example, sands and gravel, pounded gravel, and smashed stone, two fundamental systems are dynamic: waterproofing and adhesion. The asphalt coating on the union less materials gives a film which anticipates or hinders the entrance of water; subsequently reducing the inclination of the material to lose quality in the vicinity of water. The second instrument had been distinguished as adhesion and characteristics of gravelly soils.

Jones et al. (2012)¹¹ Performed an experimental study on bitumen soil stabilization. Here asphalt emulsion is a mix of asphalt binder, water, and emulsifying agent. In this case, a series of Indirect Tensile Strength (ITS), Unconfined Compressive Strength (UCS) and Marshal Tests were carried out. It is liquid at ambient temperature to facilitate handling at lower application temperatures. It accelerates breaking of the emulsion and for additional early strength to accommodate traffic during curing of the layer.

Marandi and Safapour (2012)¹² worked on base course modification through stabilization using

cement & bitumen. The main objective of this research was to analyze the use of bitumen emulsion in base course stabilization. So that it was examined as replacement with conventional pavement in regions with low quality materials. Stabilization of soils and aggregates with bitumen shows it differs greatly from cement stabilization.

Nikraz (2012)¹³ worked on Bitumen-cement Stabilized Layer in Pavement Construction Using Indirect Tensile Strength (ITS) Method. In this study, the goal was to mix and blend Portland concrete and bitumen emulsion with soil for upgrading the quality, strength and durability of the dirt.

3. DISCUSSION

Subgrade may be defined as a compacted soil layer, generally of naturally occurring local soil, assumed to be 300 mm in thickness, just below of the pavement crust. It provides a suitable foundation for the pavement. So it is very important to improve strength of subgrade soil, it may be by replacing good soil or by stabilization of existing soil. To check the subgrade soil stability CBR test is very commonly used test.

4. CONCLUSION

From this study it is clear that there is a considerable improvement in California Bearing Ratio (CBR) of subgrade due to use of MS bitumen emulsion if proper mixing is done. It is seen that it best results are obtained if the soil emulsion mix is left for about five and half hours after mixing. In each state of condition it was found that CBR value has increased consecutively from Case A to Case D. In this particular experimental study CBR value has increased up to fifty percent of the

unmodified soil CBR. Observing its economic cost and quality of stabilization improvement, it is clear that this type of stabilization may be applicable in gravel soil. As we increase the amount of emulsion CBR value of soil is increases. But the cost of emulsion is so high so the amount of emulsion also depends upon budget and importance of structure.

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