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AN EXPERIMENTAL INVESTIGATION ON USE OF BITUMEN EMULSION IN THE CONSTRUCTION OF GRAVEL ROAD

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ABSTRACT

The base soil is one of the nature's most common construction materials. Almost all types of construction are built with or upon the soil since centuries till today. The most important and effective part of a road pavement is sub grade soil, its strength and stability. If strength of soil is poor, then stabilization is normally needed. Sub grade is sometimes stabilized or replaced with stronger soil material so as to improve the strength. Such stabilization is also suitable when the available subgrade is made up of weak soil and hence has poor stability. Increase in the sub grade soil, strength may lead to economy in the structural thicknesses of a pavement. The most commonly used materials for soil stabilization are Cement, fly ash, lime, fibers, polymers etc.

In the present study, an attempt has been made to improve the properties of the gravel soil by adding bitumen emulsion. An attempt has been made to use the emulsion for improving the strength of gravel soil expressed in terms of CBR values which may prove to be economical and give better results. In this study, the whole laboratory work revolves around the basic properties of soil and its strength in terms of CBR. A little cement added to provide better soil strength. It is observed that excellent soil strength results have been achieved by using cationic bitumen emulsion (CMS) with little quantity of cement used as filler. The appropriate mixing conditions for gravelly soil with CMS bitumen emulsion are being first attempted. This is followed by deciding four particular material conditions to show the variation in dry density and CBR value to achieve the best possible strength properties of gravel soil.

Keywords: *Bitumen, CBR, Gravel, Pavement, etc.*

I. INTRODUCTION

A gravel road is defined as the unpaved road that is provided with gravel surface which has been taken from the river basin site or the watercourse bed. These roads are ordinary roads in the nations which are in less developed stage, and also in the rural areas of developed nations such as Canada and the United States in New Zealand, they may be known as 'un metal roads'. They might be mentioned to as 'dirt roads' in common term, but particular term is used more for half constructed roads where no surface material is added to them. If fully constructed and sustained, a gravel road is considered as an all-weather road.

As we know that the soil is amongst the most generally used materials in construction industry present in nature. Fundamentally all the constructions are supported by the soil. Extensive age routine of the roadway constructions is overall influenced by the toughness of the sub grade soil. The sub grades used on site commonly

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do not offer the provision needed to attain satisfactory routine in the effects of traffic loads among rise in conservational stresses.

However the soil stabilization is the distinguished choice in favor of refining material goods of soil so far the material goods calculated by stabilization change approximately due to fluctuation in soil formation, difference in grain size structure between soils, fluctuation of geologic supplies, and due to this the chemical difference in the mixture relations between the soil and stabilizers used. The defined properties necessitate the site-specific action substitutes and that essentially be accepted over analysis of soil-stabilizer mixtures of soil.

In case of elastic or non elastic pavement, both starts from the base or bank of soil, and usually known as sub grade. The sub grade soil may be defined as a deposit of compacted earth, usually the local soil just beneath the crust of the pavement that provides appropriate base to the roadway. The sub grade is typically stressed out to assured smallest of stresses stage developed with the traffic loads. The sub grade soil must be of better quality and suitably compressed in order to apply its strength fully to resist the stresses developed by the traffic loads for a specific pavement. This proves to be economical for complete thickness of the pavement. Instead the sub grade soil is distinguished by its strength and stability intended for the principle of design of the pavements.

The advancement of the engineering properties of soil is stated to the soil stabilization. And we have two principal approaches for the soil stabilization. First the machine-driven technique and the other is the addition if chemicals or stabilizer techniques. The soil is an assembly or buildup of earth material naturally, firm usually from the disintegration of rocks or deterioration of the undergrowth that might be exposed rapidly with strength materials in the ground either degenerated due to gentle reaction resources in the laboratory. The supportive soil below the pavement is excellent situated just below the base course are termed as soil sub grade. Deprived of disruption top soil beneath the roadway is termed as consistent sub grade. Compressed sub grade, the compacted soil through reserved growth for the characteristic classes of considerable compactors are used.

II. OUTLINE OF THE STUDY

The Indian Road Congress (IRC) transforms an exact framework approach of the pavement layers founded upon the sub grade class. Sub grade class is usually transferred to CBR values calculated within percentage. Therefore, the roadway and the sub grade collected essentially resist the activity size.

In this study locally available well graded soil is available as testing substantial. The medium setting emulsion is to be employed as stabilizing mediator in this definite revision. Bitumen soil stabilization is the active procedure because bitumen provides soil power along with increases confrontation capability together with water and frost action. The bitumen is an actual agent used for the soil stabilization and hence it is much overpriced. Presently we do not have specific principally subsequent procedures for the soil bitumen stabilization as well as no code is there for bitumen soil stabilization in regular Indian Standard. The particular revision deals with individual certain tests like Standard proctor test (SPT), California bearing ratio (CBR) test, the principal motive is on the way to increase the potency of soil and to develop dry density properties. Here, in this revision effort is being made to exploit the solidity of soil.

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III. NEED OF THE STUDY

There are various aims for raise the level of aggregate surfaced roads in this routine, moderately than remaining to preserve the roads in the traditional routine.

The benefit of stabilizing the top several inches has the following benefits:

- Diminishes or rejects dust.
- Approves leveled driving surface for the users
- Diminishes or disregards the gravel loss.
- Delivers well dragging surface for the vehicles.
- There will be no loss of aggregate on road surface.
- Ability to reparation of smaller defects of pavement.
- Extensively cheap technique for refining of durability, appearance, and repetitive abilities of the pavement.

The required design of construction and potential right-of-way expenditures to raise unpaved roadways might be unreasonable, and would not be an efficient use of highway funds.

And the study emphases on the thickness of the stabilized layer and on measurable properties for design and construction, using principal methods of defining roadway ratings of load, and do not highlight the longstanding fatigue features of the materials.

IV. OBJECTIVES OF THE STUDY

The chief objective ofthe revisionis:

- Firstly to develop thefeatures ofwell graded soilwith addition of emulsified bitumen as an additiveand cementas per binder.
- Secondly to make use of bitumen emulsion in favor of filtering the potency and geotechnical properties of well graded soil.
- To maximizethe value ofCBR, scoring a number ofconditionsto increase theCBRvalue of thebottom surface.

V. RESEARCH METHODOLOGY

Various material resources and approaches are the benchmarks to some class of investigational studies. In the direction of differentiate the substantial properties of soil following laboratory tests are performed like specific gravity, plastic limit, liquid limit test and particle size distribution test by sieve analysis. Subsequently the substantial measure is to select the intercourse method and the circumstances or miscellaneous environments for leading the following tests. In the direction of defining the greatest dry density of the substance standard proctor test is being directed. However the definite objective is to raise the strength. So California Bearing Ratio experiments are directed within diverse environment and circumstances and to formulate a relative investigational study. Consequently the approach is how to attain superlative bearing capability or exploit the California Bearing Ratio value. Here, in the succeeding page various approach measures is shown in the flow diagram arrangement.

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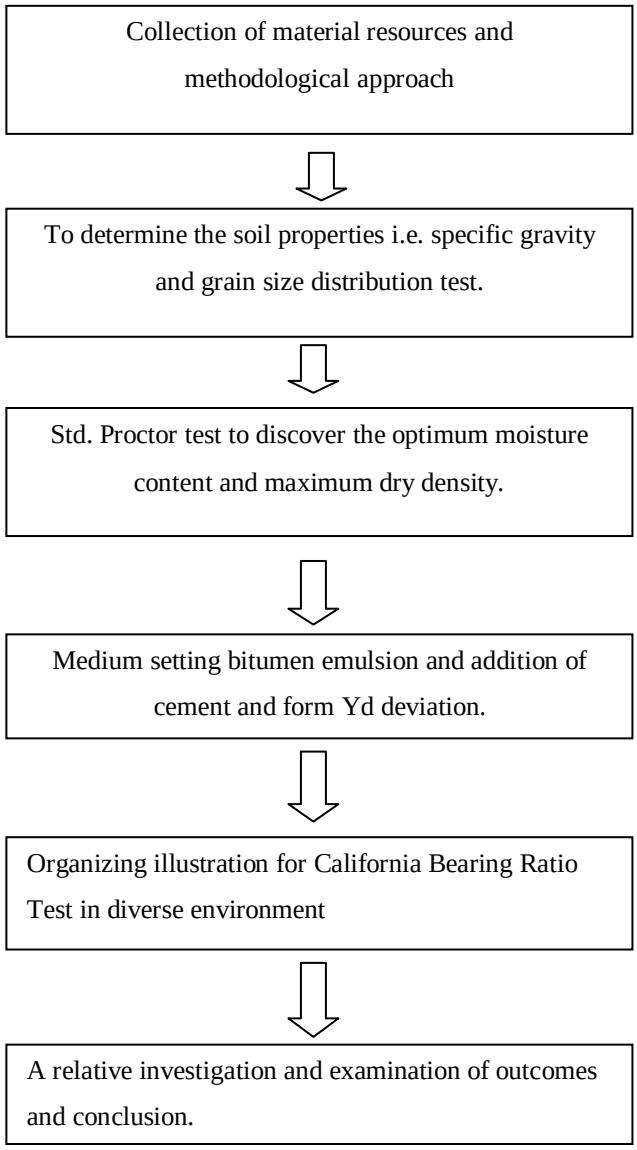

Methodology Flow chart

VI. CONCLUSION

According to the transportation engineering, the sub grade is defined as the indigenous or natural material below the constructed highway, pavement or railway track. Moreover it is too known as structure rank. It is assumed that the thickness of the sub grade is 300 mm.

Sub grades are generally compacted before the construction of a road, pavement or railway track and at times stabilized by the addition of lime, asphalt, Portland cement and other modifiers available in the market. The sub grade is the groundwork of the pavement structure at which the sub base is laid.

The load bearing strength or capacity of sub grade is determined by California Bearing Ratio (CBR) test and other methods.

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VII. FUTURE SCOPE

From the present study we conclude that CBR value of different soils can be improved.

In laboratory, need to perform tests using those materials and check the effects on soil properties. The use of bitumen emulsion for chemically soil stabilization in India requires many investigation studies in the future including classification and identification of the different soil types. Various studies would be required to evaluate the use of bitumen emulsion to treat and stabilize different soil types and to establish Indian guidelines and standard specifications for the bitumen emulsion stabilization process.

VIII. SUMMARY

Commencing that after this study, it is obvious that sizeable improvements in CBR values of sub grade are made after the addition of bitumen emulsion when integration is carried out properly. It is observed that greatest outcomes are achieved when the soil asphalt mix is left for few hours after blending process. At all the situations, it was achieved that the CBR values has improved repeatedly from case 1 to case 3. According to this investigational learning, the California Bearing Ratio rate has improved to 40 % to 50 % with respect to the standard soil CBR. It is helpful in reducing the economic cost and to make the improvements in the soil stabilization quality. Moreover particular stabilization possibly will be appropriate for the gravel soil roads and also in the shoulder part of the roads.

References

1. Chauhan(2010),” a laboratory study on effect of test conditions on subgrade strength”. Unpublished B.Tech Thesis, N.I.T Rourkela.
2. Punmia B.C., Jain A.K, Jain A.K (2004), Soil Mechanics and Foundation, Laxmi Publications, New Delhi 16th edition.
3. A. 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.
4. 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
5. Jaleel,Z.T.(2011), Effect of Soaking on the CBR-Value of Subbase Soil. Eng. and Tech. journal, vol.29.
6. Punmia B.C, Soil mechanics and foundation, Lakshmi publications, New Delhi 15th edition.
7. Chauhan 2010, A laboratory study on effects of test conditions on sub grade strength, B.Tech , report study, N.I.T Rourkela.
8. Tom. V. Mathew, Pavement materials, Soil lecture notes in Transportation Engineering.