Design Of Flexible Pavement By IRC Method

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Abstract- *As per IRC recommendation, California Bearing Ratio (CBR) value of subgrade is used of flexible pavements. California Bearing Ratio(CBR)value is an important soil parameter for design of flexible pavements and runway of air fields. It can also be used for determination of sub grade reaction of soil by using correlation. It is one of the most important engineering properties of soil for design of sub grade of roads.*

CBR value of soil may depends on many factors like maximum dry density (MDD), optimum moisture content (OMC), liquid limit (LL), plastic limit (PL), plasticity index (PI), type of soil, permeability of soil etc. Besides, soaked or unsoaked condition of soil also affects the value. These tests can easily be performed in the laboratory. The estimation of the CBR could be done on the basis of these tests which are quick to perform, less time consuming and cheap, then it will be easy to get the information about the strength of sub grade over the length of roads, by considering this aspect, a number of investigators in the past made their investigation in this field and designed different pavements by determining the CBR value of the basis of results of low cost, less time consuming and easy to perform tests. In this study, attempts have been made to seek the values of CBR of different soil samples and correlate their CBR values for the design purpose of flexible pavement as per guidelines of IRC: 37-2012.

Keywords- CBR Ratio, Opm, Soil, Liquid Limit, Plastic Limit

I. INTRODUCTION

Definition of Road or Pavement:

Pavement or road is an open, generally public way for the passage of vehicles, people, and animals. Pavement is finished with a hard-smooth surface. It helped make them durable and able to withstand traffic and the environment. They have a life span of between 20-30 years. Road pavements deteriorate over time due to

- The impact of traffic, particularly heavy vehicles.
- Environmental factors such as weather, pollution.

Purpose:
Many people rely on paved roads to move themselves and their products rapidly and reliably

1. One of the primary functions is load distribution. It can be characterized by the tire loads, tire configurations, repetition of loads, and distribution of traffic across the pavement, and vehicle speed.
2. Pavement material and geometric design can affect quick and efficient drainage. This eliminating moisture problem such as mud and ponding (puddles). Drainage system consists Surface drainage: Removing all water present on the pavement surface, sloping, chambers, and kerbs.Subsurface drainage: Removing water that seep into or is contained in the underlying sub-grade.

Rigid pavement:

A rigid pavement is constructed from cement concrete or reinforced concrete slabs. Ground concrete roads are in the category of semi-rigid pavements.

Rigid pavements are those which posses note worthy flexural rigidity.

1. It possesses flexural strength.
2. Load transfer is by the way of slab action and it distributes the wheel load to a wider area below.
3. Flexural stresses will be developed due to wheel load temperature changes.
4. Tensile stresses will be developed due to bending action of the slab under the wheel load.
5. It does not deform to the shape of lower layer, but it bridges the minor variation of the lower layer.

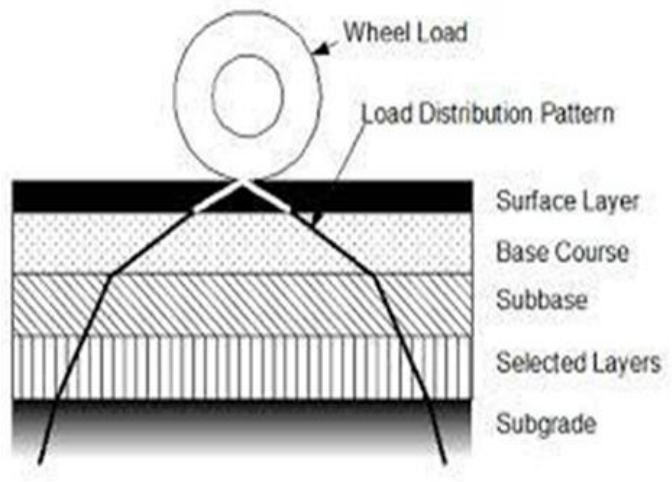
Rigid pavement consists of the following components:

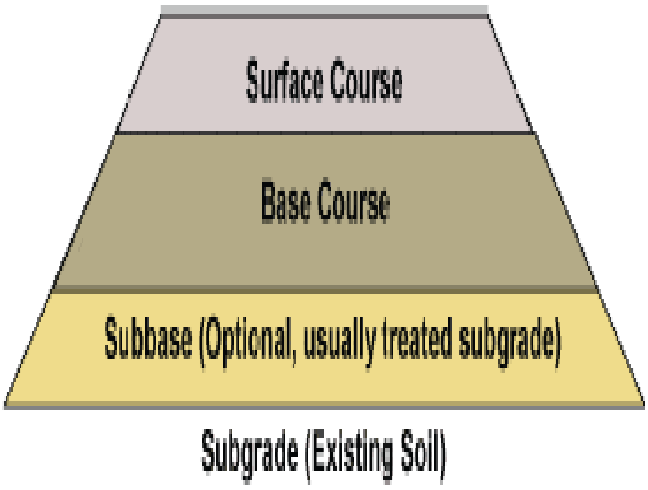
1. Cement concrete slab
2. Base course
3. Soil sub-grade.

The design of rigid pavements is based on providing a structural cement concrete slab of sufficient strength to resists the loads from traffic. The rigid pavement has rigidity and high modulus of elasticity to distribute the load over a relatively wide area of soil.

Rigid Pavement Cross-Section Minor variations in subgrade strength have little influence on the structural

capacity of a rigid pavement. In the design of a rigid pavement, the flexural strength of concrete is the major factor and not the strength of subgrade. Due to this property of pavement, when the subgrade deflects beneath the





In order to perform the test, a sufficient sample of the aggregate must be obtained from the source. To prepare the sample, the aggregate should be mixed thoroughly and be reduced to a suitable size for testing. The total weight of the sample is also required.

Results: The results are presented in a graph of percent passing versus the sieve size. On the graph the sieve size scale is logarithmic. To find the percent of aggregate passing through each sieve, first find the percent retained in each sieve. where WSieve is the weight of aggregate in the sieve and WTotal is the total weight of the aggregate. The next step is to find the cumulative percent of aggregate retained in each sieve. To do so, add up the total amount of aggregate that is retained in each sieve and the amount in the previous sieves. The cumulative percent passing of the aggregate is found by subtracting the percent retained from 100%.

The values are then plotted on a graph with cumulative percent passing on the y axis and logarithmic sieve size on the x axis. There are two versions of the % passing equations. The .45 power formula is presented on .45 power gradation chart, whereas the simpler %passing is presented on a semi-log gradation chart. Version of the percent passing graph is shown on .45 power chart and by using the .45 passing formula..45 power percent passing formula% Passing
Where: Sieve Largest - Largest diameter sieve used in (mm). Aggregatemax_ size - Largest piece of aggregate in the sample in (mm).

Where: W Below - The total mass of the aggregate within the sieves below the current sieve, not including the current sieve's aggregate.

W Total - The total mass of all of the aggregate in the sample.

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INTRODUCTION:

This chapter describes about the tests conduct to the selection of black cotton soil. The tests are sieve analysis, Liquid limit, Plastic limit, Optimum moisture content, California bearing ratio (CBR)

SIEVE ANALYSIS:

Apparatus:

1. Sieves,
2. Weighing balance,
3. Wire brush,
4. Thermostatically controlled oven,
5. Mechanical sieve shaker,
6. Mortar and Rubber pestle

Penetration of plunger(mm)	Standard load (kg)
5.0	2055
7.5	2630
10.0	3180
12.5	3600

DESIGN CALCULATIONS:

1. Lane Distribution factor = 0.75
2. Initial traffic (Assuming 50% in each direction) =2000CVPD
3. Vehicle Damage Factor (VDF) computed for the traffic =5.2
4. Cumulative number of standard axles to be catered for in the design N = 365*[(1+r) ^x−1]*A*D*F
   N = [(365*(1+0.075) ^20-1)/0.075]*0.075*2000*5.2
   N = 124msa.
5. CBR of the embankment material = 2%, CBR of the subgrade =10%,
6. Effective CBR of the subgrade from Fig.5.1 = 6%.
   Design resilient modulus of the compacted subgrade $=17.6(6)^{0.64}$=55.40Mpa.
7. Thickness of granular layers: WMM = 260mm, GSB =230mm

Resilient modulus of granular layer = $0.2*(490)^{0.45}*62$ = 201Mpa.
Total pavement thickness for traffic 124msa =680mm

Pavement composition interpolated from plate 4, CBR 2%

a) Bituminous surfacing = 50mm SDBC + 120mm DBM
b) Granular base = 250mm
c) Granular Sub base = 260mm Granular material of CBR not less.

II. CONCLUSION

General

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

1. The thickness of crust varies with the change in the value of CBR the crust thickness is less and vice versa.
2. From this laboratory test it has been observed that the soil is suitable for the construction purpose for soil sub grade in comparison with the black cotton soil on the basis of higher values of CBR.
3. Due to the saving in crust less quantity of material will be applicable so that, huge amount of money can be saved
4. Due to the higher values of CBR the soil will be more durable.
5. The different unsoaked conditions of soil with respect to time, and improving the CBR values with the stabilization process with the different materials.

Pavement Thickness:

The thickness of crust varies with the change in the value of CBR, thethickness of pavement are changes with the percentage of CBR.

III. APPENDIX

This is to certify that the dissertation entitled **"DESIGN OF FLEXIBLE PAVEMENT BY USING IRC METHOD"** being submitted by **VANGALA VENKATESH with** Regd.No. **423232913026** in partial fulfillment of the requirements for the award of **MASTER OF TECHNOLOGY in civil engineering with the specialization of TRANSPORTATION ENGINEERING** is an authentic work carried out by **Mr.HEMANTH RAJU M.Tech** under their supervision and guidance. To the best my knowledge, the matter emboided in this seminar report as not been submitted to any other University/institute for award of any degree of engineering

IV. ACKNOWLEDGMENT

Would like to express my sincere gratitude to all those who supported and guided me through the course of this project. First and foremost, I am deeply thankful to my research **Mr.HEMANTH RAJU ,M.Tech.** Assistant professor and **Dr.M.MADHURI, Mtech.Ph.D** for their invaluable guidance, unwavering support, and continuous encouragement. Their expert advice and insightful feedback were instrumental in shaping the direction and quality of this research,

Would also like to extend my gratitude to the faculty and staff of the civil engineering at **SANKETIKA VIDYA PARISHAD ENGINEERING COLLEGE** for providing the Necessary Resources and a Conducive Research Environment. Special thanks to their assessment in the laboratory experiments and material preparation, which greatly facilitated the research process.

Am also grateful to my colleagues, [**SVP ENGINEERING COLLEGE**], For their constructive discussions, teamwork, and friendship, their collaboration Helped enhance the overall outcome of this project. I Would Like To Acknowledge Any External Organizations, Institutions, For Funding Bodies For Providing Financial Support, Materials, Or Any Necessary Tools that contributed to the successful completion of this study. Finally, I wish to thank my family and friends for their emotional support, understanding, and patience during the course of this research. Their constant encouragement gave me the strength to overcome challenges and continue with my work. Feel free to adjust the names and specific details to suit your actual acknowledgments.

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