DESIGN OF FLEXIBLE PAVEMENT BY USING DEMOLISH CONCRETE ON SUB-BASE

[1]Rashmi Bade, [2]Shadab Akhtar, [3]Fazil Siddiqui, [4]Harshada Lanjewar, [5]Faizaan Sheikh

[1]Assistant Professor,[2]Student Of Graduation Programme [3]Student Of Graduation Programme ,[4]Student Of Graduation Programme, [5]Student Of Graduation Programme

[1]Department of Civil Engineering,

[1]Anjuman College of Engineering & Technology, Nagpur (MS),India

Abstract: Pavement is defined as the process of setting the required overlays on the existing ground layer. There are different techniques for structuring the pavement, for example, CBR method, GI method. There are four layers of flexible pavement. The bituminous material which consists of more asphalt, that asphalt is viscous in nature which enters plastic deformation. The pavement on which the all vehicle will move, so it must have enough strength in the layers i.e. in sub-grade , sub-base, base & surface layers. To encourage the concept of waste management and to maintain the economy of Road Project the waste material i.e. Demolished Concrete is replaced with the Sub-Base layer of pavement.

I. INTRODUCTION

The pavement is design for long- life .So vehicle can move easily on it. Its durability should be good enough. It is laid down where to sustain the vehicular heavy loads which regularly move on it. It consists of basic four layers such as sub-grade, sub-base, base and outermost layer is surface layer which is made of bituminous material. Where sub- grade is made of soil, sub-base is made of boulders or gravels & base is made of moorum or fine- aggregates. The primary function of the pavement is to transmits the applied load on the sub-grade layer i.e. last one layer of the pavement. The greater understanding of pavement failures that could be gained from detailed investigations could be valuable in reducing the costs associated with pavement failures in the future. In many cases the failure of pavement structure can be directly attributed to inadequate maintenance and ineffective evaluation programs. It is important to find out a method to minimize the maintenance cost under a limited budget, [1]. The Indian Road Congress (IRC) encodes the exact design strategies of the pavement layers based upon the subgrade strength which is most commonly expressed in terms of the California Bearing Ratio (CBR). For the design of pavement CBR value is invariably considered as one of the important parameter. With the CBR value of the soil known, the appropriate thickness of construction required above the soil for different traffic conditions is determined using the design charts, proposed by IRC. CBR value can be measured directly in the laboratory test in accordance with IS:2720 (Part-XVI) on soil sample procured from the work site.[2]

II. LITERATURE REVIEW

The greater understanding of pavement failures that could be gained from detailed investigations could be valuable in reducing the costs associated with pavement failures in the future (1). The design for new construction should be based on strength of the samples prepared at optimum moisture content (OMC) corresponding to the Proctor Compaction & soaked in water for a period of four days before testing (2). Pavement infrastructures are considered vital & important in safely transporting people & goods from one point to another which makes it one of the fundamental component of any transportation system both in the united states of America & world in over (3).Surface transport system plays an important role on rapid development in agricultural & industrialization of any countries. A high quality of road network system maximizes its benefits to the society & facilities to achieve the economic growth of the country(4).

1.1 OBJECTIVE OF THIS STUDY

The aim of the project is to replace the material on sub - base so it helps to reduce the cost of the pavement. It gives the same strength as conventional material gives you. it also helps u to reduce the cost of pavement by using different material on sub-base such as demolish-material which are having scrap value or has no cost & easily available in nearby areas or city.

1.2 NEED OF RESEARCH

There is a need to research the material which are having scrap value or zero cost. We need to utilize this material instead of throw or dumped it. Might be it will gives the same strength as conventional gives us.

1.3 SCOPE OF RESEARCH

The material which is applied on the sub-base for designing the pavement it will reduce the construction cost of pavement & simultaneously gives us same strength as conventional one gives us.

III. EXPERIMENTAL PROGRAM

For checking the properties of the soil, reported different properties like Water content, Specific Gravity, Grain Size Analysis, liquid limit (LL), plastic limit (PL), plasticity index (PI), CBR test etc.

2.1 COLLECTION OF MATERIALS

The materials were obtained from the nearby areas, where plenty amount of material is available for the construction purpose. The material which is collected for testing is different in quality and property, so that the material was separately tested in the laboratory so as to design the soil sub grade.

2.1 WATER CONTENT

The natural water content also called the natural moisture content is the ratio of the weight of water to the weight of the solids in a given mass of soil. This ratio is usually expressed as percentage.

	READINGS				
SR.NO	**Obs. no.**	**1**	**2**	**3**	**4**
1	Wt. of container with liquid	20	20	20	20
2	Wt. of container + wet soil	60	64	74	72
3	Wt. of container + dry soil	54	58	66	64
4	Water content	**17.65%**	**15.79%**	**17.39%**	**18.2%**

Where, W = water content
W = Weight of water/ weight of solid soil
W =**17.5%.**

2.2 SPECIFIC GRAVITY

Definition - The ratio of the weight of an equal volume of distilled water at that temperature both weights taken in air.
(a) Represent the empty pycnometer of mass =W1
(b) Represent the pycnometer + soil grains of mass= W2
(c) Represent the pycnometer + soil grains+ water of mass= W3
(d) Represents the pycnometer + water of mass = W4
Wt. of pycnometer = M1= 626g
Wt. of pycnometer+ Aggregates =M2=1.238kg
Wt. of pycnometer + water+ Aggregate = M3 = 2.03 kg
Wt. of pycnometer + water = M4 = 1.65 kg

S.G. = M2-M1/(M2-M1)-(M3-M4)
S.G. = **2.66**

2.3 CRUSHING VALUE

Sr. No.	**Obs. no.**	**Readings**
1	Wt. of pan	0.822kg
2	Wt. of aggregates	2.992kg
3	Wt. passing	0.621kg

CRUSHING VALUE = (0.621/3)*100 = 20.7%

2.4 IMPACT VALUE TEST

Impact value = Passing through 2.36 mm/Total wt.
= (286/860)*100
Impact Value = **33.25%**

2.5 SHAPE TEST

a) Flakiness Index
F.I. = Wt. of fraction passing from gauge/Total wt. of fraction
= **74.6 %**
b) Elongation Index
E.I. = Wt. of Retained/ total
= **15.1%**

2.6 CBR TEST

Penetration (mm)	Reading (div.)	Load (kg)
0.5	16	94.02
1.0	24	141.02
1.5	26	152.72
2.0	30	176.28
4.0	38	223.29
5.0	41	240.92
7.5	56	329.06
10.0	73	428.95
12.5	85	499.46

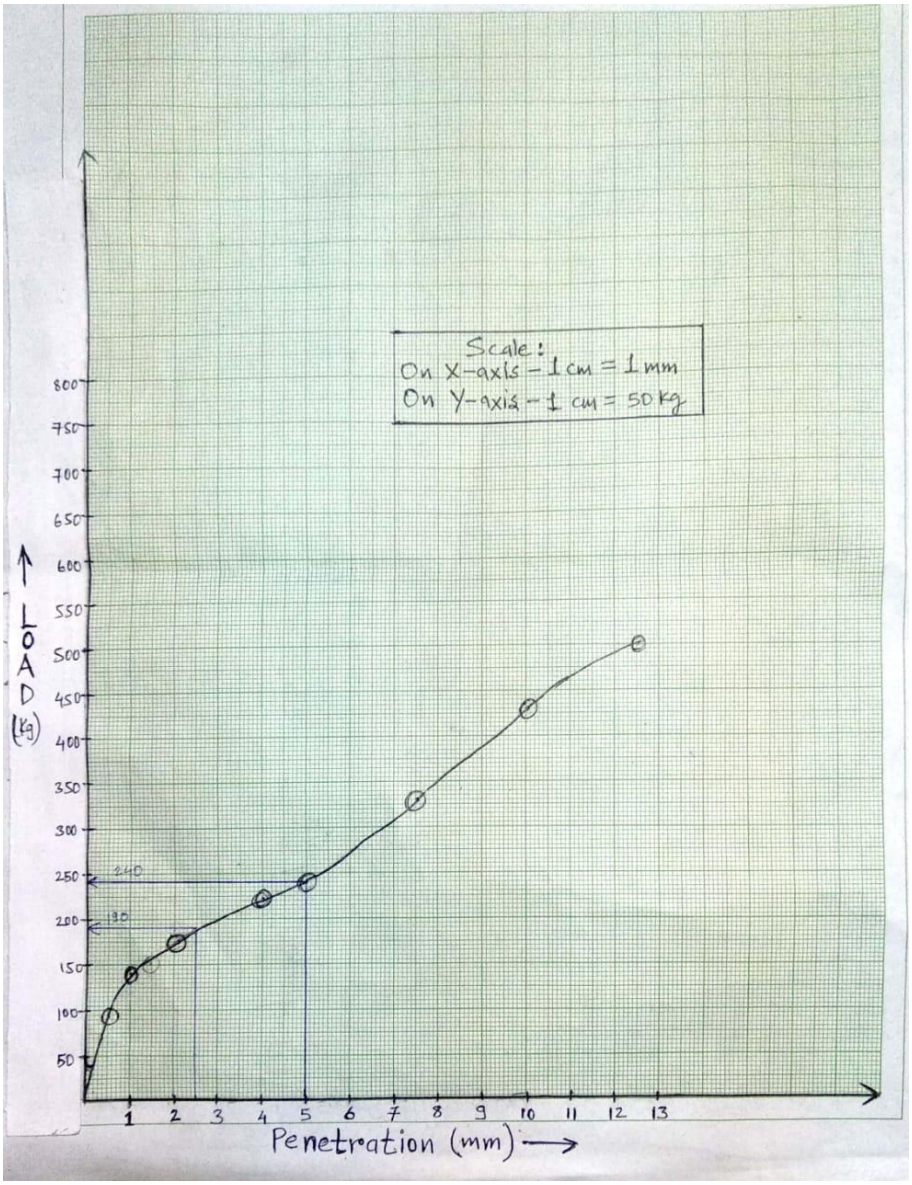
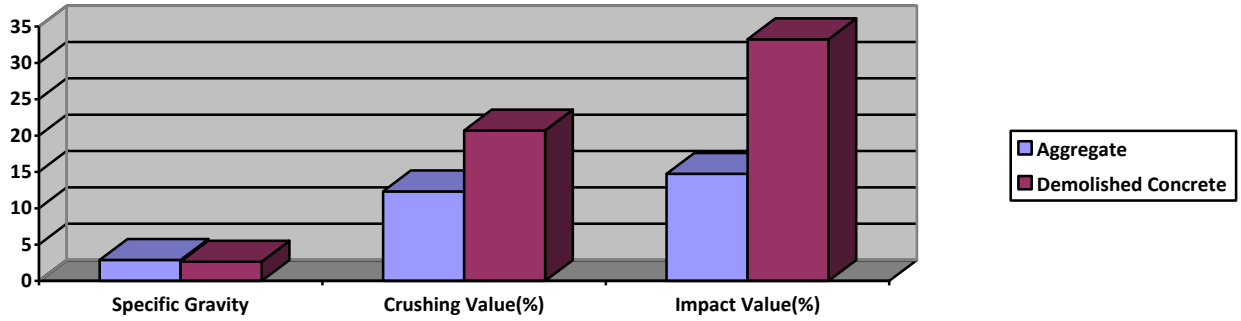


Figure: CBR Graph

From Graph, CBR = **13.86%**

Result: The results of experimentations in tabular form are compared with natural material below :

Description	Specific gravity	Crushing value	Impact value
Aggregates	2.9	12.32%	14.73%
Demolish concrete	2.66	20.7%	33.25



IV. Discussion & Conclusion:

After experimentation it is observed that the replace material gives us the same strength as conventional material. Simultaneously it will reduce the cost of construction of pavement. In this way, the wastage material will be re-used. This will also help to conserved natural material which used for the sub-base of pavement. And also the waste management technique is adopted.

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