DESIGN OF FLEXIBLE PAVEMENT: A CASE STUDY OF ONGC TO VENUS, BHOYAN RATHOD

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ABSTRACT

In the present time, to provide a better road network is necessary, but it is not available at some places . There are some places where the traffic is higher or enough but road network is not available for it. Research area is from ONGC to Venus collage which is used by Daily traffic such as Collage bus, four wheeler, two wheelers, village people etc. to. the daily traffic is required a proper road but because of lack of maintenance the road becomes damaged and pavement deterioration is taking place like potholes ,rutting, disintegration and surface defects which are studied in this research. now it is need to be repaired with a proper design. The aim of this research to provide a road design from ONGC TO VENUSICT which should be safe and economical. Traffic data collection soil data collection and soil testing has been carried out.

Keywords : Road Design, Flexible Pavement, Site Investigation

I INTRODUCTION

1.1 Project Area Profile

Total Length of Road – 3.1 km.

- Starting Point Address:-
  ONGC WSS Opp. IFFCO kalol unit,
  Ahmedabad – Mehsana Highway, Saij, Kolol.
- Ending Point Address :-
  Venus International Collage of technology,
  Bhoyan Rathod, Gandhinagar – 382420

Starting Point: - At ONGC (0 m)

- Latitude - 23°12’ 58.13” N
- Longitude - 72°31’ 12.55” E

Ending Point: - At Venus Collage (3.1 km)

- Latitude - 23° 14’ 5.58” N
- Longitude - 72° 32’ 31.42” E

1.2 Pavement Deterioration

The problems relating to pavement maintenance are still complex due to the dynamic nature of road pavements where elements of the pavement are constantly changing, being added or removed.

Pavements are complex structures involving many variables, such as materials, construction methods, loads, environment, maintenance, and economics.

1.2.1 Types of deterioration

(Surface defects)

Fig.1 Fig.2 **(**Disintegration**)**

t holes)

Fig.3(Po Fig.4 (Rutting)

II FIELD WORK

2.1 Soil Sample Collection

Soil sample is collected at the 500m interval of the project area.

Fig.5 (Soil sample collection at different six point)

2.2 Traffic Data Collection

Traffic data are collected for 3 days because traffic intensity is very low.

2.2.1 PCU Calculation

- For making capacity computation under mixed traffic condition, the different types of vehicles should be converted to a common unit known as 'passenger car unit' by multiplying of their number with relevant equivalency factors, there are meant for use in open sections in plain terrain away from intersections. As per IRC:-64-1976 "Geometric design standards for rural highways."
- In excel sheet calculated PCU value of traffic volume.

	Bus							**Goods Vehicles**			**Slow Moving Vehicles**			
	Standard Bus		**Other Bus**	**Mini Bus**	**Cars/ Jeep/ Van**	**Two Wheelers**	**Auto Rickshaws**	**Trucks**	**MAV**	**LCV**	**Cycles**	**Carts**	**Cycle Rickshaw**	
total pcu traffic	**City Bus**	**Mofussil Bus**												TOTAL
Monday	0	18	42	15	57	300	49	21	6	0	12	24	0	544
Tuesday	0	18	48	24	77	284.5	42	6	6	0	10	16	1.5	533
Wednesday	0	12	42	18	56	272.5	42	9	6	0	8.5	16	1.5	483.5
Average	0	16	44	19	63.3333	285.667	44.333	12	6	0	10.1667	18.6667	1	520.167

Table 1. Average Daily Traffic

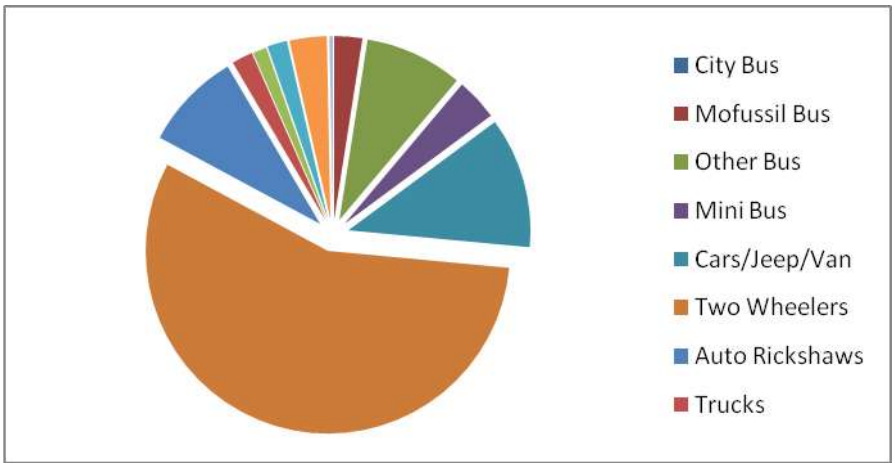


Chart 1. Average traffic Intencity

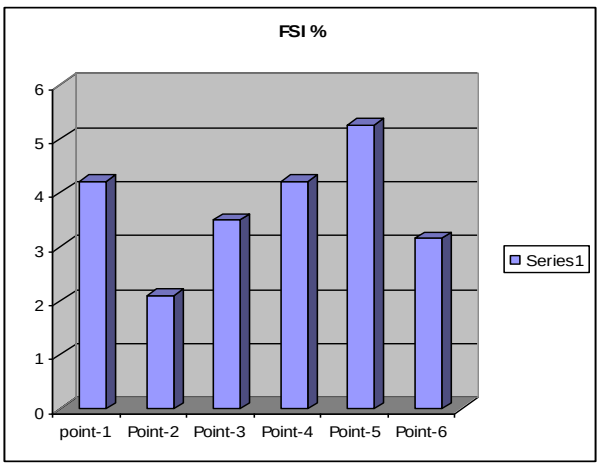
- Therefore, PCU/day = 520.167

III. LABORATRY WORK

3.1 Free Swell Index Test

- Free Swell Index is the increase in volume of a soil, without any external constraints, on submergence in water.
- Performed As per IS: 2720 (Part 40) 1977.

Reporting of Results



3.2 Liquid Limit Test

- The liquid limit of a soil is the moisture content, expressed as a percentage of the weight of the oven-dried soil, at the boundary between the liquid and plastic states of consistency.
- Reference: : IS:2720 (Part 5)-198
- CALCULATION OF LIQUID LIMIT:- At point 1

Cane No.	9	11	13
Mass Of Empty Cane	9.35	9.39	9.26
Mass Of Empty Cane + moist soil	26.74	26.36	24.38
Mass Of Empty Cane + Dry Soil	23.37	23.32	21.47
Mass of Soil Solid (Ms)	14.02	13.39	12.21
Mass of pore Water (Mw)	3.37	3.04	2.91
W = Water content	24.03	21.82	23.83
No. of Blows	27	23	20

Table 2: Reading of liquid limit test

- Water content at 25 blows is 22.95
- Liquid limit at point 1 is 22.95

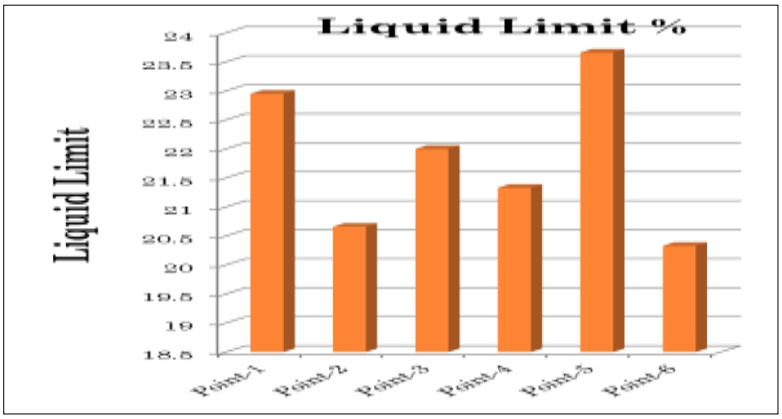


Chart 3. Liquid Limit at Different Point

3.3 Plastic Limit Test

The plastic limit is determined by rolling out a thread of the fine portion of a soil on a flat, non-porous surface.

3.4 Reporting of Results

The plastic limit should be determined for at least three portions of the soil passing through 425µm IS Sieve. The average water content to the nearest whole number should be reported.

At point 1:-

Cane No.	1	2	3
Mass Of Empty Cane	8.18	8.25	8.14
Mass Of Empty Cane + moist soil	21.57	22.17	20.89
Mass Of Empty Cane	19.64	20.19	19.08

+ Dry Soil			
Mass of Soil Solid(Ms)	11.46	11.94	10.94
Mass of pore Water(Mw)	1.93	1.98	1.94
W = Water content	16.84	16.58	16.54

Table 3: Reading of plastic limit

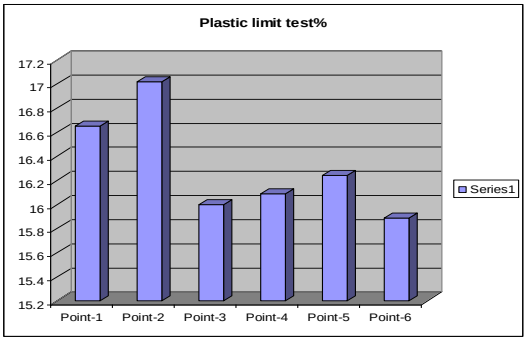


Chart 4: Plastic limit at different point

3.5 California Bearing Ratio

At point : 1

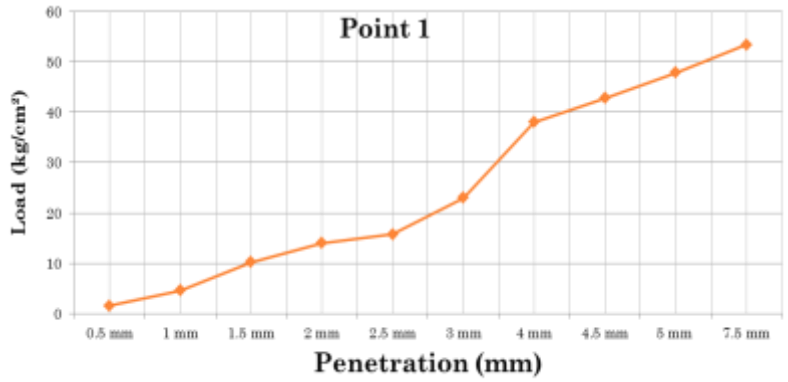


Chart 5: CBR test

Chart 6. CBR value at different point

3.6 Layers in Flexible Pavement

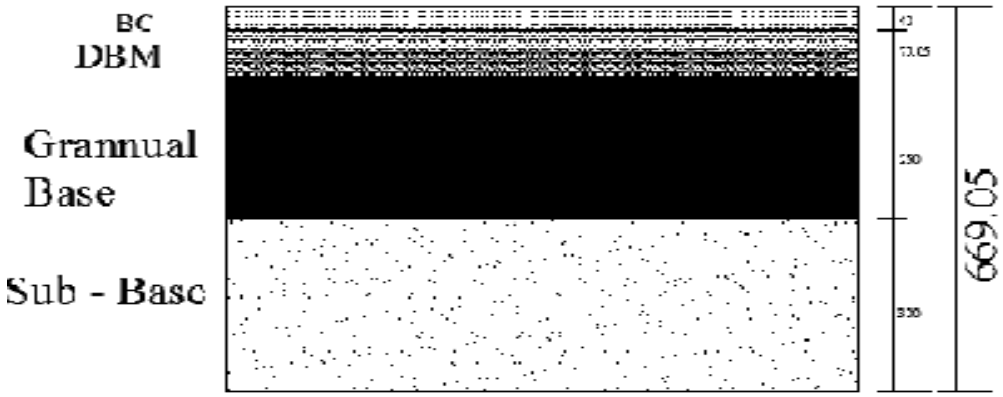


Fig 7. Design of pavement

Summary

Point	FSI %	Liquid Limit	Plastic Limit	Plasticity Index	CBRvalue	
					2.5mm	5mm
1	4.21	22.95	16.65	6.3	12	41.6
2	2.1	20.66	17.02	3.64	10.8	48.8
3	3.5	22	16	6	16.6	50.2
4	4.21	21.33	16.09	5.24	17.4	51
5	5.26	23.66	16.24	7.42	18	46.4
6	3.15	20.33	15.89	4.44	15.8	47.8

Table 4

IV. CONCLUSION

1. We observed traffic pattern which promotes us to design Flexible pavement.
2. Actual road is weaker presently because of poor maintenance & heavy rainfall in monsoon season.
3. Our soil testing record shows all the FSI results are below 50%, does mean soil does not require any special treatment.
4. Our soil group is Silt and very fine sand ; rock flour ; fine sand with low plasticity (ML) , which is suitable for subgrade for flexible pavement.
5. Cumulative number of standard axles to be catered for in the design
   N = 13.07 msa
6. Peak Hours of traffic = 8:30 TO 11:30 AM & 2:30 TO 5:30 PM
7. We obtain Pavement thickness = 669.05mm
   - Total DBM = 79.05 mm
   - Granular Base = 250 mm
   - Granular Sub-base = 300 mm

- BC (Bituminous Coarse) = 40mm

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