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Design of Flexible Pavement for Thakurwadi Village using Indian Standards

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Abstract - *"A pavement is one type of hard surface made from durable surface material lay down on an area which is intended to carry vehicular or foot traffic".*

There are mainly two types of road pavement used namely flexible and rigid pavements road.

In the project report, a road is designed at a village near Khopoli, based on the principles of pavement design. Soil samples are collected for the determination of soil characteristics like consistency limits, sieve analysis, C.B.R. values.

The alignment of the road is designed by surveying and levelling. The total road length being 1760 meters.

Key Words: *Flexible Pavement, Pavement Design, Highways, CBR Test, Highway Safety, Highway Engineering, Soil Mechanics.*

1. INTRODUCTION

"A pavement is one type of hard surface made from durable surface material lay down on an area which is intended to carry vehicular or foot traffic".

Its main function is to distribute the applied vehicle loads to the sub-grade through different layers. The road Pavement should provide sufficient skid resistance, proper riding quality, favourable light reflecting characteristics, and low noise pollution.

Its goal to reduce the vehicle transmitted load, so that they will not exceed the bearing capacity of the sub-grade. The Road Pavements are playing a crucial role in the development of any construction. There are mainly two types of road pavement used namely flexible and rigid pavements road.

1.1 Flexible Pavement

Flexible pavement can be defined as the one consisting of a mixture of asphaltic or bituminous material and aggregates placed on a bed of compacted granular material of appropriate quality in layers over the subgrade. Water bound macadam roads and stabilized soil roads with or without asphaltic toppings are examples of flexible pavements.

The design of flexible pavement is based on the principle that for a load of any magnitude, the intensity of a load diminishes as the load is transmitted downwards from the surface by virtue of spreading over an increasingly larger area, by carrying it deep enough into the ground through successive layers of granular material.

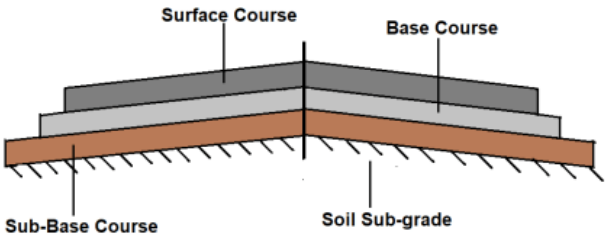


Fig: 1. Cross-section of Flexible Pavement

2. COMPONENTS OF FLEXIBLE PAVEMENT

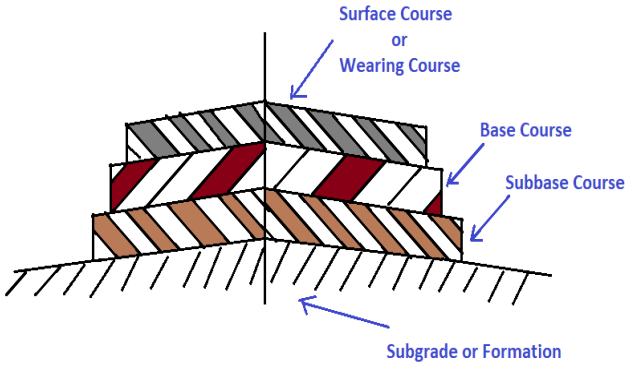


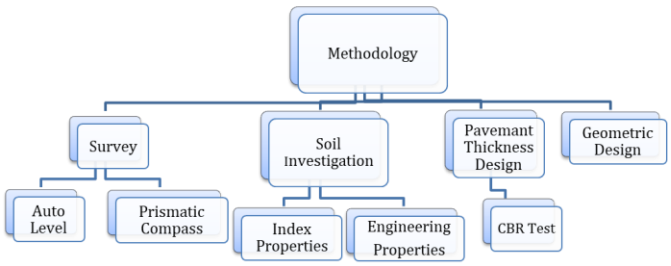
Fig: 2. Components of Flexible Pavement

3. FACTORS CONSIDERED IN THE DESIGN OF FLEXIBLE PAVEMENTS

The various factors to be considered for the design of pavement are:

1. Wheel load
2. Axle configuration
3. Contact pressure
4. Vehicle speed
5. Repetition of loads
6. Subgrade type
7. Temperature
8. Precipitation

4. METHODOLOGY



5. VARIOUS APPROACHES OF FLEXIBLE PAVEMENT DESIGN

Various approaches for flexible pavement design may be classified into three broad groups:

(a) Empirical methods:

They are based on strength pavement of soil subgrade. The Group Index method, CBR method are empirical methods.

(b) Semi empirical methods or semi theoretical methods:

These methods are based on the stress-strain function.

Triaxial Test is an example of semi empirical method.

(c) Theoretical methods:

These methods are totally depends on the theoretical analysis and mathematical calculations. Burmister method is an example of theoretical method.

6. CALCULATIONS

6.1 Liquid Limit Test

Liquid limit of soil sample was found to be **23%**

6.2 Plastic Limit Test

The plasticity index of soil was found to be **8.72%**

6.3 Sieve Analysis Of Soil

Uniformity Coefficient $\mathbf{C_u = 4.61}$

Coefficient of curvature $\mathbf{C_c = 2.367}$

6.4 Proctor Compaction Test

The optimum moisture content of the soil sample = **11.63%**

Maximum dry density of the soil sample = **2.678 g/cc**

6.5 California Bearing Ratio (CBR) Test

The CBR value of soil sample = **13.36%**

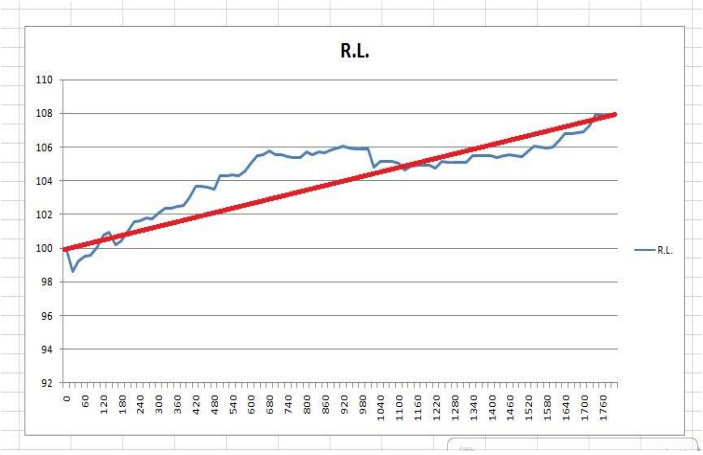
6.6 Design of Pavement Thickness by Group Index Method

Traffic observed in this road section is approximately 100 to 250 vehicles per day.

From the design charts, the combined thickness, of surface, base and sub-base course = **23cm**

The thickness of base and sub- base courses = **20cm**

6.7 Longitudinal Profile of Road



X-axis shows chainage and Y-axis shows reduced level.

Blue line shows the longitudinal profile of road.

Red line shows the gradient of road.

Gradient of road is found to be **1 in 228**

7. ESTIMATION & COSTING

Description	Length	Breadth	Height	Quantity
Sub-grade	1760m	4m	--	7040m^2
Sub-base	1760m	4m	0.2m	1408m^3
Wearing Course	1760m	3.7m	0.03m	195m^3

Description	Quantity	Rate	Amount
Sub-grade	7040m^2	20	140,800 Rs
Sub-base	1408m^3	210	295,680 Rs
Wearing Course	195m^3	250	48,750 Rs
Total Amount	--	---	**485,230 Rs**

8. CONCLUSIONS

In this project work, an attempt is made to use latest techniques of geometric design, pavement design for a road for village.

The thickness of surface, sub-base and sub-grade is calculated as 23cm.

Total cost for constructing the road is calculated as 485,230Rs

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