

“EFFECT OF PAVEMENT CONDITION ON CAPACITY AND LEVEL OF SERVICE FOR URBAN ROAD”

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ABSTRACT

This study deals with the flexible pavement condition and its effect on capacity and level of service of urban road. There are two stretches raiya road and field marshal road of 1km straight length selected for functional evaluation. The distress parameters are included cracking, raveling, potholes, shoving, patching, settlement - depression and Rut depth. Ratings of pavement have been done on the selected urban roads by using Guidelines for Maintenance Management of Primary, Secondary and Urban Roads, IRC 2004. In this study, Traffic volume count data was collected in selected urban road and calculate capacity of road and according to capacity find out the Level of Service (LOS) as per Indo HCM-2017 on urban road. It is found that, the raiya road rating is 4 and condition is good and the field marshal road rating is 2.86 and condition is poor to fair by using Guidelines for Maintenance Management of Primary, Secondary and Urban Roads, IRC 2004. It is found that, the raiya road level of service is below C and the field marshal road level of service is above D by using Indo HCM-2017. In this research has been carried out investigating the relationship between roadway surface conditions and traffic quality.

KEY WORDS: flexible pavement, rating, condition assessment, capacity, Level of service.

1] INTRODUCTION

Traffic flow in most cities of India may be a mixed traffic characteristics and also the traffic jam is that the common problem in most major cities in India. Due to the rise of Rajkot city urbanization and number of private vehicles in most parts of city badly affected the capacity and level of service of roads and capacity also affected of roads functional condition. Present study mainly focuses on the effect of pavement condition on capacity and LOS of urban road. In this study, the pavement condition survey, different types of distress like crack, potholes, ravelling, patching & shoving are identified and measured. Capacity is a quantitative measure, whereas LOS is a qualitative measure. Capacity of a road is represented by the most rate at which vehicles can pass a given point in an hour under prevailing operational conditions. Volume-to-capacity ratio is one in every of the operational measures of effectiveness employed in measuring level of service. Level of Service (LOS) is one such parameter in terms of compatibility that gives a quality measure for the operational conditions within a traffic stream, i.e., generally in terms of service that is provided by the road to the user.

2] LITERATURE REVIEW

[1] Wadalkar Shruti S., et.al.(2020) “Rating and Condition Assessment of Urban Roads Based on Functional Distresses” (International Journal of Recent Technology and Engineering)

The pavement management system deals with a pavement condition assessment. Rating of pavement can be done on the pavement condition assessment. Structural and functional distress is responsible for the failure of pavements. In this work,

significant functional distresses which occur in flexible pavements are considered for the rating and assessment of road sections. The functional distress considered are Raveling, Potholes, Shoving, Patching, Depression, and Rutting as these are common and frequently occurred in the flexible pavements. The study of these distresses is done by authors. The measurement of distresses is done as per guideline given by the Indian Road Congress 1982 is used. For the condition, assessment guideline provided in Maintenance Management of Primary, Secondary, and Urban Roads, IRC, 2004, is used. Total five road section in the Pune region is considered for the study. All are flexible pavements.

In this work, major functional distresses are considered for the condition assessment of urban roads. Flexible pavements are considered for the study as the majority of urban roads are constructed as flexible pavements. Functional distresses Viz. Raveling, Potholes, Shoving, Patching, Depression, and Rutting are considered for the assessment as these are common and frequently occurred in the flexible pavements. Condition assessment of road is done based on the guideline for pavement condition rating given by Guidelines for Maintenance Management of Primary, Secondary, and Urban Roads, IRC, 2004.

[2] Harita C. Koringa , et.al. (2020) “Estimation of Capacity and Level of Service for Urban Arterial Road – A Case Study of Rajkot City” (International Journal of Innovative Research in Science, Engineering and Technology)

In this study signify the concept of capacity and level of service for urban roads for heterogeneous traffic condition. In study is carried out two stretches Dr. Yagnik Road and 150ft. Ring Road in Rajkot Urban road. Various Speed - Density relationships have been established in this study, which in turn have been deployed towards the development of relationship between speed and flow eventually leading to the estimation of the roadway capacity. Factors influencing capacity are classified volume of vehicle, average speed and density. Level of Service is found out from density and speed. The anxiety about the deterioration in the LOS is due to the uninhibited growth of vehicular traffic volume, shortfall of supply side of transportation capacity, resulting in the supplementary delay, additional fuel consumption, user cost etc.

The actual capacity analysis is fundamental to plan and improve the existing traffic facilities. Capacity is increase with increase in width of carriageway for selected different road section and Level of service is increase with the decrease in the width of carriageway. The observed capacity value by the static PCU method is 11% higher than the suggested value by IRC.

[3] Silpa Sekhar G and Vincy Varghese (2020)“Influence of Pavement Condition on Headway and Average Travel Speed” (International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering)

To evaluate the capacity and service level of road section accurately, it is necessary to study the quantified influence of pavement on headway and average travel speed. In this project work, pothole width, rut depth etc. were used as indicators to evaluate the status of damaged pavements. Based on the parameter surveyed on different pavement sections, the effects of pavement condition on headway and average travel speed are analyzed. The main objective of this study is to evaluate the influence of pavement condition on headway and average travel speed. From the study it was identified that the pavement condition has a greater influence on speed and headway. Section 5, 7, 10, 11 are in good condition and section 15 is rated as serious. Maximum speed obtained is 52.5 kmph and minimum speed obtained is 25 kmph.

3] METHODOLOGY

Methodology for this study depends on flexible pavement condition and its effect on capacity and level of service of urban road. Two lane undivided road has selected for the study. There are two stretches raiya road and field marshal road of

1km straight length selected for functional evaluation and that road width is 6.6 meter and the collection of distress data will be analyzed by using Guidelines for maintenance management of primary, secondary and urban roads (IRC-2004). For Traffic volume study, the straight mid block section selected and it should be free from effect of intersection, curvature, bus stop or any other side friction. After performing various traffic volume studies and collection of data, the data will be analyzed by using Indo HCM-2017 and to estimate the capacity and level of service of the selected road stretch.

4] DATA COLLECTION & ANALYSIS

4.1] Functional Evaluation:

The functional distress considered for the study is cracks, ravelling, potholes, shoving, patching, settlement & depression and rutting. Various distress areas were collected in selected road.

- The Following figure 4.1 & 4.2 shown types of distress and that area (m²) at raiya road and field marshal road.

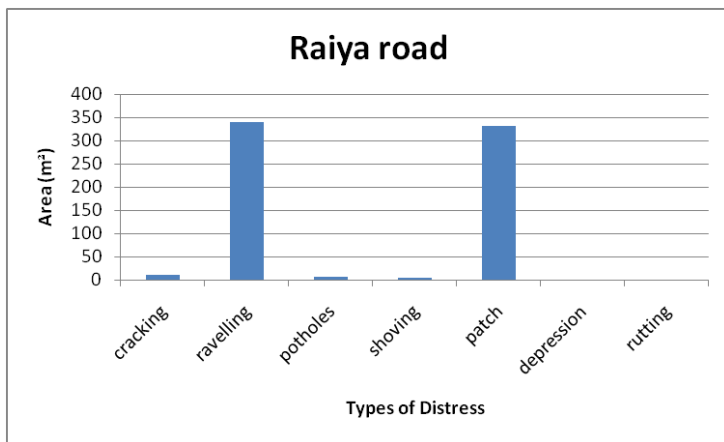


Figure 4.1 Chart of Distress at raiya road

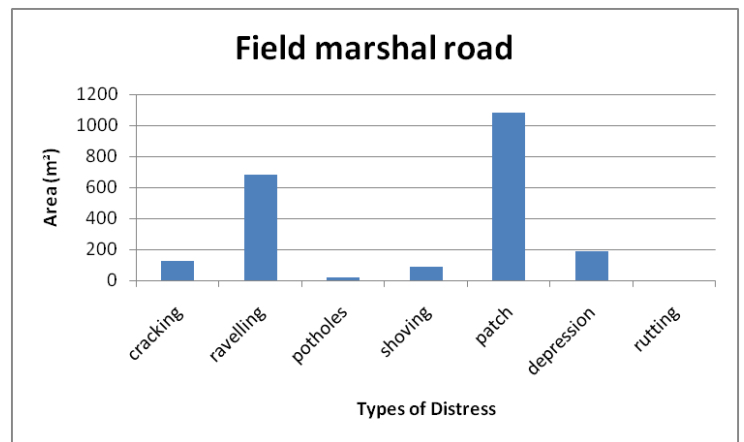


Figure 4.2 Charts of Distress at Field marshal road

- Rating and condition is done by guidelines for maintenance management of primary, secondary and urban roads (IRC-2004).

Table 4.1 Rating & condition Analysis

Road section	Rating of basis of percentage distress							Avg. rating	Condition
	Cracking	Ravelling	Potholes	Shoving	Patch	Depression	Rutting		
Raiya road	5	3	3	4	3	5	5	4	Good
Field Marshal road	5	2	3	1	2	2	5	2.86	Poor to Fair

4.2] Traffic volume count:

Data should be collected at two stretches for classified volume count at mid-block section. Traffic volume data was collected in morning 9:00am to 12:00pm and in evening 5:00pm to 8:00pm at mid-block section by manual method. Types of vehicles included two wheeler, three wheeler, car, bus, light commercial vehicle, truck, tractor and cycle. Traffic volume data should be in terms of pcu/hr.

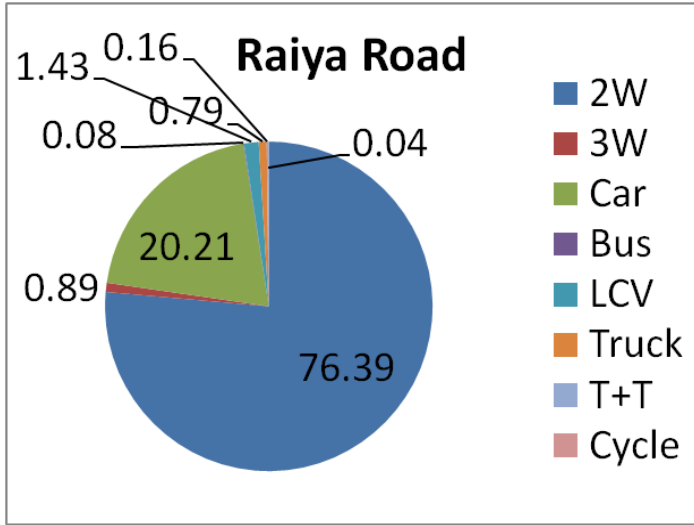


Figure 4.1 Percentage of traffic volume at Raiya road (Saturday)

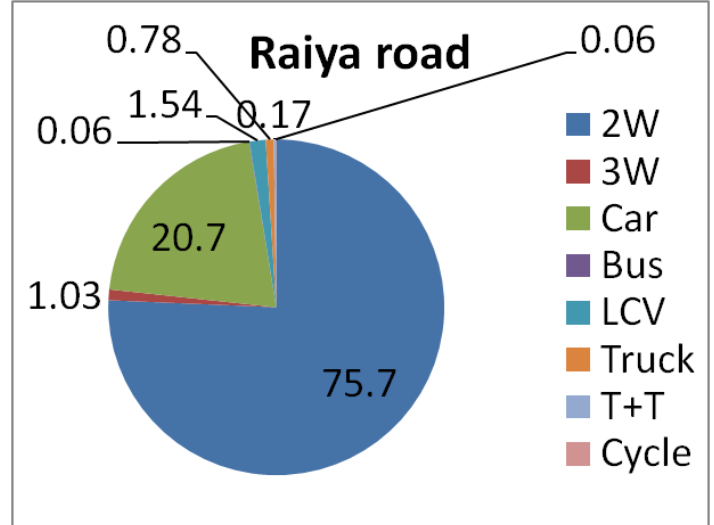


Figure 4.2 Percentage of traffic volume at Raiya road (Sunday)

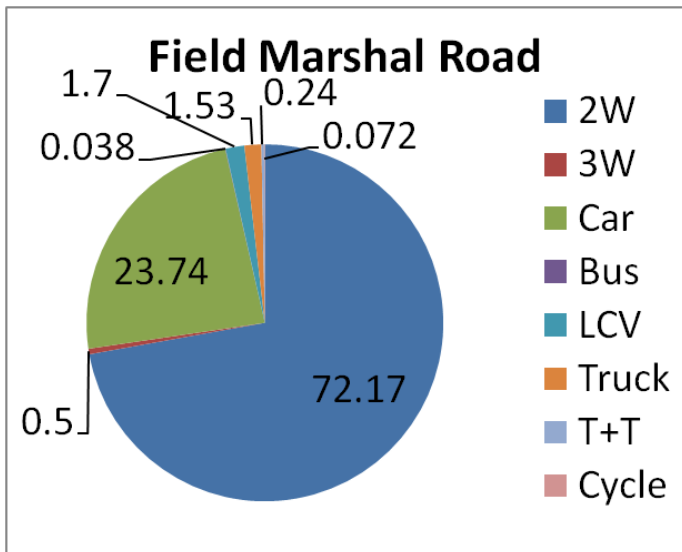


Figure 4.3 Percentage of traffic volume at Field Marshal road (Saturday)

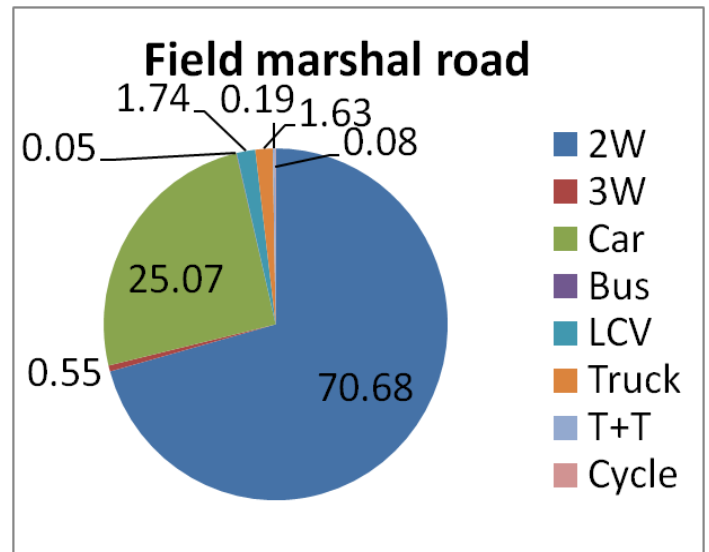


Figure 4.4 Percentage of traffic volume at Field Marshal road (Sunday)

- The following table 4.2 is observed capacity of road at raiya road and Field marshal road.

Table 4.2 Capacity of Road (pcu/hr)

Time	Capacity (pcu/hr) at Raiya Road		Capacity (pcu/hr) at Field Marshal road	
	Date:09/10/2021 Saturday	Date:10/10/2021 Sunday	Date:16/10/2021 Saturday	Date:17/10/2021 Sunday
9:00 to 10:00 AM	1256.01	1452.04	1982.04	2197.32
10:00 to 11:00 AM	1282.78	1281.22	2056.86	1924.00
11:00 to 12:00PM	1176.62	1109.66	1872.07	1819.55
5:00 to 6:00 PM	1235.49	1216.57	1837.2	1814.41
6:00 to 7:00 PM	1382.42	1345.00	2054.7	2045.01
7:00 to 8:00 PM	1574.31	1602.48	2062.72	2173.16

4.3] Evaluation of Level of service:

- Calculated LOS based on volume to capacity (v/c) ratio by using Indo HCM-2017 method.

Table 4.3 Determination of LOS

Time	LOS at Raiya road		LOS at Field marshal road	
	Date:09/10/2021 Saturday	Date:10/10/2021 Sunday	Date:16/10/2021 Saturday	Date:17/10/2021 Sunday
9:00 to 10:00 AM	B	C	D	E
10:00 to 11:00 AM	B	C	E	D
11:00 to 12:00 PM	B	B	D	D
5:00 to 6:00 PM	B	B	D	D
6:00 to 7:00 PM	C	C	E	D
7:00 to 8:00 PM	C	C	E	E

5] CONCLUSION

5.1] Conclusion:

The present study is carried out roadway conditions and their capacity and level of service. It is found that, the raiya road rating is 4, condition is good, observed capacity is low and level of service is B & C. It is found that, the Field marshal Road rating is 2.86, condition is poor to fair, observed capacity is high and level of service is D & E. According to result analysis when pavement condition is good at that time capacity is low and LOS is above C (traffic quality nearest to good) and when pavement condition is poor to fair at that time capacity is high and LOS is below D (traffic quality nearest to poor). Hence, according to result say that effect of pavement condition which is directly affecting on the road traffic quality parameter.

6] REFERENCES

6.1] Journal article:

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