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Investigation And Analysis of Traffic Flow Capacity And Level of Service Determination of Three Bridges Across Sabarmati River In Ahmedabad Metro City

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Abstract - *India is one of the world's developing nations. There are numerous intricate issues with the nation's transportation system. These include an ever-growing population, an increase in vehicles, and clogged roads. Gujarat is one of the states in our nation that is growing the fastest. Ahmedabad is a growing metropolis. The city is Gujarat's largest city. Out of the 11 bridges that span the Sabarmati River in Ahmedabad, some of the bridges that connect the city's residential and commercial areas experience heavy traffic during peak hours, causing backups and bottlenecks in some areas. Following a survey, the three bridges—Swami Vivekanand Bridge, Sardar Bridge, and Subhash Bridge—are chosen for analysis of traffic flow capacity and service level. In order to suggest improvements in the current traffic congestion on selected bridges, it is important to quantify the traffic characteristics in the traffic circumstances that now exist on those bridges. By measuring the parameters for traffic speed, flow, and density on the chosen bridges during peak hours, I will be able to determine the traffic flow capacity and Level of Service in this study. This could be useful to determine whether or not the current bridges can safely handle the current and future increases in traffic flow.*

Keywords: **Bridge, Traffic, Population.**

1. INTRODUCTION

In developing nations like India, traffic congestion is one of the main problems that most metropolises face, and numerous strategies have been implemented to reduce it. The initial stage in such attempts is to identify the features of congestion because this information is crucial for choosing the right course of action. Understanding the fundamentals of traffic flow characteristics, such as traffic volume under such traffic conditions, is important for the planning, designing, and operating of roadway systems. Congestion affects the movement of people and freight and is closely related to the past of having high levels of accessibility and mobility, both in perception and in actuality. Traffic congestion wastes time and resources, results in stress and pollution, lowers productivity, and has a financial impact on society.

2. OBJECTIVE & AIM

A. Objective

- To calculate the traffic capacity parameters, including volume, composition, speed, and density of the traffic as well as travel time on the chosen bridges.
- To determine the selected bridges' level of service.

To recommend solutions for reducing traffic congestion on the chosen bridges

B. Aim

By measuring traffic speed, flow, and density parameters on the selected bridges across the Sabarmati River during peak hours in Ahmedabad city, the study's objective is to determine traffic flow capacity and Level of Service. The goal of the study is to identify corrective actions for reducing traffic congestion at particular bridges.

3. PROBLEM STATEMENT

Traffic congestion is an issue in India that has become worse because of ongoing urbanization, a growth in the number of private automobiles, the heterogeneous character of the traffic, the lack of lane discipline, unlawful encroachments on urban streets, and a variety of other factors. What is the cause of the rise in car operating costs? Because there is a shortage of available road space, bottleneck conditions frequently occur on the roads in Ahmedabad, the fourth fastest growing city in the world. Traffic is backed up at the Sabarmati River bridges because of a bottleneck situation. Out of the nine bridges that span the Sabarmati River in Ahmedabad, some of the bridges that connect the city's residential and business areas have significant traffic during peak hours, causing backups and bottlenecks in some areas. Following a survey, the three bridges—Swami Vivekanand, Sardar, and Subhash—were chosen for analysis of traffic flow capacity and service level. Therefore, it is intriguing to calculate the traffic flow capacity by observing the parameters of traffic flow, density, and speed on the chosen bridges during busy periods in Ahmedabad.

4. METHODOLOGY CHART & STUDY AREA

Three bridges—Swamivivekanand Bridge, Sardar Bridge, and Subhash Bridge—are chosen for this study assessment.

In the northern region of Gujarat and the western region of India, Ahmedabad is situated along the banks of the Sabarmati River. It covers 205 km2 and is situated at 23.03°N 72.58°E. 53 metres is the average elevation.

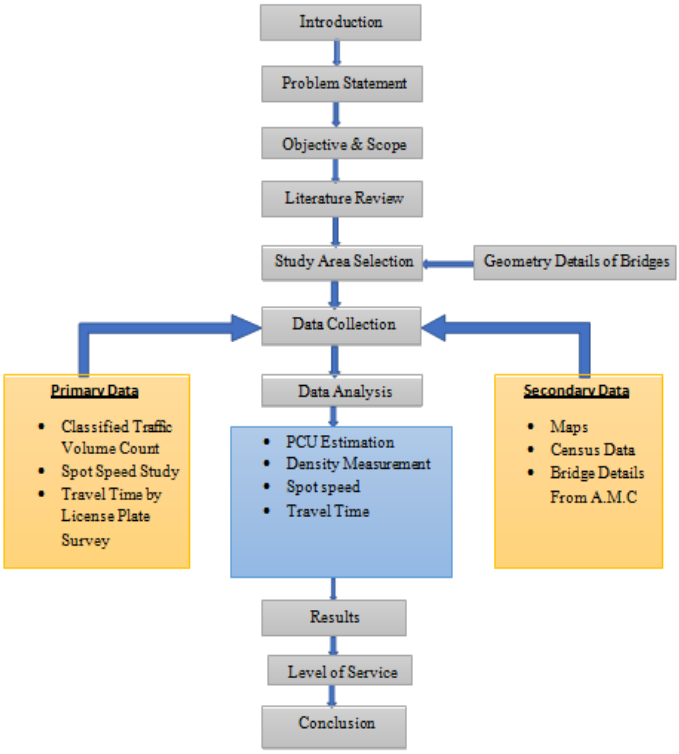

Fig-1: Methodology Chart

5. DATA COLLECTION

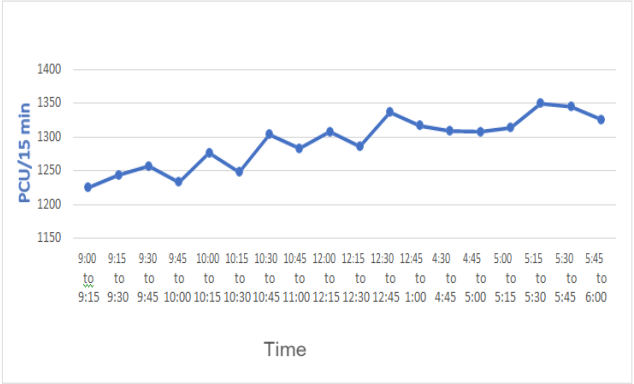

Fig-2: Graph of PCU/15min (Sahibaug to RTO)

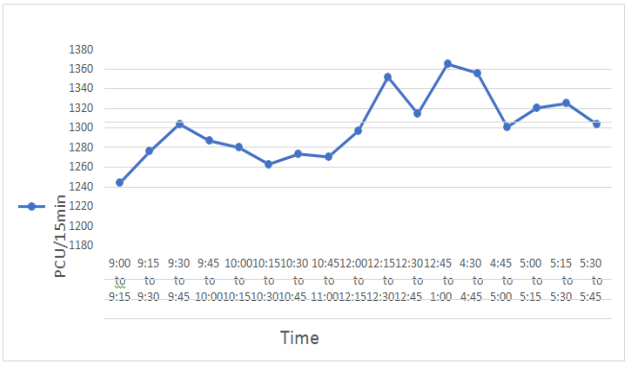

Fig-3: Graph of PCU/15min (RTO to Sahibaug)

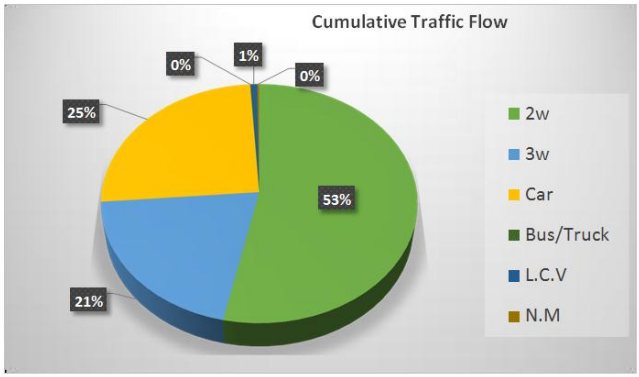

Fig-4: Cumulative Traffic Flow (Sahibaug to RTO)

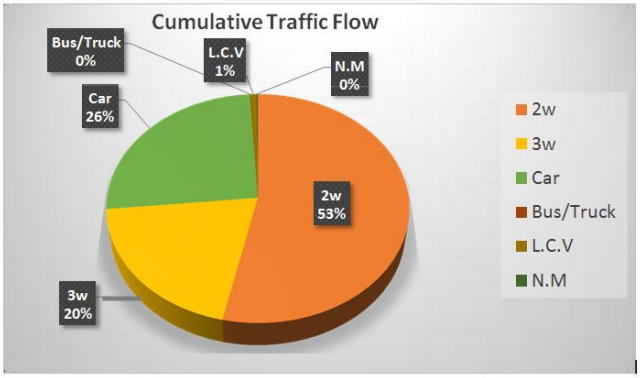

Fig-5: Cumulative Traffic Flow (RTO to Sahibaug)

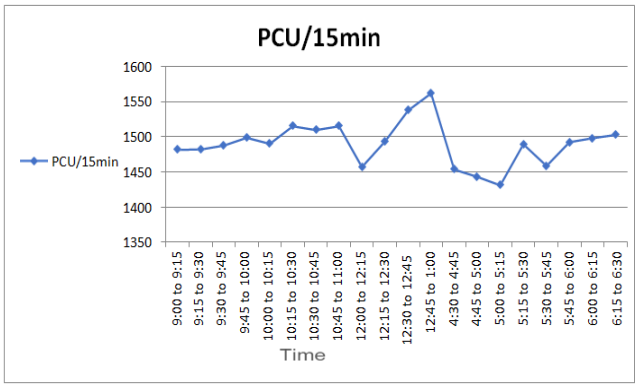

Fig-6: Graph of PCU/15min (Astodiya Darwaja to Parimal Garden)

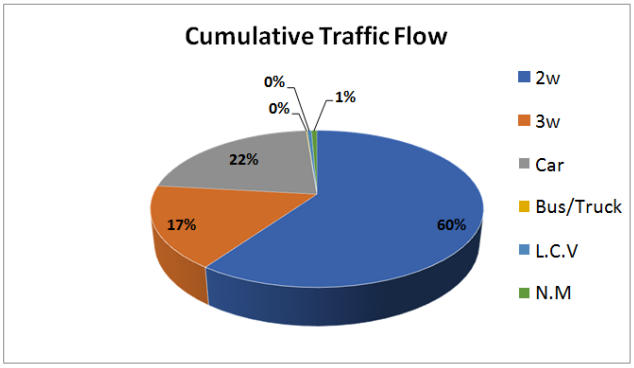

Fig-7: Cumulative Traffic Flow (Astodiya Darwaja to Parimal Garden)

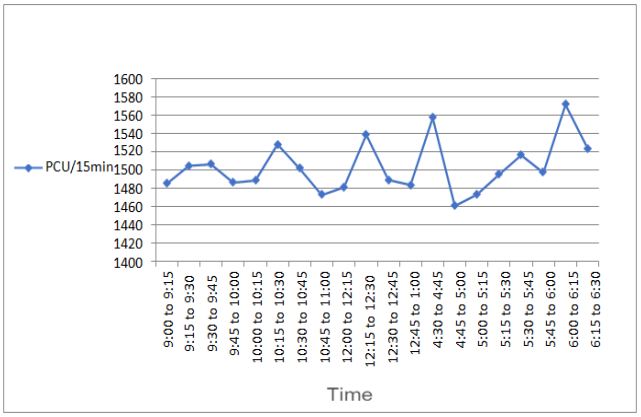

Fig-8: Graph of PCU/15min (Gita Mandir to Paladi)

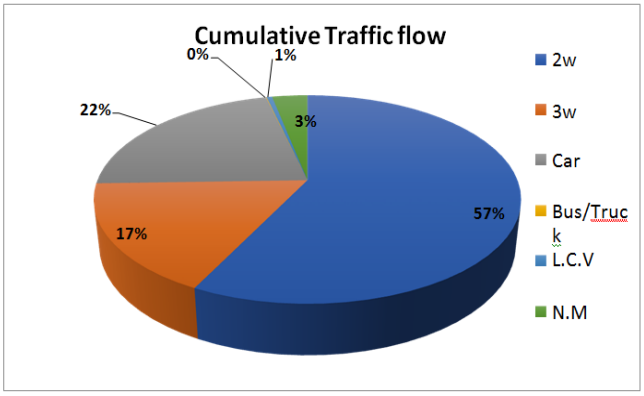

Fig-9: Cumulative Traffic Flow (Gita Mandir to Paladi)

6. RESULT

Table-1: Results of Traffic Flow count

Bridge Name	Direction	PCU/hr
Sardar Bridge	Gita Mandir to Paladi	6013.5
	Paladi to Gita Mandir	6173.7
Swami Vivekanand Bridge	Astodiya Darwaja to Parimal Garden	5959.4
	Parimal Garden to Astodiya Darwaja	6092.1
Subhash Bridge	Sahibaug to RTO	5194
	RTO toSahibaug	5229.7

Table-2: Results of Spot- Speed and Density

Bridge Name	Direction	Avg. Spot-Speed (v) kmph	Avg. Density PCU/km (k)
Sardar Bridge	Gita Mandir to Paladi	14.74	406.55
	Paladi to Gita Mandir	14.70	420.55
Swami Vivekanand Bridge	Astodiya Darwaja to Parimal Garden	15.01	395.55
	Parimal Garden to Astodiya Darwaja	14.96	396.81

Subhash Bridge	Sahibaug to RTO	17.48	295.34
	RTO to Sahibaug	17.48	300.24

Table-3: Results of Spot- Speed and Density

Bridge Name	Direction	Avg. Spot-Speed (kmph)	Avg. Speed (kmph)
Sardar Bridge	Gita Mandir to Paladi	14.73	15.37
	Paladi to Gita Mandir	14.70	15.40
Swami Vivekanand Bridge	Astodiya Darwaja to Parimal Garden	15.01	14.67
	Parimal Garden to Astodiya Darwaja	14.95	14.68
Subhash Bridge	Sahibaug to RTO	17.48	25.90
	RTO to Sahibaug	17.47	25.25

Table-4: LoS of Urban road based on Stream Speed, V/C Ratio and FFS

Level of Service(L.O.S)	Range of Average Stream Speed	V/C Ratio (Volume/ Capacity Ratio)	Percentage of Free flow Speed
LoS A	> 64	< 0.15	> 84
LoS B	64-58	0.15-0.45	84-76
LoS C	58-45	0.45-0.75	76-59
LoS D	45-31	0.75-0.85	59-41
LoS E	31-17	0.85-1.0	41-22
LoS F	<17	> 1	< 22

Table-5: L.O.S Calculation

Bridge Name	Direction	Avg. Speed (v) kmph	vg.V/C Ratio	L.O.S
Sardar Bridge	Gita Mandir to Paladi	15.37	1.11	F
	Paladi to Gita Mandir	15.40	1.14	
Swami Vivekanand Bridge	Astodiya Darwaja to Parimal Garden	14.67	1.10	F
	Parimal Garden to Astodiya Darwaja	14.68	1.11	
Subhash Bridge	Sahibaug to RTO	25.90	0.96	E
	RTO to Sahibaug	25.25	0.96	

7. CONCLUSION

Urban roads are designed for L.O.S type C according to IRC guidelines. However, in this instance, the observed L.O.S for the Sardar and Swami Vivekanand Bridges is found to be category F, while the L.O.S for the Subhash Bridge is found to be category E. Therefore, it is necessary to implement some corrective measures in order to raise the level of service on a few chosen bridges.

Suggested Measures:

Enhancing the public transit network

Increasingly irregular work hours in both public and private organisations timing of the new school schedule

Traffic law enforcement and lane discipline the potential for diverting traffic to alternative routes increasing the existing bridge's capacity building a new bridge next to an already existing bridge

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