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A Review on the Various Properties of the Gravely Soil by Adding Bitumen Emulsion as Stabilizing Agent

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***Abstract:** In this research the excessive elastic deflections that would result in fatigue cracking within the layer or in overlying layers and to Preventive measure for excessive permanent deformation through densification is studied. The main objectives of the Research Work is to study the properties of the gravely soil by adding bitumen emulsion as stabilizing agent and to find the California Bearing Ratio value of soil subgrade. to optimize the strength of soil and its dry density properties.*

I. INTRODUCTION

Any earth-based structure depends on the elements of its foundation. For that reason, soil is the most critical factor influencing the success of construction work. Soil is the first component of a foundation or one of the immature materials used in the entire construction process. So the main thing related to us is soil stability is not an object but a process of increasing the CBR capacity of the soil for a given construction purpose. So much work has been done on cement, lime or fly ash ash. But very little work has been done to strengthen the soil tar. The bitumen emulsion is used as a chemical stabilizer. Cement is used here as a bond to improve road strength. Previously a lot of work was done to strengthen the asphalt in the sand and to strengthen the asphalt in the sandy soil in various places. This research is inspired by that research. Dust red clay is used here, as it is found in many provinces of India. Other similar functions, performed earlier, are discussed below.

Kota prudhvi teja et al (2015) directed the development of muddy soils as a substrate by stabilizing with bituminous emulsion. The first part of the investigation was to determine the subdivision of the selected soil according to the USCS (Unified soil classification system) by conducting the Atterberg boundary survey, after the soil was sorted by screen filtering was done to determine the Coarse and Fine part of the soil to determine whether the soil was properly prepared. The second part of the study was to identify the specific gravity of the earth to help determine the dryness of the soil, using a modified proctor test of maximum density dry density (MDD) of soil completed with a different concentration of water and a larger amount. humidity is determined by setting a graph between the amount of dryness and the humidity. The last part of the investigation was to disclose General changes, body structures and ground machinery. The second and third trimesters found that the visible and mechanical properties of stable soils were improved according to CBR and Maximum dry density. In the final investigation associated with different emulsion concentrations and combinations, the internal shear angle and three Atterberg boundary boundaries increase.

Habiba Afrin (2017) stated Different Types of Land Reform. The main purpose of this study is to review the physical and chemical properties of different soils types of stabilization methods. Stability and its impact on the soil reflects the reaction of the ingredients, the effect on their strength, enhances and retains soil moisture and the proposal of construction systems. Soil consolidation can be done in many ways. All of these methods fall into two broad categories namely mechanical stability and chemical stabilization. As technology advances and economic conditions change, more and more chemical agents will be introduced at lower levels to improve their combined efficiency, durability, and strength. At the same time, further performance-based testing will be required to confirm the effectiveness of these stabilization agents. In addition, there are chemicals used today in the petrochemical industry whose use in the soil has not been tested. Another area of study is procedures such as injections and spraying techniques to find a cost-effective treatment. Global climate change may affect the resilience and the use of stabilizers.

N. Vijay Kumar et al (2017) studied the strength of Laterite soils using bitumen emulsion and ESP, CSA. In this research study, an admixture bitumen emulsion was added to 5%, 10%, & 15%. Similarly egg shell powder and coconut shell ash are also added in equal proportions. The initial strength of the Laterite soil is determined by various tests such as Sieve Analysis, Plastic Limit, Liquid Limit, Specific Gravity, Compaction, Unconfined Compression, California Bearing Ratio and Direct Shear testing. Similar tests have been performed with Laterite soil mixed with bitumen emulsion and Laterite soil mixed with egg shell powder and coconut

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shell ash. The results obtained were then compared with the original Latite soil and the Laterite soil mixed with compounds. This study conducted a complete soil performance test on the performance of the bitumen emulsion. The characteristics of the soil sample are known by the experiments performed and the same tests are performed for the soil sample mixed with three different concentrations of bitumen emulsion.

Maheshwari G. Bisanal et al (2015) stated The Stabilization of the Earth by Using Marine Shell and Bitumen Emulsion. In this study an attempt was made to stabilize the soil of black cotton with sea shell and bitumen emulsion. Soil consolidation is a method intended to increase or maintain the stability of the soil weight and the chemical modification of the soil to improve their Engineering Buildings. These curiosity led to our decision the key effects of the proposed combination of work are described in this paper. Stabilization can be used to treat a variety of low-level conditions from expanded to granular. This allows for the establishment of a design process and the determination of the appropriate level of chemical additives and compounds that will be used to achieve the required engineering properties. The benefits of the stabilization process can include high resistance rates, plastic reduction, low accessibility, reduced road stiffness, eliminating the transport of excavation material or handling. Extensive compaction of compacted soil controls the ability of the soil to change volume, and improves soil strength.

M.Udaya Sri et al (2016) studied Laterite Soil Stabilization Using Bitumen Emulsion. The main purpose of this experimental study was to improve the properties of the Laterite soil by adding a bitumen emulsion. An effort has been made to use bitumen emulsion to improve the strength of the Laterite soil produced in terms of the California Bearing Ratio (CBR) values that may appear to be economical. In this study, all laboratory work revolves around basic soil characteristics and energy according to CBR. Litt le Fly ash was added to enhance the earth's energy. It is noteworthy that excellent soil strength results from the use of cationic bitumen emulsion (CMS) with a small amount of fly ash used as a filler. Appropriate conditions for mixing Laterite soil with CMS Bitumen emulsion have been tried for the first time. This is followed by determining the four specific properties of the material to indicate the difference in dry density and CBR value in order to achieve the best possible strength characteristics of the Laterite soil.

Vishal Kumar Pal (2015) directed the use of bitumen emulsion in the construction of a stone road. In this study, the properties of stable soils are discussed by adding a bitumen emulsion. In this study, all laboratory work revolves around basic soil characteristics and energy according to CBR. A thin layer of cement has been applied to provide better strength to the soil. It is noteworthy that excellent soil strength results have been obtained using cationic bitumen emulsion (CMS) with a small amount of cement used as a filler. Proper conditions for mixing desert soil with bitumen emulsion for CMS are being tested for the first time. This is followed by determining the four material conditions to indicate the difference in dry density and CBR value in order to achieve the best strength characteristics of the rock soil. According to this research study, the California Bearing Ratio rate has improved to 40% to 50% in relation to CBR standard ground. It helps to reduce economic costs and improve land reform.

Olugbenga The City Amu et al (2014) studied The Need for Sustainability and Strength of Lime in Other Samples of the Lateritic World As a Pavement. In this work, soil samples A, B, and C were collected at the dam site and stabilized by 0, 2, 4, 6, 8, and 10% lime was tested for the first time (natural moisture, gravity, particle size). Atterberg limitations and limitations) and power tests (compaction, California bearing ratio (CBR), unstoppable pressure and non-triaxial concentrations). The results of the initial test divided the samples as good building materials from the worst ones. The suitability of samples A, B and C was improved with lime stability at 8, 6, and 6% respectively.

Simarpreet Singh Batra et al (2016) studied the effect of cationic bitumen emulsion on shear strength limits in soil. Many efforts have been made by many historians to increase soil strength in various ways including limestone, cement, etc. Recent research has been done using non-traditional materials such as Bitumen Emulsions etc. developing soil structures. . Bitumen Emulsion is usually a dispersions of minute drops of bitumen in water i.e. oil in water emulsions and is used to improve the combined strength of granular, low bonds, low plastic materials. They can also improve the integrity of road foundation, substrate or sub-grade materials by resisting water damage. In this paper, Direct Shear testing is performed on soils with varying amounts of Cationic Bitumen Emulsion (0%, 2%, 5%, 6% and 7%) to study the effect on Shear Strength parameters of the soil. The maximum cutting strength is observed in 6% of Bitumen Emulsion from laboratory tests performed on soil. which means about 65% of the shear strength is increased by increasing the Angle of Internal Friction but reducing the cohesiveness of the soil without Emulsion.

Michael (1993) proposed a Bench-Scale Evaluation of Asphalt Emulsion Stabilization of Contaminated Soils. In this study, it was discussed about the use of heat transfer technology for asphalt emulsion stabilization and discussed the natural remediation of soil contaminated with organic pollutants.

Razouki et al. (2002) proposes experimental research on Granular Stabilized roads. Bitumen was used as a stabilizing agent, which could also serve as a binding or waterproofing agent. Ground beam systems have found the greatest use in road infrastructure and beyond.

Cokca et al. (2003) focuses on the effects of congested moisture content on the shear quality of incomplete mud. In this study, the effects of dense humidity and water immersion on unbalanced shear quality standards were investigated. Tests were performed on specimens covered in high humidity, on the dry side of the optimum and on the wet side. It has been found that the limit of erosion erosion is rapidly increasing with increasing humidity, part of the shearing quality union has reached its maximum value in the area around high humidity and decreased later.

A.P. Chritz (2006) discussed 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) did an excellent work to establish the correlation between CBR value and un- drained 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) 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) conducted a study examining the cohesive properties of non-gravel and Dust soils using a small mixing machine. General messenger inspections were widely used and recommended to show soil similarity in controlling field density. Here in addition it shows about the impact of stone size and the content of the gravel in the standard test results of the messenger. In this study the relationship was improved between the concentration of large amounts of water separately in the dusty soil and the content of the stone in normal skins using the compression results from the proposed small object.

L. Lauren (2011) has experimented with taking a shotgun at soil-based stabilizer products such as polymer emulsion by having all the characteristics of being a stabilizer for the future. All three polymer emulsions were used as part of this outstanding experimental project making solid examples that provided the necessary CBR properties along the way. The CBR test was used for this business on the grounds that it was effectively associated with subgrade quality skills, sub-base, and basic subject materials for use in road and aviation development.

Paul et al. (2011) suggested an introduction to soil consolidation in a paved area with a mixture of bitumen and well-laid stone or crushed compound. After assembly it provides a stable waterproofing subbase or quality for basic subjects. The basic system involved in stabilizing fine-grained asphalt is a miracle of waterproofing. Soil particles or soil agglomerates were covered with tar that prevents or reduces the ingress of water that could cause permanent soil erosion. In addition, the reinforcement of the tarmac can improve the strength of the tiles by making the soil less resistant to adverse effects of water, for example, volume. In non-metallic materials, for example, sand and stone, crushed stone, and crushed stone, two basic systems are powerful: waterproofing and adhesive. Asphalt adhesive union small objects provide a film that anticipates or prevents water ingress; thereafter it reduces the tendency of the material to loss of quality in the vicinity of the water. The second tool has been classified as adhesive and desert soil features.

Nikraz (2012) has worked on a Solid Cement Layer for Pavement Construction Using the Indirect Solid Strength (ITS) Method. In this study, the aim was to mix and mix Portland cement and bitumen emulsion with soil to improve the quality, strength and durability of the impurities.

In order to improve the quality of the soil and to reduce its vulnerability to water logging, soil consolidation is compulsory. In line with this, it has been improved loads of loads are added to the tarmac formation by having a bond effect that really supports the durability and effects of the Bitumen emulsion which improves the flexibility and penetration of the prepared layer.

Jones et al. (2012) conducted a study examining soil compaction of bitumen. Here the asphalt emulsion is a mixture of asphalt binder, water, and emulsifying agent. In this case, a series of Indirect Tensile Strength (ITS), Infinite Pressure Strength (UCS) and Marshal tests were performed.

It is a liquid at ambient temperature to make it easier to manage at low operating temperatures. It speeds up the breaking of the emulsion and the pre-applied strength to meet the traffic during the layer treatment.

Marandi and Safapour (2012) worked on transforming the Base Course with Authentication using cement and bitumen. The main objective of this study was to analyze the use of bitumen emulsion in reinforcing basic studies.

So much so that it has been tested as a substitute for standard paved roads in low-quality areas. The reinforcement of soils and tar piles shows that it is very different from cement stabilization. The basic method involved in strengthening the asphalt was waterproofing.

II. CONCLUSIONS

1) The To study the effect of addition of bitumen emulsion in soil on MDD and OMC relationship different percentages of bitumen emulsion is added and adjusted.
2) The addition of bitumen emulsion upto 8% may gives the satisfactory results
3) The soaked CBR values of soil samples increases considerably with addition of bitumen emulsion as compared to the normal soil.
4) The stabilization of gravel soil with bitumen emulsion gives better strength to subgrade soil in pavement design.

REFERENCES

[1] KOTA PRUDHVI TEJA, “Improvement of silty soil as subgrade material by stabilizing with bituminous emulsion”, International J. of Engg. Research & Indu. Appls. ISSN 0974-1518, Vol.8, No. III (August 2015), pp.81-95.
[2] Habiba Afrin, “A Review on Different Types Soil Stabilization Techniques”, International Journal of Transportation Engineering and Technology, http://www.sciencepublishinggroup.com j/ijtet.
[3] Perloff. W. H. (1976), "Soil Mechanics, Principals and Application", New York: John Wily, & Sons.
[4] Janathan Q. Addo, Sanders, T. G. & Chenard, M. (2004), Road dust suppression: "Effect on unpaved Road Stabilization".
[5] Chen, F. H. (1981), "Foundation on Expansive soil", Amsterdam: Elsevier Scientific Publishing Company.
[6] DAMAGE TO FOUNDATIONS FROM EXPANSIVE SOILS, J. David Rogers, Robert Olshansky, and Robert B. Rogers.
[7] Sherwood, P. (1993). Soil stabilization with cement and lime. State of the Art Review. London: Transport Research Laboratory, HMSO.
[8] Pousette, K., Macsik, J. and Jacobsson, A. (1999). Peat Soil Samples Stabilized in Laboratory-Experiences from Manufacturing and Testing. Proceeding of Dry Mix Methods for Deep Stabilization (pp. 85-92). Stockholm: Balkema, Rotterdam.
[9] Alayaki, F. M., Bajomo, O. S. (2011), Effect of Moisture Variation on the Strength Characteristics of Laterite soil. Proceedings of the Environmental Management Conference, Federal University of Agriculture, Abeokuta, Nigeria.
[10] AASHTO (1086). Guide for Design of pavement structures Washington D.C: American Association of State Highway and Transportation Officials (AASTO)
[11] Dr. S.K Khana, Dr. C.E.G. Justo, Dr. A. Veeraragavan tenth edition (2015) Highway engineering Hodgkinson., A.T. Visser (2004), University of Pretoria and Concor Roads (Pty) Ltd, The role of fillers and cementitious binders when recycling with foamed bitumen or bitumen emulsion.
[12] Consoli, N. C., Prietto, P. D. M., Carroro, J. A. H., and Heineck, K. S.(2001). “Behavior of compacted soil-fly ash- carbide lime mixture.”J. Geotech. Geoenviron. Eng., 127(9), 774–782.
[13] D. Jones., A. Rahim., S. Saadeh., and J.T. Harvey (2012), Guide lines for the Stabilization of Subgrade Soils In California, Guideline: UCPRC-GL-2010-01
[14] Gregory Paul Makusa. (2012), Department of Civil, Environmental and Natural resources engineering, Luleå University of Technology, Sweden.
[15] Jaleel,Z.T.(2011), Effect of Soaking on the CBR-Value of Subbase Soil. Eng. and Tech. journal, vol.29.
[16] Mouratidis A.(2004), Stabilization of pavements with fly- ash, Proceedings of the Conference on Use of industrial by- products in road construction, Thessaloniki, 47-57.
[17] Nugroho,S.A., Hendri,A., Ningsih,S.R.(2012), Correlation between index properties and california bearing ratio test of pekanbaru soils with and without soaked. Canadian Journalon Environmental, Construction and Civil Engineering Vol. 3, Indonesia.
[18] Punmia B.C., Jain A.K, Jain A.K (2004), Soil Mechanics and Foundation, Laxmi Publications, New Delhi 16th edition.
[19] Tom V. Mathew, (2009), Entitled “Pavement materials: Soil Lecture notes in Transportation Systems Engineering”
[20] Sarika B. Dhule., S.S. Valunjkar., S.D. Sarkate., S.S. Korrane (2011),Improvement of Flexible Pavement With Use of Geogrid, volume 16

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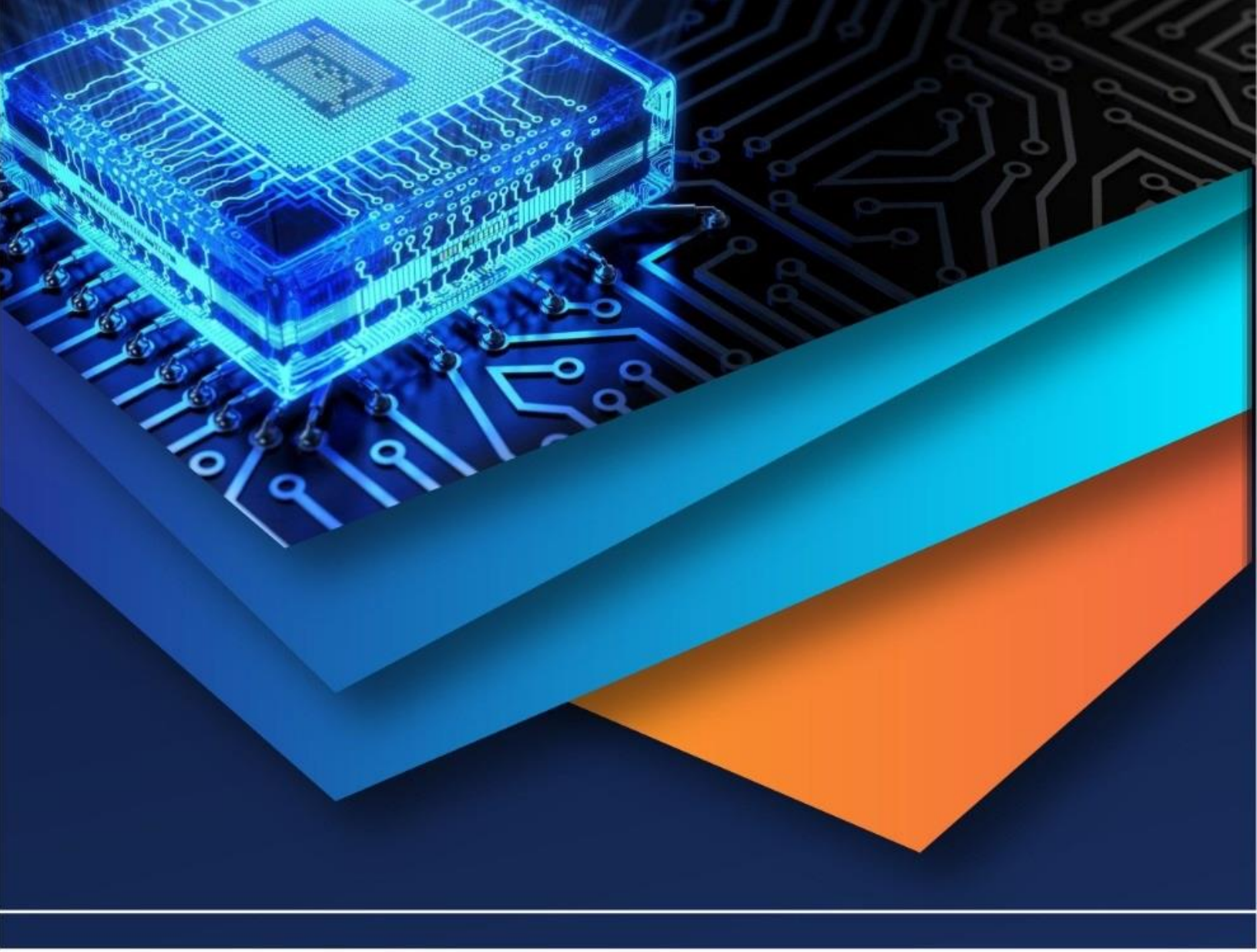

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