

Strengthening And Extension Of Existing Urban Road For The Development Of Industrial Corridor : A Case Study In Telangana State Highway (Sh-1)

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Abstract - Grossly, In India different types of pavement design have been observed, Most of the highways are having the flexible pavement. Pavement is designed to support the wheel load imposed on it from traffic moving over it. Extra Load per unit area is also imposed with the change in climate. Pavement shall be strong enough to resist the stresses and to distribute an external load. The study highlights the need of pavement evaluation and pavement evaluation measures for the road pavements of Hyderabad – Karimnagar – Ramagundam of state highway -1 also known as “Rajiv Highway” for the stretch of 207 km. The road plays an important role in connecting some of the main regions in Telangana state of Hyderabad, Siddipet, Karimnagar and Ramagundam. “This corridor is expected to play a vital role in the economic development of the Telengana region as the belt is marked by presence of several industrial units.” It is a great and well maintained highway in Telangana. It looks very beautiful with 4 lanes 2 carriage way traffic. We can achieve more than the design speed, The design speed would be around 85 to 100 km/h, one can travel by bike with safely. It takes hardly 2-1/2 hours to 3 hours to reach Hyderabad to Karimnagar. A distressed pavement should required the maintenance. This Maintenance can measures the constitute fresh investment on the existing roads.

Key Words: Extra load, Pavement evaluation, Economic development, Wheel Load....

1. INTRODUCTION

Transportation infrastructure plays a lead role in economic growth and development of country. The road transport is the ancient and perhaps the most widely adopted mode of transport of mankind. The road transport witnessed a tremendous growth rate after independence of our country. Pavements are the key elements of infrastructure of the country, whose functions are to promote transport activities, economic activities and to improve the standard of living. Flexible pavements undergoes the functional deterioration as well as the structural deterioration simultaneously due to the combine effects of climate, environment and traffic loads.

The functional deterioration is also indicated by the changes in surface condition of the pavement in the form of distress in the quality, which can be measured by simple methods ; it is also possible to restore the surface to original condition of the pavement by providing a profile correction course and a re-surfacing the layer.

2.LITERATURE REVIEW

BHAGAT KUNAL P, et.al (2015), in this literature flexible pavement overlay design was carried out as per IRC: 81-1997 -Guidelines for Flexible Road Pavement Strengthening using Benkelman beam deflection (BBD) technique. The design thickness is designed as per the evaluated of Benkelman beam deflection is 85mm of bituminous layer. They have done overlay design as per IRC: 37-2012 base on fatigue and rutting failure of criteria. The various inputs required for the design is computed with the deflection & existing pavement layer thickness as per IRC guidelines. The design is checked with the software of IIT-PAVE for horizontal tensile strain computed at the bottom of layer of bituminous and vertical strain at sub-grade on top. The computed fatigue & rutting strain is 0.0837 micron and 169 micron due to material, which is the lower than strain due to traffic so that the overlay design found safely in both criteria.

MAHENDRAKAR KIRAN KUMAR, et.al (2015) in this research they have studied on a factor, which causes further concern in Indian is very high and very low pavement temperature in some parts of the country. Under this condition, flexible pavement tends to become soft in summer and brittle in winter. Further increase in road traffic since the last 10years with an un-duly low level of maintenance has contributed to accelerated damage of road surfacing. To prevent this deterioration process, several types of measurements may be adopted effectively such as improved design use of high performance material and effective construction technology. Over the last 20 years, traffic volume and the percentage of heavy truck traffic have increased enormously on the national highway - 18. This pavement is a flexible pavement with bituminous surface.

DHAVAL V. LAD, et.al (2015) in this structural evaluation of flexible pavement deflection by the Benkelman Beam is measured. Re-bound deflection is used for overlay design. A detailed pavement condition survey is done on State Highway 158 (Waghodiya crossing to Limda) and the road condition is evaluated structurally. Their present study is evaluate's the overlay thickness for State Highway 158 Waghodiya is crossing to Limda.

This studied method in they have carried out visual survey and structural survey. In visual survey find Rutting, Patching and Pot-hole and in structural survey find deflection by Benkelman beam deflection test.

UMERSALAM, et.al (2015) in this research they have focus on need of pavement evaluation and pavement evaluation measures for the road pavements of urban areas in Kashmir. The collection of required field data such as sub grade data of soil, existing pavement structure, traffic data, surface condition of pavement and rebound deflection by using BBD technique, laboratory investigation is finally the design of the over all thickness of the road pavement and overlay what so ever required to strengthen the road stretche. In this given compassion between newly propose thickness and existing pavement thickness.

3.OBJECTIVES OF STUDY

The main objectives of this study are below:

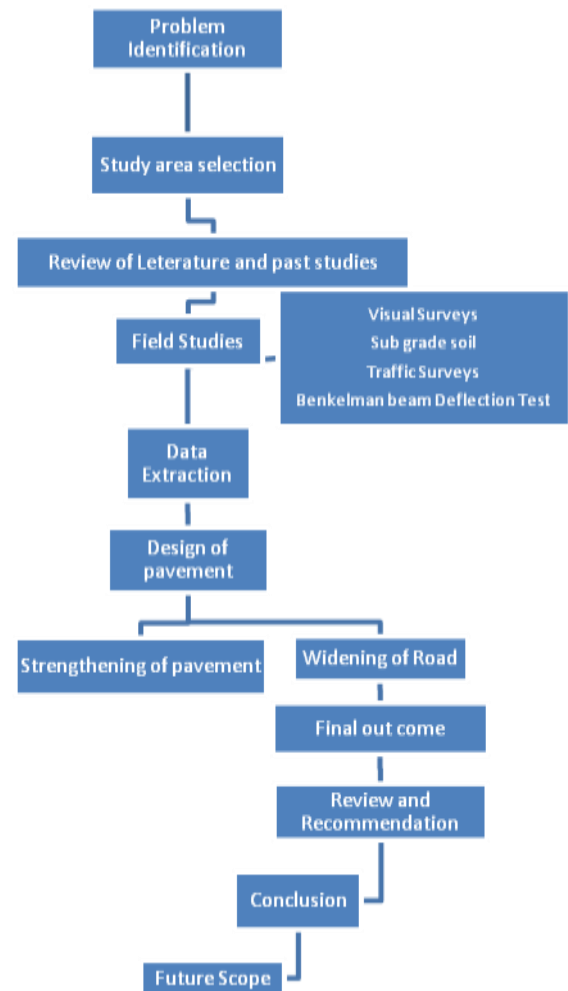
1. To evaluate the necessity of strengthening and overlay design.
2. To know the impact of road widening on environment
3. To study the need of road widening and justify.
4. Development opportunities are to ensure that roadway improvement are committed.
5. To analyse the impact of road widening on local residents.
6. To avoid the congestion on the highway roads.
7. To increase the maximum speed of Vehicles in short period of time.

4.METHODOLOGY

The Methodology involved for the study is as follows.

- 1) The detailed site investigation : in which road inventory data, traffic flow condition and identify the traffic circulation pattern in & around study area.
- 2) The traffic survey & Analysis: A Collected data has analysed to identify roadway segment capacity, based on the IRC Guidelines for the capacity of Urban Road in plain area IRC: 86-1983.
- 3) Preparation of a conceptual design : A Next step has to propose section specific inventions to be identified and

prepare their of implementation plan. Based on the need of urgency.



Flow Chart – 1: Methodology

5.DATA COLLECTION

The various data collected are as follows:

5.1 Atterberg Limits

Liquid limit value is 56%

Plastic limit value is 27%

5.2 CBR Test: To find the Bearing capacity of soil. The values of deformations and proven ring divisions are mentioned in the observation table 1.

Table -1: CBR values

Deformations (mm)	Proven ring divisions
0	0
0.5	15
1	31
1.5	44
2	59
2.5	72
3	87
3.5	101
4	115

Result: CBR Value at 2.5 mm = 5%

5.3 Aggregate Impact value is found to be 5.84%.

5.4 Aggregate crushing value is found to be 18.87%.

5.5 Commercial Vehicle per day(CVPD) is 2815.

Road Inventory Data Has Collected Which Are Given Below:

- Name of work: Widening and strengthening of PWD road from JBS to Ramagundam via Siddipet.
- Length of stretch: 207 Kms
- Type of Pavement: Bituminous
- Carriage way width: 7 Mtrs
- No.of Lanes: 4 Lanes
- Surrounding Environment:Rural & Urban
- Existing Road: 2Lane Road
- Type of traffic: Mixed traffic
- Class of Road :State Highway

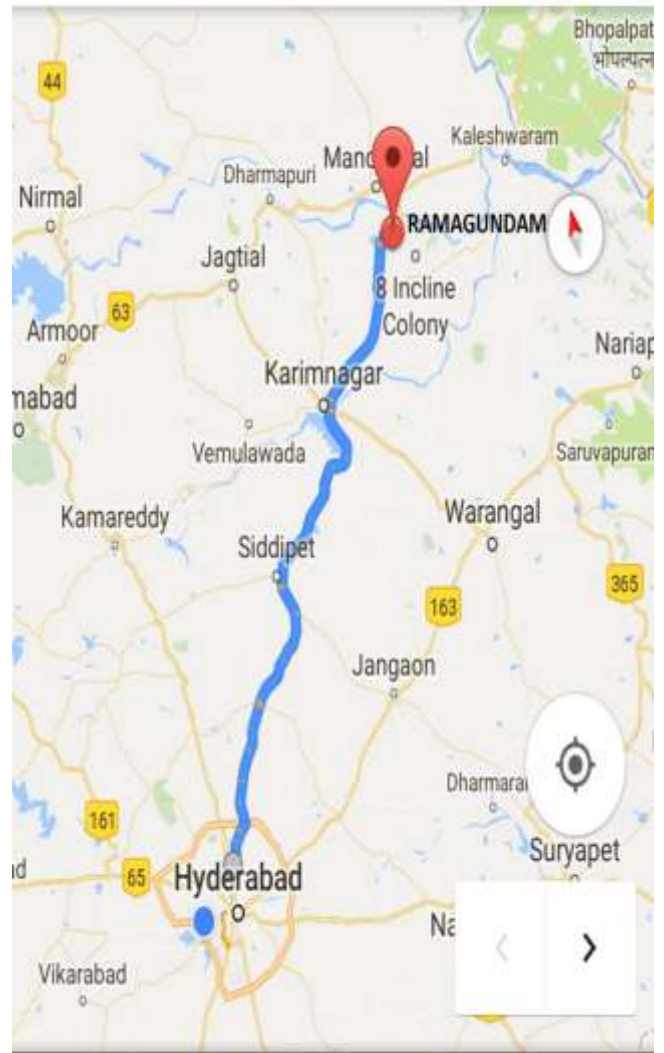


Fig-1: Location and Layout of study area

6.RESULT AND CONCLUSION

Calculation of million standard axles for widening portion:

$$N_s = \frac{365 \times A [(1+r)^x - 1]}{r} \times F$$

Where,

N_s = The Cumulative no. of standard axles is to be catered for in the design

A = The Initial traffic, in the year of completion of construction, in terms of the no. of commercial vehicles per day duely modified to the account for lane distribution

r = Annually growth rate of commercial vehicles

x = Designed life in years

F = Vehicle damage factor (no. of standard axles per commercial vehicle)

N_s = 50msa(For widening portion)

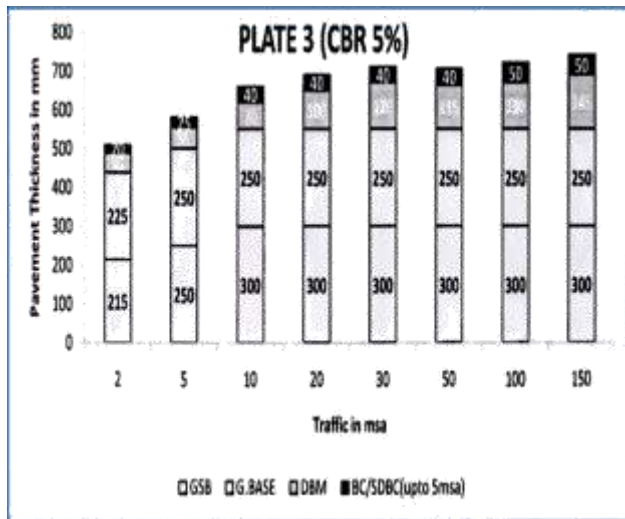


Fig: 2 Flexible pavement design plate

The design is Mostly depends on Design traffic of 50msa:

The total proposed Layer thickness= 705mm

- Bituminous Surface Layer= 155mm
- G. Base= 250mm
- GSB=300mm

CONCLUSIONS:

- It is observed from data that average daily traffic (ADT) in PCU/day is more than the IRC recommended for capacity per day of 2 lane for plain rural road.
- Average daily traffic (ADT) on Hyd to Ramagundum state highway 1 is 25,843 PCU/day, it is more than 15,000 PCU/day of IRC recommended for capacity per day of 2 lane plain rural road from which it has been justified that widening is required on the selected stretch.
- Mechanistic pavement design for widening is also proposed which will be having 745 mm of overall depth with surface layer of 195 mm, base layer 250 mm and sub-base layer 300 mm.
- Overlay thickness at each section (total 4 kilometer) is calculated in 3 alternate designs like BC/DBM, DBM and BM are i) 35/40, 85 and 120; ii) 35/40, 75 and 105; iii) 30/40, 70 and 100; iv) 35/55, 90 and 125 respectively.

FUTURE SCOPE

- Structural evaluation of the pavement can be done by using falling weight.deflectometer (FWD) and/or light weight deflectometer (LWD).
- Estimation for the widening and overlay can be computed.
- Other pavement design software can be used for evaluation.
- Alternate material can be used in the pavement designing.

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