Design of Flexible Pavement

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***Abstract*- The work examines the possibility for using Soil, Lime powder, Fly ash, Rice husk ash waste as a partial replacement as 5%, 10%, 15% and for its strength up to 7, 14 & 28 days of age and was compared with those conventional material. Leaving the waste material has been emphasized waste can be used more efficiently and the environmental problem. Hence the reuse of waste material has been emphasized waste can be used to produced new product or can be used admixture so that is natural resources are used more efficiently and the environment is protected for waste deposits. This material is fine material obtained as by product of Industrial & Rice mill during sawing and shaping and not recycling its cause's environmental problem in the world.**

***Index terms*- Soil, Lime powder, Fly ash, Rice husk ash, Bituminous, Water**

I.INTRODUCTION

The design of flexible pavement involves the interplay of several variables, such as, the wheel loads, traffic climate, terrain and sub-grade conditions. With a rapid growth of traffic, the pavement is required to design for heavy traffic volume of traffic. For working out design of flexible pavement, IRC brought out guideline based on California Bearing Ratio test.

There is need to design and construct the road with optimize cost, for this; reduction in overall pavement thickness is one of the option available with us. As per IRC: 37:2001, thickness the pavement is directly depend upon CBR of the sub-grade soil. The sub-grade either in cut or fill should be well compacted to utilize its full strength and to economize thereby on the overall thickness of pavement requirement. For design, the sub grade strength is assessed in terms of CBR of the sub grade soil in both fill and cut sections at the most critical moisture conditions likely to occur in-situ. In this project there are using Fly ash, Rice husk ash, Lime powder are referred for stabilization of soil. Soil stabilization broadly refers to any chemical or mechanical treatment given to a mass of soil to improve or maintain its engineering properties. Lime, Fly ash, And Rice husk are some commonly used chemical stabilization materials, while geotextiles and georgics are examples of mechanical soil stabilizers. Cement-treated bases are most commonly used for upgrading a poor quality soil.

II. EXPERIMENTAL MATERIAL

A. Fly ash, Rice husk ash, Lime powder Admixtures.

The principle waste coming into the industry is the Admixtures waste. Admixtures are generated as a waste during the process of Rice, Fly ash, Lime Manufacturing. It is estimated that 12 To 14% waste are produced of total raw material used, and although a portion of this waste may be utilized on-site, such as for excavation pit refill, disposal of those waste material acquire large land areas and remain scattered all around, spoiling the aesthetic of the entire region. It is very difficult to find a use of Admixtures materials.

B. Soil

California Bearing Ratio Test on sub grade soil procedure and values. The CBR test is a measure of resistance of a material to penetration of standard plunger under controlled density and moisture conditions CBR test may be conducted in remoulded or undisturbed sample.

III. CALIFORNIA BEARING TEST

The California Bearing Ratio test is a penetration test used to evaluate the sub grade strength of roads and pavements. The results of these tests are used with the curves to determine the thickness of pavement and its component layers. This is the most widely used method for the design of flexible pavement.

The CBR test was designed as per Indian Road Congress method (IRC 37:2001) and the same was used to prepare the test samples. The design proportion is in the table below.

IV. EXPERIMENTAL SETUP

PENETRATION FOR SOIL

PENETRATION	LOAD DIAL READING
0	0
0.25	0.06
0.50	0.11
0.75	0.14
1.0	0.17
1.25	0.20
1.50	0.23
1.75	0.25
2.0	0.27
2.25	0.30
2.50	0.32
2.75	0.34
3.0	0.36
3.50	0.39
4.0	0.41
4.50	0.44
5.0	0.46

PENETRATION FOR SOIL + ADMIXTURES

PENETRATION	LOAD DIAL READING
0	0
0.25	0.091
0.50	0.185
0.75	0.273
1.0	0.364
1.25	0.445
1.50	0.546
1.75	0.637
2.0	0.728
2.25	0.819
2.50	0.91
2.75	1.001
3.0	1.092
3.50	1.274
4.0	1.456
4.50	1.638
5.0	1.82
5.50	2.002
6.0	2.184

STANDARD LOAD FOR CBR TEST

PENETRATION	UNIT STANDARD LOAD	TOTAL STANDARD LOAD
2.5	70	1370
5	105	2055
7.5	134	2630
10	162	3180
12.5	182	3600

EXPERIMENTAL METHODOLOGY

The California Bearing Ratio (CBR) test is a penetration test used to evaluate the sub grade strength of roads and pavements. The results of these tests are used with the curves to determine the thickness of pavement and its component layers. This is the most widely used method for the design of flexible pavement.

CBR value at different material use in soil

%	Lime powder
0	0
3	2.5
5	4.9
7	6.65
9	6.1
%	Rice husk ash
0	0
04	2.7
08	03
12	3.3
16	4.2

20	3.9
%	Fly ash
0	0
04	2.5
08	2.9
12	3.5
16	4.7
20	5.8
24	3.8

V. CONCLUSION

In flexible pavements cost of every layer also depends on the load bearing capacity. Top most layer will the most expensive one, because it is carrying the maximum load on the bottom layer will the least expensive, because of minimum load bearing capacity.

Overall observation table

	Soil	Lime powder	Fly ash	Rice husk ash
Pavement thickness	735 mm	470 mm	470 mm	540 mm
Cost estimation per Km	36.02 Lakh	26.49 Lakh	30.76 Lakh	24.72 Lakh
CBR	2.34	6.65	5.8	4.2
Quality of subgrade	Very poor	Fair	Fair	Poor

By above table we conclude that CBR value of soil increase by 282.9% with using 7% lime powder, lime powder improve more load bearing capacity of natural soil compare to fly ash & rice husk ash. And lime powder is also economic as cost purpose of construction of flexible pavement.

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