"Case Study on Lane Widening Project based on Prediction of Level of Service (LOS) And Financial Analysis of Bharatpur Bypass from NH-11"

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Abstract - In India different types of pavement design are observed, Most of the highways are having the flexible pavement. Pavements have been designed to support the wheel load imposed on it from traffic moving over it. Additional stresses also imposed by change in the climate. Pavement should be strong enough to resist the stresses and to distribute the external load. The study highlights the necessity of pavement evaluation and pavement evaluation measures for the road pavements of Bharatpur-Mathura Bye pass. Design of extra width of road and overlay thickness of the road pavement and strengthening of the pavement has been discussed for the same road stretch.

For road widening the present traffic volume study has been carried out and compared with design standard volume as per IRC: 64-1990 guidelines and need of widening is justified. Widened portion mechanistic flexible pavement design has been carried out as per IRC: 37- 2012.

1. INTRODUCTION

Scope of transportation system has developed very largely. This led to the rise in vehicle traffic especially in transport network. Thus road space available was becoming insufficient to fulfill the growing demand of traffic and congestion started. The population of India is growing day by day. The intensity of the traffic and pedestrians crossing has increased significantly and there's no scope for increasing the road length and widening because of land acquisition problem especially at junctions in multiple directions. For lots of reasons such as population, economic and auto ownership growth, increasing traffic demand can exceed the carrying capacity of the road during peak periods. As a consequence, traffic condition deteriorates and safety risk worsens. Capacity of a road is represented by the maximum rate at which vehicles can meet up through a given point in an hour under prevailing operational conditions. Intersection capacity or volume-to-capacity ratio is one among of the operational measures of effectiveness are used in measuring LOS.

The Govt. of Rajasthan, has realized the worth of development of infrastructure within the overall growth of the state. Rajasthan government has decided through RIDCOR for Widening and improvement of Bharatpur Bye Pass Road, from NH-11 to Mathura Border. Total length of Bye Pass is 23.02 km. Initial 2.3 km road already has been widened to 4 Lane and remainder of widening and strengthening is that the part of this report.

1.1 Problem & Their Causes

➢ India is one among of the fastest growing economies in the world. The average income of Indians is growing and thereby the amount of privately owned vehicles is rising.

➢ Though transport is widely available in India, still its not sufficient for the population of India. Especially in Metro cities, often transport services are congested. So, to travel peacefully people are choosing for commuting in their own vehicles. And as a result more vehicles are going on roads.

➢ Lack of parking spaces is one among main problem of traffic congestion in India. Because of lack of parking spaces people are forced to park their vehicles in front of the buildings often encroaching roads. This ends up in the less usable road.

➢ Poor quality of roads is also a major cause. Often this leads to repairs and thereby reducing the usable space.

➢ Lack of proper implementation of traffic rules.

➢ Due to lack of footpaths in many places, pedestrians are forced to walk on the corner of roads which further increasing traffic issues.

1.2 Objectives & Need of Study

➢ To study the present traffic situation for the selected road

➢ To find the level of service of the selected road .

➢ To evaluate the traffic performance operation and transport scenario of mixed traffic in urban stretch of City.

➢ To propose the traffic improvement measures for the chosen road stretch.

➢ Prediction of Level of Service (LOS) Different Locations based on volume-speed relationship of an urban road widening project.

➢ To promote the efficient use of the present facilities

➢ To improve cost recovery and revenue generation throughout the sub-sector

➢ To make efficient and prudent use of the limited resources available for capital investments in roads.

➢ To provide a satisfactory riding quality to the road users.

➢ To reduce number of accidents.

➢ To ensure safe and efficient movement of traffic.

2. REVIEW OF LITERATURE & INDIAN STANDARDS

2.1 Breeten Singh Konthoujam, Dr. M. R. Rajashekar (2015) "A Study On Urban Road Widening Project Based On Prediction Of Level Of Service (Los)- A Case Study In Banetghatta Road Bangalore"

2.2 Indrajit Ghosh, Satish Chandra, Amardeep Boora (2013) "Operational Performance Measures for Two-Lane Roads: An Assessment Of Methodological Alternatives"

2.3 Kazunori Munehiro, Azuma Takemoto, Satoshi Kasai, Motoki Asano (2011) "Analysis On Rural Highway Design Using Traffic Micro-Simulation In Cold Regions"

2.4 C.C. Bhattacharya considered safety as a main objective and introduced traffic calming techniques. The only idea for this study is to enforce a speed control to 15 - 20 km/hr., which is taken as a safe speed of travel. Methods performed and designed during this study are changed in street alignment, installation of barriers and installation of other control devices as the situations requires. Decrement in number and severity of accidents, enhance facilities for non- motorized modes, increased in property value etc. are the benefits of traffic calming.

2.5 P.K Sahooet conducted a study on traffic flow characteristics which contains traffic speed, volume, density, etc. on two stretches of national highway no. 5 connecting Bhubaneswar , capital of Odisha. The sector study was done for 1km length on each stretches. The primary stretch was between Bhubaneswar to Cuttackand the second was between Bhubaneswar and khurda.

The experiment was conducted between the average peak periods on week days. The traffic density and vehicular speed was observed through regression equations. The speed – flow relationship was drawn and concluded that the speed decreases with the increase in volume. On the Bhubaneswar –Khurda stretch at a traffic volume of around 750 veh/hr , the lowest average speed was 30 kmph and 33 kmph on the Bhubaneswar – cuttack stretch at about 850 veh/hr.

2.6 IRC 37-2018 :- For flexible pavement designs and other considerations.

2.7   IRC 84-2014 :- For specification of four laning of road

2.8   IRC 19-2001:- For specification of traffic analysis

3   PROJECT DESCRIOTION

This road has been planned to decongest Bharatpur City. This road joins the traffic from NH-11 to Mathura (UP Border). This connects traffic from Jaipur to Mathura

The whole road divided in 3 sections:-

Section-1: NH-11 to Sarson Anusandhan Kendra (2.3 km)

Section-2: Part - I - Sarson Anusandhan Kendra to Kanjoli (4.10km)

Section-3: RUB & ROB – Kanjoli to Mathura – UP Border (16.62 km)

4   STUDY AREA & MEHTHODOLOGY

It contains study area and its characteristics and proposed methodology adopted for strengthening and widening of road pavement.

Following Steps will be carried out For This Purpose.

    A.   Data Collection & Traffic Volume Survey

    B.   Analysis of Traffic Data & Forecasting

    C.   Design & Estimate of Pavement

    D.   Financial Analysis & Repayment Strategies

A. Data Collection & Traffic Volume Survey

Capacity analysis is fundamental to the planning, design and operation of roads, and provides, among other things, the basis for determining the carriageway width to be provided at any point in a road network with respect to the volume and composition of traffic. Moreover, it is a valuable tool for evaluation of the investments needed for future road construction and improvements, and for working out priorities between the competing projects.

Traffic volume survey carried out at Bharatapur Bypass Road in PCU/day for justification of capacity of road. 7 days 24 hours survey has carried out for the wide and accurate justification of road capacity.

| TIME (HOURLY) | WHEELERS | | | BUS | | LCV | TRUCK | | | TRACTOR | | SLOW VEHICLE | | |
	Two	Three	Car/ Jeep	Mini	Full		2-axle	3-axle	Multi Axle	With Trailer	Without Trailer	Cycle / Rickshaw	Animal/ Carts	Others
DD-MM-YY														

Traffic volume study data for three days are tabulated in Above Format.

B. Analysis of Traffic Data & Forecasting

Traffic projection of project with comparing irc recommendation:-

Capacity analysis of the project road has been carried out based on traffic projections. As per the Traffic counting following PCU of the route has been optained.

Chainage (km)	Year 2020	Year 2021	Year 2026
	PCU	PCU	PCU
Whole Route	11599	12178	15543

The IRC recommended design service volumes for 2 lane roads for plain terrine and curvature (degrees per kilometer 0-50) are 15,000 PCU/day. And also the actual PCU/day of selected stretch is 15543 PCU/day. So that according to IRC recommendation and present PCU/day widening of road is required.

C. Design & Estimate of Pavement

Pavement has been designed by CBR Method as per IRC 37-2012 and Following Thickness of Pavement has been obtained.

Structural Section:	Thickness	
Bituminous Surfacing	40	mm
DBM	75	mm
Granular Base	250	mm
Granular Sub-Base	260	mm

Total Pavement Thickness for design C.B.R. IS 625mm & For This Thickness of Pavement, Estimate of The Road Section has been Calculated which is 4464.31 LAC Rupees.

D. Financial Analysis & Repayment Strategies

➢ Annual Toll Revenue of each year on quarterly basis has been calculated first as per the `Standard growth rate.
➢ All Tollable vehicles are considered in repayment schedule.
➢ Construction year of Project is Taken as 2021

➢ As per the Analysis Repayment of Total Cost of Project is occurring in year 2048
➢ Result from the analysis is Shown in the Following Table:

Construction Period	1	Years	0	Months
Repayment Period	25	Years	2	Months
Total Concession Period	26	Years	2	Months

5 CONCLUSIONS

➢ It is observed from data that average daily traffic (ADT) in PCU/day in 5 years will be more than the IRC recommended for capacity per day of 2 lane road.
➢ Average daily traffic (ADT) on highway is 15543 PCU/day, it is more than 15,000 PCU/day of IRC recommended for capacity per day of 2 lane road from which it has been justified that widening is required on the selected stretch.
➢ Overlay thickness at each section is calculated total of 625mm in 4 alternate designs like BC 40mm , DBM 75mm, Granular Base of 250mm &Gradual Sub base of 260mm.
➢ The developed methods may be used for dealing with similar projects i.e. lane widening of different type of roads.
➢ Constructed Cost of the projected will be equaled in 2046-47 from the Toll.
➢ Period of Repayment period of the construction cost is around 25 years and 3 month.

6　FUTURE SCOPE

➢ 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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7   REFERENCES

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