EXPERIMENTAL STUDY ON DEVELOPMENT OF GEO POLYMER CONCRETE USING GEO TEXTILES

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Abstract Pavements are required for the smooth, safe and systematic passage of traffic. Pavements are generally classified as flexible and rigid pavements. Flexible pavements are those which have low flexural strength and are flexible in their structural action under loads. Rigid pavements are those which possess note worthy flexural strength and flexural rigidity. Flexible pavement are preferred over cement concrete roads as they have a great advantage that these can be strengthened and improved in stages with the growth of traffic and also their surfaces can be milled and recycled for rehabilitation.

The flexible pavements are less expensive also with regard to initial investment and maintenance. The economic part are carried out for the design pavement of a section by using the result obtain by design method and their corresponding component layer thickness. In our project we are calculating thickness of flexible pavement by using California Bearing Ratio method (CBR). From this design method maximum thickness is adopted for the construction of flexible pavement.

Keywords – *Design of flexible pavement, traffic, economic*

I. INTRODUCTION

For economic and efficient construction of highways, correct design of the thickness of pavements for different conditions of traffic and sub-grades is essential. The science of pavement design is relatively new. In India, previously road crust was designed on some rational data but more on the experience of the road engineer.

Some arbitrary thicknesses of the pavements were used which lead to costly failures and wastage as in some cases, the thickness of pavements was insufficient and in the other cases expensive. As there are no proper design criteria, the construction of roads was more or less uneconomical in almost all cases.

Hence judicious method of designing and calculating the crust thickness on the basis of estimation of traffic loads and bearing capacity of sub-grade etc.., will lead to economical construction of roads.

II LITERATRE REVIEWS

Muddada poojitha 1 , B.Praveen babu 2 , et al.,(2016) This paper discusses about the design methods that are traditionally being followed and examines the "Design of rigid and flexible pavements by various methods & their cost analysis by each method". Flexible pavement are preferred over cement concrete roads as they have a great advantage that these can be strengthened and improved in stages with the growth of traffic and also their surfaces can be milled and recycled for rehabilitation.

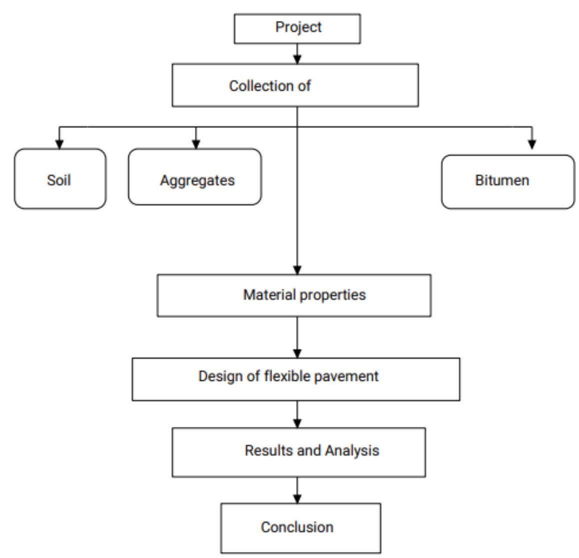
The flexible pavements are less expensive also with regard to initial investment and maintenance. It is observed that flexible pavements are more economical for lesser volume of traffic. The life of flexible pavement is near about 15 years whose initial cost is low needs a periodic maintenance after a certain period and maintenance costs very high. The life of rigid pavement is much more than the flexible pavement of about 40 year's approx 2.5 times life of flexible pavement whose initial cost is much more then the flexible pavement but maintenance cost is very less

Sanju Meena 1 ,Dr Om Prakash 2 , et al,.(2017) Highway construction is important part of infrastructural development of any zone and the highway construction process are carried out in a number of ways these days. Automated Highway System, abbreviated as AHS is newly developed idea which uses different sensors and microprocessors for automatic design process. The management and control of traffic system using roadside controllers and intelligent vehicles is innovative technique for the design of highway system. From this study we conclude that the Automated Highway Systems brings major transportation benefits in terms of safety, efficiency, affordability and usability, and environment in order to achieve its development goals. The models at the various layers are different not only in terms of their formal structure (ranging from differential equations to state machines to static graphs), but also in the entities that have a role in them.

III METHODOLOGY USED

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge.

A methodology does not set out to provide solutions - it is therefore, not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to a specific case, for example, to calculate a specific result.



Methodology of the study

RED SOIL

Red soil is an important soil resource, which bears substantial implication for sustainable development of agriculture and healthy growth of economy. We also summarized how the iron redox cycling may be affected by other biogeochemical processes or active constituents, such as the nitrogen cycling, the sulfur cycling and humic substances. Finally, future research needs pertaining to iron redox cycling coupled to the fate of heavy metals are suggested. The results summarized in this review may provide insights for solving the heavy metal pollution of paddy soils in the red soil

Red soil

IV DESIGN OF FLEXIBLE PAVEMENT

The following sub sections describe the various variables and parameters involved in design of flexible pavement of road as per

Traffic- CV/Day Annual traffic census 24 X 7

For structural design, commercial vehicles are considered. Thus vehicle of gross weight more than 8 tonnes load are considered in design. This is arrived at from classified volume count.

Wheel loads

Urban traffic is heterogeneous. There is a wide spectrum of axle loads plying on these roads. For design purpose it is simplified in terms of cumulative number of standard axle (8160 kg) to be carried by the pavement during the design life. This is expressed in terms of million standard axles or msa. Design Traffic Computation of design Traffic In terms of cumulative number of standard axle to be carried by the pavement during design life

$$N = \frac{365\ A\ [(1+r)n - 1]}{r} \times F \times D$$

Where N = The cumulative number of standard axles to be catered for in design in terms of million standard axles - msa. A = Initial traffic in the year of completion of construction duly modified as shown below. D = Lane distribution factor F = Vehicle damage factor, VDF n = Design life in years r = Annual growth rate of commercial vehicles {this can be taken as 7.5% if no data is available}

OBSERVATION DURING PENETRATION AND DETERMINATION OF CBR

S.No	Penetration Y (mm)	Standard load Value (p)(kgf)	Proving Ring Dial Gauge Reading (R)	Plunger Load on (Pt)=R x f =R x 1.282 (kgf)
1	0		0	0
2	0.5		10	12.82
3	1.0		18	23.07
4	2.0		33	42.30
5	2.5	1370	54	69.22
6	3.5		63	80.76
7	4.0		71	91.02
8	5.0	2055	78	99.99
9	7.5		85	108.97
10	10.0		91	116.66
11	12.5		102	130.76

DESIGN OF FLEXIBLE PAVEMENT BY CBR DATA

1. Length of Road= 3.45/00 km

2. Traffic intensity as worked out =1001 CV/D Average

3. Growth rate of traffic (assumed) = 7.5%

4. Total Period of Construction =4 months

5. Design C.B.R. of Sub grade Soil=5.00%

6. Design Period of the Road= 10 Years

7. Initial Traffic in the Year of Completion of Construction

A = P x (1 +r) x

Where:

A = Traffic in the year of completion of construction CV/ Day

P = Traffic at last Count April 2013

r = Annual growth rate of traffic

x = Number of years between the last census and the year of completion of construction

A =1001 x (1 + 0.075) x1 1076 CV / Day

(As per Clause 3.3.4.4 Table 1 of IRC -37 - 2001)

8. Vehicle Damage Factor =3.5Standard Axle per CV

9. Design Calculation

Initial traffic in design lane = Initial traffic x Distribution factor

= 1076 x 0.75 = 807.05 CVPD

N = [365 x {(1+r) x - 1} x A x F] / r

=365 x [{(807(1 +0.075)^10-1}x3.5]/0.075

= 14.58 msa Say 15.00 msa

10.Total Pavement Thickness for design C.B.R.

= 660 mm (As per Plate - 2 of IRC-37-2001)

The thickness of individual component layers of flexible pavement by CBR method is given below:

So pavement thickness =660mm

Thickness of surface course =40mm

Thickness of DBM =70mm

Thickness of base course=250mm

Thickness of sub base=300mm.

V CONCLUSIONS

The major conclusions drawn at the end of this work are as follows:

1. The traffic and sub-grade soil characteristics are necessary in order to design a pavement. The IRC method of design can be used to find the total

pavement thickness due to its simple approach.

2. A decline in the yearly variation of commercial vehicles like bus, truck and HCM/EME was observed from the data analysis of traffic volume data. An increase in the yearly volume of cars was also observed from the analysis.
3. The thickness of pavement varies with the change in the value of C.B.R. With higher value of C.B.R. the pavement thickness is less and vice versa.
4. Due to the saving in Pavement thickness is less quantity of material will be applicable so that, huge amount of money can be saved.
5. The thickness of pavement as per CBR method 660mm.
6. Thickness of surface course is obtained as 40mm, thickness of DBM course obtained as 70mm, thickness of base course is obtained as 250mm and thickness of sub base is obtained as 300mm.
7. Further this Research work can be carried with different materials to improve CBR values and also with different Soaking Conditions.

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