

MAINTENANCE AND REHABILITATION OF FLEXIBLE PAVEMENT (KOSMADI PATIA TO SEVNI, MDR ROAD- KAMREJ)

¹PARTHIK B. NAKRANI, ²KHUSHBU BHATT, ³SIDDHARTH GUPTA

Civil Engineering Department, Parul University, Vadodara.

¹P.G. Student, ^{2,3}Assistant Professor, Civil Engineering Department, Parul University, Limda, Vadodara.

E-mail: ¹parthiknakrani@gmail.com, ²k22112011@gmail.com, ³Siddharth.gupte@paruluniversity.ac.in

Abstract - The arterial are designed for the higher traffic and traffic but due to distress in the pavement, its functional performance was not achieved. The pavement of arterial roads are designed for the high loads and resistance of life but due to variety of side friction such as climate the functional performance of Pavement designed was not satisfactory due to lack of design criteria, quality control, improper load on pavement looking to the issue on the causes of pavement distress that occur on the surface study was carried out on pavement distress and proposing the maintain option on an arterial roads due to distress. Laboratory investigation was carried out to identify the distress on a selected section of Kosmadipatia to Sevni area. The major cause of pavement distress was identified in the study. The comparison was made by an ordinary method of pavement construction and adding waste plastic during construction method. The results of Marshall Stability of the pavement by adding the waste plastic was satisfactory.

Keywords - Maintenance Modified Bitumen, Plastic Waste, Rehabilitation.

I. INTRODUCTION

Transportation infrastructure plays a lead role in economic growth and development of country. India has the second largest highway and road networks system on the world. They carry almost 90 percent of the country's passenger traffic and 65 percent of its freight. However, most highways in India are narrow and congested with poor surface quality. Also most of India's villages do not have access to all weather roads.

Quality of the road surface, stiffness and thickness of pavement layers are important parameters which influences the performance and efficiency of roads. Pavement evaluation plays a very important role in repair and rehabilitation of existing roads and quality control of new roads.

Flexible pavement is made with different layers with different material. It is important to design all layers carefully. It transmits the load by grain to grain contact.

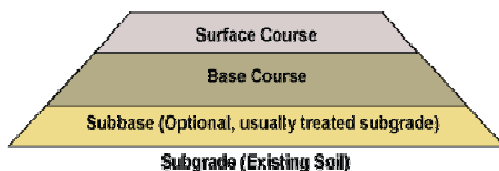


Fig 1- Flexible Pavement Layer

The aim of the thesis is Maintenance and Rehabilitation of flexible pavement and special focus on the performance of the pavement, find out the different aspect of deterioration of roadway, therefore suggest the suitable measure for the improvement of the selected road as per IS standard.

1.

II. OBJECTIVES

- To identify the different aspects of deterioration of Pavement.
- To suggest the suitable measures for the improvement of the selected damage stretch.

III. STUDY AREA

My study area site is KosmadiPatia to Sevni section runs in Kamrej district from Kosmadi-Morthana-Segva-Sevni. Map of site shown below. Total length of stretch is 10 km, nearby area is developing rapidly in last few years. In this stretch, there is a college route to Vidhyabharti Campus and many residential projects are going on, so that the traffic volume should be increased further days. There are many college buses and private vehicles like cars, bikes, vans and loaded trucks travels on the road. So that the pavement condition become rough, unsafe for road users.

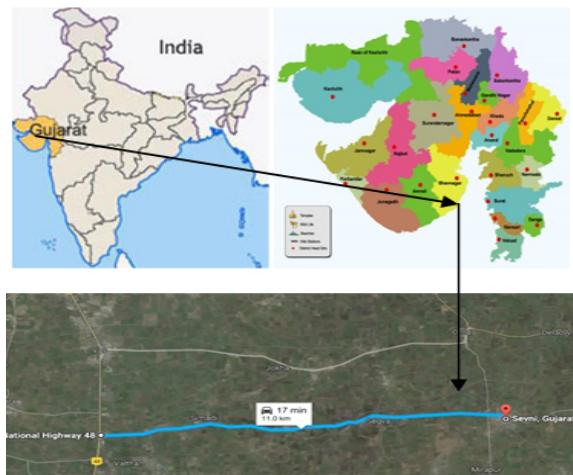


Fig 2- Study Area Location

The salient features of the Road Section are: measuring the deflections. The deflection measurements were taken according to IRC: 81-1997. (KosmadiPatia to Sevni village, Kamrej district)

- Length of the stretch: 10 km.
- Type of Pavement: Bituminous.
- No. of lanes: 2 lane.
- Divided/Undivided: Undivided.
- Type of Shoulder: Rough Shoulder.
- Surrounding Environment: Rural.
- Type of traffic: Mixed traffic.

IV. DATA COLLECTION & ANALYSIS

Pavement Condition Index (PCI): By using of pavement condition index, we can find out which type of improvement needed in pavement are as follows:

Chainage	PCI	Rating	Type of Improvement
0-1	3	Fair	Overlay
1-2	2.5	Fair	Overlay
2-3	2.5	Fair	Overlay
3-4	3	Fair	Overlay
4-5	2.5	Fair	Overlay
5-6	2.5	Fair	Overlay
6-7	3	Fair	Overlay
7-8	3	Fair	Overlay
8-9	4	Good	Routine
9-10	4	Good	Routine

Therefore, as per the table at chainage 1 to 8 km overlay required and at chainage 8 to 10 km routine maintenance required.

Test Property	Test results obtained By bitumen	Test results obtained By modified bitumen	Specification
Minimum stability (KN)	12.33	18.83	12.0
Flow (mm)	3.85	3.70	2 - 4
Per cent Air void	4.70	4.67	3-5
VFB	71.34	69.40	65-75
VMA	15.86	15.26	-
Compaction level (Number of blows)	75	75	75 blows on each of the two faces of the specimen
Bitumen Content	4.50 %	4.50 % + 6% plastic	-

Benkelman Beam Deflection Measurements: To determine the present structural adequacy of the project road, non-destructive method of Benkelman Beam rebound deflection has been used. A standard two-axle truck, having rear axle load of 8.16 tones and tyre pressure of 5.6 kg / cm² was used for



Fig 3- BBD Survey in progress - Deflection Observation point



Fig 4- Taking Dial gauge reading

Chainage (km)	Deflection (mm)	B.M. (mm)	DBM = 0.7 × B.M.
0-1	1.774	140	98
1-2	1.517	120	84
2-3	1.304	100	70
3-4	1.156	60	42
4-5	1.770	140	98
5-6	1.211	80	56
6-7	2.156	165	115.5
7-8	1.704	135	94.5

MARSHALL MIX DESIGN

COST ANALYSIS

Table 3: Cost comparison between Traditional Method and Waste Plastic modified bitumen method for 1 Km.

Sr.No	Item	Traditional Method (Rs/M.ton)	Using modified bitumen (Rs/M.ton)
1	Aggregate	233.31	233.31
2	Tack coat	72.72	72.72
3	Cost of asphalt	1449.13	1362.18
4	Cost of Waste Plastic	-	14.58
5	Cost of labour	398	398
6	Total	2153.16 Rs/M.ton	2080.79 Rs/M.ton
7	Total for 1645 M.ton	35,41,948	34,22,900

	× 2299.36 Rs/M.ton			[2]
Total Saving = 35,41,948 - 34,22,9 = 1, 19,048 □ per Km				

CONCLUSION

- Waste Plastic can decrease the Bitumen Consumption Therefore; it will decrease the construction cost of the road.
- There is no need to be Land Filling and Incineration process for disposal of waste plastic.
- The addition of waste plastic modifies the properties of bitumen. The modified bitumen shows good result when compared to standard results.
- The waste plastic bitumen mix forms better material for flexible pavement construction as the mix shows higher Marshall Stability value and suitable Marshall Coefficient.
- Plastic has property of absorbing sound, which also help in reducing the sound pollution of heavy traffic.
- Additional to above advantages of the construction of the Flexible pavement using waste plastic, the process saves □. 1. 19 lakh also.

REFERENCES

PAPERS

- [1] "Application Of Waste Plastic As An Effective Construction Material In Flexible Pavement", SasaneNeha B, Gaikwad Harish, Dr. J R Patil, Dr. S D Khandekar, IRJET, Volume 2, Issue 3, June 2015.

"A Proposed Design of Flexible Pavement using Waste Plastic", DeveshOjha, Dilip Kumar, IJEMR, Volume-4, Issue-5, October-2014.

"Comparative Study Of Hot Mix Asphalt To Warm Mix Asphalt Containing Plastic Waste For Sustainable Development Of Roads", Varinder Singh, Dr.Pardeep Kumar Gupta, IRJET, Volume: 03 Issue: 07 | July-2016.

"Pavement Evaluation And Rehabilitation Using Concrete Overlays For Low Volume Roads", Sadath Peer, Mamatha K H, Shivaprakash B G, Dinesh S V.

"Pavement Evaluation by Benkelman Beam of State Highway Section (Waghodiya Crossing to Limda)", Prof. A.A.Patel, Dhaval V. Lad, 2015.

"Partial Replacement of Bitumen by using Plastic Waste in Bitumen Concrete", Savita Devi, Rupeshkumar, Shad Ahmad, Jitendra Kumar Dhawan, PremchandYadav, SSRG-IJCE – volume 3 Issue 7 – July 2016.

"Reduction of optimum bitumen content in bituminous mixes using plastic coated aggregates", Remadevi M, Leni Stephen, Mini M I, IJRSET, Vol. 2, Issue 3, March 2013.

"Rehabilitation Of Low Volume Flexible Pavements By White Topping-A Case Study", Vinay H, Sunil S, 2014.

"Some Strategies for Sustainable Maintenance of Rural Roads In India", Agarwal, P. K, Singh, A. P., 2011.

"Study On Performance Of Flexible Highway Pavements", Rokade S, Agarwal P K, Shrivastava R, 2010.

"Structural Evaluation Using Benkelman Beam Deflection Technique And Rehabilitation Of Flexible Pavement For State Highway 188 (Sarsa Junction To Vasad Junction)", G.BhattMayank, Prof. AmitVankar, Dr L.B Zala, JIARM, Volume 1, Issue 4, May 2013.

IRC CODE:

- [1] IRC: 37 – 2012 "Tentative Guidelines for Design Of Flexible Pavements" IRC New Delhi.
- [2] IRC: 81-1997 "Guidelines for Strengthening of Flexible Road Pavement Using Benkelman Beam Deflection Technique" IRC New Delhi.
- [3] IRC: 82-1982 "Code of practice for maintenance of bituminous surfaces of highways" IRC New Delhi.
- [4] IRC: SP: 98-2013 "Guidelines for the use of waste plastic in hot bituminous mixes (Dry Process) in Wearing Courses" IRC New Delhi.

★★★