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A Case Study : KTC-KSEB Road Palakkad

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***Abstract* - Transportation is one of the vital factor that contribute to the economy of the nation and its development. As the construction of new pavement, there is a great need and considerable scope for higher investment to upgrade the existing pavement. This paper is a case study of the road pavement of 1 km length and 7m wide at KTC-KSEB junction, Kanjikode. And it is suggested that the existing poor condition and the problems in the KTC- KSEB pavement can be eliminated by using cement and lime in the subgrade layer of the pavement and proper design.**

I. INTRODUCTION

Transportation by road system is the only mode which could give maximum flexibility of service from origin to destination, to one and all. About 86% of passengers and 62% of goods traffic are moving on the existing roads. Transportation contributes to the economic, industrial, social and cultural development of any country. Especially for a developing industrial area good transportation facilities are necessary. Due to increased magnitude of wheel load, tyre pressure, and traffic load repetitions, the pavement deterioration starts taking place much earlier than the anticipated design life.

The industrial belt of Palakkad is Kanjikode, where the most prominent industries such as BEML, KINFRA, Instrumentation Ltd, FCRI, ITI, Saint Gobain, KOSO etc.. are situated. Therefore heavy loaded vehicles are moving in this area. So the pavement must be of good condition and provide safe and convenient travel facilities to the road users.

II. SCOPE AND OBJECTIVES

In the present study, attempt is made to study the existing road condition at KTC junction to K.S.E.B substation Kanjikode and to study how cement and lime may be effectively utilized in combination with the soil to get an improved soil material which may be used in various soil structures. Soil collected from the site has been used in this experimental investigation. Following are the objectives of the present work:

1. To study of the existing road condition at KTC junction to K.S.E.B substation Kanjikode.
2. To conduct various tests on subgrade soil with or without additives.
3. To design a new pavement or overlay.

III. SITE INVESTIGATION

Information from local people regarding the present traffic and load condition and problems occurring in the nearby places of proposed road due to poor road condition. Collection of data's such as condition of drainage, width and length of road, details of nearby industries, and topography of the land.

A. Existing road condition

The number of vehicles using the pavement are minimum .But the vehicle loads acting on the pavement are heavy (80 number of vehicles each having unloaded weight more than 3 tonnes and loaded weight of approximately 20 tonnes).The major defects in the proposed road due to distress were potholes, isolated crack area, localized depressions etc.. The presence of these defects cause a total damage to the pavement.

IV. SAMPLE COLLECTION

The samples of soil are collected from 3 different location such as starting point, middle and end point of the road at the depth more than 150mm. The collected samples are packed in a water tight container and transported to the laboratory.

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V. ENGINEERING PROPERTIES OF SOIL

In the following table properties of the soil are given. It is determined by conducting various tests on soil as per IS code procedures.

Table I Properties of soil

Sl No	Properties	Values
1	Natural moisture content	11.11%
2	Specific Gravity (G)	2.67
3	Sieve analysis: Coefficient of curvature Uniformity coefficient	 1.088 4.35
4	Liquid Limit (W_L)	23%
5	Plastic Limit (W_P)	2%
6	Shrinkage Limit (W_S)	44.5%
7	Plasticity Index (I_P)	21%
8	Maximum Dry Density (γ_d)	1.487g/cc
9	Optimum Moisture Content (OMC)	16.20%
10	CBR	1.82 %

As per the results, the maximum dry density of soil sample is low and the CBR value of soil is also very less. Hence we suggest to improve the properties of soil by doing stabilization.

VI. MATERIALS USED FOR STABILIZATION AND PROPERTIES OF MATERIALS

For the stabilization of soil we use cement as the admixture and lime as the additive.

A. Soil

The properties of the soil is given in the table I.

B. Lime

- Source = Sakthi Productions, Kalladikode

C. Cement

- Specific Gravity = 3.1
- Consistency = 30%
- Source = Amma cements, Coimbatore
- Grade = 53

VII. METHOD OF TESTING

The blending operation was carried out manually and care was taken for uniform mixing as per the procedure given in IS: 2720. Laboratory tests are carried out in accordance with the specification of relevant Indian Standards. The properties like moisture-density relation (IS heavy compaction) and CBR are evaluated for the soil blended with varying proportions of cement and lime.
Following table gives various proportions that we are used for the stabilization.

Table II Various proportions of samples

Samples	Symbol used	% of materials used		
		Soil	Cement	Lime
Sample 1	1	100	0	0
Sample 2	2	95	0	5
Sample 3	3	98	0	2
Sample 4	4	93	5	2
Sample 5	5	93	6	1

VIII.RESULT AND ANALYSIS

A. Compaction characteristics

IS heavy compaction tests were carried out on different proportions of cement, lime and soil in accordance with the procedure laid in IS:2720 so as to study their moisture –density relationship. The results of Modified Proctor test conducted on various proportions are shown below.

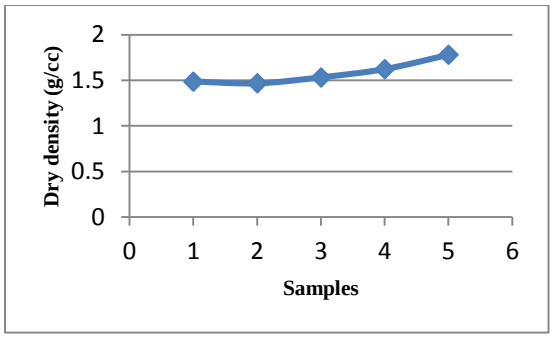

Fig: 1 Samples vs Dry density

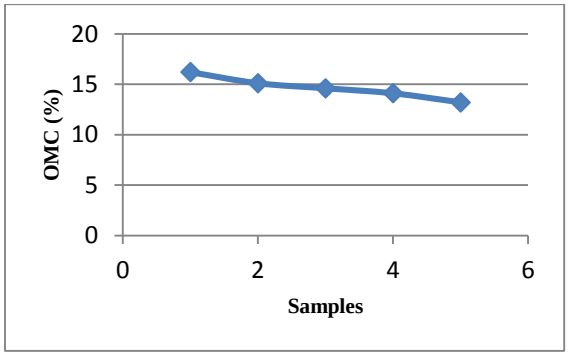

Fig: 2 Samples vs OMC

By comparing, the test results the dry density (1.781g/cc) of the sample 5 is more with an optimum moisture content of 13.14%.The cement react with the soil and the coarse grained particles are cemented and the proportion of fine grained soil cementation is small. Therefore dry density of the sample increases with the decrease in optimum moisture content.

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B. Strength characteristics

California Bearing Ratio (CBR) tests were carried out under soaked conditions on soil mixed with different proportions of cement and lime so as to study their load bearing capacity. The results of California Bearing Test conducted on various proportions are shown in the chart below.

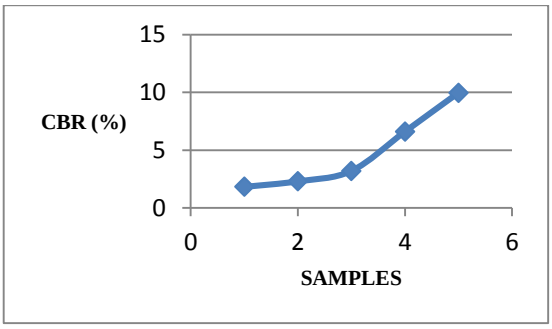

Fig: 3 Samples vs CBR

The CBR values for sample 1 are much less than the sample 5. As admixture is added to the soil, the penetration resistant capacity increases, so we suggest the sample 5 (Soil 93% + Cement 6% + Lime 1%) as the suitable stabilization proportion for the pavement construction.

IX. DESIGN OF FLEXIBLE PAVEMENT

Following table shows the pavement composition of different samples as per IRC: 37-2001

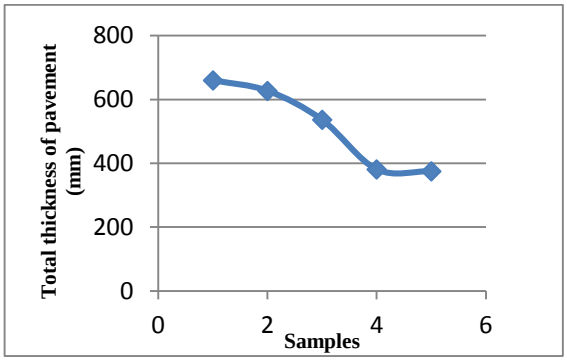

Fig: 4 Samples VS Total thickness

Table III Thickness of pavement for various samples

Samples	Total pavement thickness (mm)	Pavement composition (mm)		
		Wearing course	Granular base	Granular sub-base
S1	660	20 PC	225	435
S2	627	20 PC	225	402
S3	536	20 PC	225	311
S4	381	20 PC	225	156
S5	375	20 PC	225	150

By using admixtures and additives in the soil, the strength of the soil is increased and therefore the thicknesses of the pavement get reduced up to 65.5 % of sub base.

X. COST ANALYSIS

Based on PWD rates cost analysis is done for the pavement construction on soil with stabilization and without stabilization for a length of 1km.The following table gives the construction cost of pavement.

Table IV Cost analysis

Sl No.	Subgrade layer	Total construction cost of the pavement
1	With Stabilization	4215702.50 /-
2	Without Stabilization	4986304.50 /-

By doing stabilization, the construction cost of the pavement is reduced up to 1**5.5%.**

XI. CONCLUSION

Based upon the above study following conclusions can be drawn.

1. The properties of the soil and traffic conditions are the two main factors that are to be thoroughly analyzed while designing a pavement.
2. Strength of soil can be increased to certain extent by using additives in the soil. A total of 5 sample proportions were tested and we suggested sample 5 (soil 93% + cement 6%+ lime 1%) as the suitable proportion for the proposed pavement stabilization.
3. By doing stabilization total pavement construction cost is reduced up to 15.5 %. Even though the savings in cost is less, but the improvement of the strength of the pavement is really considerable.
4. Based on the study conducted it is concluded that The existing poor conditions and the problems in the pavement from KTC junction Kanjikode to K.S.E.B substation can be eliminated by using cement and lime in the subgrade layer of pavement and proper design.

REFERENCES

[1] IRC : 37- 2001, "Guidelines for the design of flexible pavement" (second revision), The Indian Road Congress, New Delhi
[2] IS : 2027- Part 1to 9 , Part 16, Bureau of Indian Standards
[3] KishanKhunt, "Use of additive materials in subgrade for road construction", IJETT – Vol.4 Issue 8,Sep(2013),pp. 3790-3795
[4] Praveen Kumar and ShalendraPratapSingh ,"Reinforced flyash sub base in rural roads", Journal of Indian Road Congress August(2007) , pp. 66-75
[5] Reddy B.B and Veeraragavan.A "Structural performance of inservice flexible pavement", Journal Of Transportation Engineering March/April(1997) ,pp. 156-167
[6] SaravutJaritngam, OpasSomchainuek, and PichaiTaneerananon. "An investigation of lateritic soil cement for sustainable pavement", Indian journal of science and technology Nov (2012) Vol.5 Issue 11, pp.3603-3606
[7] Yogesh Shah, Jain.S.S,Jain M.K , and Tiwari .D, "A Conceptual Approach for Urban Pavement Maintenance Management System" , Indian Highway" Nov(2013),pp.26-40