

TRAFFIC DELAY STUDY DUE TO SIDE FRICTION

CASE STUDY: BAPUNAGAR AREA, AHMEDABAD

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Abstract: This research paper presents data collection and traffic analysis of Bapunagar area, Ahmedabad, India. Inventory surveys including road inventory and traffic volume studies like classified volume count survey and travel time delay survey were conducted and data was collected. Data analysis yield that road is overloaded and traffic jams are because of poor management. Side friction can be defined as all that activities which are going on or along the roadway facility. It includes but not limited to pedestrians, slow moving vehicles (SMV), on road parked vehicles, roadside vendors, on road stopping vehicles. On the basis of results and location of road we can observe the traffic delay.

Index Terms- Traffic, Side friction, Analysis, Volume, Capacity, Delay.

I. INTRODUCTION

1.1 General

Most Asian countries have heterogeneous traffic and India as one of the developing country has the characteristic. The characteristics of heterogeneous traffic are many kinds of vehicles in every road side, dynamic characteristic of vehicle composition, and complex behavior of indiscipline road users unfortunately; none of the official guidelines on highway construction include the effect of grade in the geometric design of horizontal curves. For instance, the Green Book (AASHTO 2011) considers a point-mass model for the basic curve equation. However, the point-mass model is not adequate for obtaining comprehensive results for the side friction factor, and an alternative model must be used. Activity road side factor affecting side friction is one of the traffic characteristic in urban area in India aside from mix traffic, public transportation condition and indiscipline driving behavior.

Land use in an area gives impact on the existing transportation system. Transportation system and land development are interrelated. One of the area that has high side friction is market, mainly traditional market. Traditional market has unique characteristics of traffic, one of them is the existing various side friction. Market is one of the bond that unites the flow of goods and services and the users.

II. LITERATURE REVIEW

2.1 Md. Mofizul Islam , Md. Shamim Al Razib , Md. Mahmudul Hasan , Md. Shapon Ali , Md. Ohab Monir , Md. Hasan. et. al. 2018 in this paper the cause of reduction of effective roadway width due to side friction is Dhaka city. The specific objectives of the study were to identify the factors which contribute in the Reduction of roadway width for measure the total wide loss. Reduction of roadway width due to side friction is a major problem for the people transport system. The pedestrian face many problems to walk on footpath due to site friction. When footpath is blocked for various side friction likes tea stall, shirt pant stall, paper stall, Fruit stall etc. the pedestrian tense to effective roadway width for that reason traffic jam occurs. For rapid economic, industrial and cultural growth of any county a good system of transportation is very important. As transportation comprise road ways, railways, waterways, and airways mankind has to think of a convenient and easy way for movements and this may probably be the beginning of modern roads since roadway can be width and free from side friction.

2.2 Iin Irawati. et. al. 2015 This research focuses on delay evaluation which is one of the road performance parameter, using microscopic approach that takes place on one of traditional market in Central Java, that is in Mranggen market, Indonesia. Side friction itself has impact on the road performance. Data analysis is drawn using VISSIM. From simulation results and Lilliefors method test to figure out the significance, we can conclude that there is significant difference between the delay of road segment with side friction.

2.3 Mayank Kanani, R. G. Motwani, H. K. Dave. et. al. 2017 The main purpose of side friction can be defined as all that activities which are going on or along the roadway facility. It includes but not limited to pedestrians, slow moving vehicles (SMV), on road parked vehicles, roadside vendors, on road stopping vehicles. These factors are frequent in developing countries but they are sparse and random so making it of less interest for the researchers for their studies. But in day to day life everyone is interacting with these factors. So this paper is mainly focused on reviewing the influence of side friction causing parameters on traffic speed and road capacity for urban arterial roads. Many urban areas in India are influenced by side friction which needs to be defined with their causes and influence to arrive at mitigation techniques using relevant design standards.

2.4 Adarsh Patel, Khushbu Bhatt, Jayesh Juremalani. et. al. 2017 The paper focuses on the Traffic congestion and capacity reduction in urban roads which are very common in developing countries like India. Capacity is important fundamental to planning, design and operation of the roads. It is helpful for determination of a number of lanes required by considering a volume of the vehicles, their composition and other traffic-related parameters. Behind capacity reduction in the urban road, there are several reasons that affect the capacity factor such as on-street parking, pedestrian movement, the presence of street hawkers, roadside bus stop. This review paper is intended to highlight various studies reported with regards to the impact of side frictions in a capacity of urban road and gives a suitable measure.

III. STUDY AREA

3.1 Briefing of the Location

Bapunagar was established in the early 1960s, in the vicinity of the city of Ahmedabad, as a residential area for the poor mill workers, when Ahmedabad was a flourishing textile centre in India. Many of these mills had closed by the late 1980s, reducing the now unemployed mill workers to home businesses, such as making incense sticks or candles. The present day detergent giant Nirma – started from Ambica Society located in the compound of Navlakha Bunglow began as just one such home industry; the owner started by making household detergents and selling them door to door. Navlakha Bunglow which is believed to be built around 1922 is now a Heritage Building, in Year 1966 in this Bunglow Late Mr.S.K.Varma and Late Mr.R.S.Varma established a Trust under which they started a School to provide better education to children of Bapunagar, students from more than 10 km away used to come to this school, the school named "Shri Jivan Sadhana Higher Secondary School" is now 50 Years old and going strong and is well known for giving best education at a very low fees amount in whole Bapunagar.



Figure 3.1 Bapunagar Location

Road Inventory Survey

Road (network) inventory studies serve to collect data describing the road network in terms of the actual cross-sectional elements and the vertical and horizontal alignment. These data are essential for network (Asset) management and are extensively used for managing road rehabilitation programs, maintenance of signing and marking (incl. Inventory management) etc. Furthermore, descriptive data of the road network is also extensively used in traffic safety analysis, more specifically in describing the relationship between geometric criteria, traffic volumes, road crashes and/or driver behavior.

Table 3.1 Road Inventory Data

Road Area	Number of lanes	Carriageway			Median(m)	Side walk (m)
		Type	Width(m)	condition		
Shubh laxmi complex to Bapunagar char rasta	1	BT- Bitumen	15	Good	Nil	1
Bapunagar char rasta to Bhid bhanjan hanuman	1		15		0.8	1.5
	2		12			1
Bhid Bhanjan hanuman to Amber cinema	1		15		Nil	1.7
Amber cinema to Saraspur	1		9		0.9	1.9
	2		10			1.8

IV. DATA COLLECTION

Classified Volume Count - CVC

Traffic data collection is basic requirements for transport planning. Traffic data forms an integral part of national economics and such knowledge is essential in drawing up a rational transport policy for movement of passengers and goods by both government and the private sectors.

One of the fundamental measures of traffic on a road system is the volume of traffic using the road in a given interval of time. It is also termed as a flow and expressed in vehicle per hour or vehicle per day. Volume is important for understanding the

efficiency at which the system works at present and the general quality of service offered to the road users. Method used for vehicle count here is named as video photography method.

Table 4.1 Classified Volume Count (Morning)

Towards the Saraspur				Towards the Bapunagar Brts			
Time Duration	Two Wheeler	Three Wheeler	Four Wheeler	Time Duration	Two Wheeler	Three Wheeler	Four Wheeler
10:00 to 10:05	139	61	7	10:00 to 10:05	82	47	7
10:05 to 10:10	142	49	7	10:05 to 10:10	103	58	8
10:10 to 10:15	140	50	11	10:10 to 10:15	94	27	6
10:15 to 10:20	125	55	9	10:15 to 10:20	126	48	14
10:20 to 10:25	142	46	10	10:20 to 10:25	118	49	6
10:25 to 10:30	143	44	10	10:25 to 10:30	138	58	7
10:30 to 10:35	140	41	9	10:30 to 10:35	119	52	11
10:35 to 10:40	122	46	10	10:35 to 10:40	134	51	8
10:40 to 10:45	153	52	6	10:40 to 10:45	157	36	13
10:45 to 10:50	170	56	14	10:45 to 10:50	128	47	7
10:50 to 10:55	144	55	12	10:50 to 10:55	114	46	8
10:55 to 11:00	135	39	6	10:55 to 11:00	126	46	6
11:00 to 11:05	147	57	5	11:00 to 11:05	101	46	9
11:05 to 11:10	129	52	11	11:05 to 11:10	117	48	5
11:10 to 11:15	122	54	5	11:10 to 11:15	107	49	6
11:15 to 11:20	114	49	11	11:15 to 11:20	123	53	10
11:20 to 11:25	156	58	17	11:20 to 11:25	121	53	13
11:25 to 11:30	116	53	12	11:25 to 11:30	109	46	8
11:30 to 11:35	115	49	13	11:30 to 11:35	105	34	7
11:35 to 11:40	128	43	10	11:35 to 11:40	111	33	5
11:40 to 11:45	117	40	9	11:40 to 11:45	122	47	4
11:45 to 11:50	117	53	13	11:45 to 11:50	121	61	12
11:50 to 11:55	122	46	7	11:50 to 11:55	116	55	7
11:55 to 12:00	130	52	8	11:55 to 12:00	112	34	9
Sub Total	3208	1200	232	Sub Total	2804	1124	196
PCU value	0.5	1.0	1.0	PCU Value	0.5	1.0	1.0
PCU	1604	1200	232	PCU	1402	1124	196
Total PCU	3036			Total PCU	2722		

Traffic flow condition at the study area in the morning peak hour was vast and varied on the inner side of the curve from Bapunagar Char Rasta to the city area and vice-versa at the evening peak hours through city area to the extending side of the airport. Another crucial factor which is unavoidable at the curve, the turning vehicles or changing the direction of the flow through an opening provided at the curve area. Although number of direction changing vehicles is less, it creates very unpleasant

environment for the other road users and affects the moving traffic flow resulting in conflicts between vehicles and road users at the section. Due to classified volume count we can find out the no of vehicles which are going in that particular area at how much rate and also we can see how side friction affects it.

Table 4.2 Classified Volume Count (Evening)

Towards the Saraspur				Towards the Bapunagar Brts			
Time Duration	Two Wheeler	Three Wheeler	Four Wheeler	Time Duration	Two Wheeler	Three Wheeler	Four Wheeler
17:00 to 17:05	86	40	4	17:00 to 17:05	64	28	5
17:05 to 17:10	90	31	7	17:05 to 17:10	61	43	11
17:10 to 17:15	72	46	10	17:10 to 17:15	84	46	5
17:15 to 17:20	96	48	8	17:15 to 17:20	61	36	5
17:20 to 17:25	77	43	7	17:20 to 17:25	86	51	6
17:25 to 17:30	72	48	3	17:25 to 17:30	79	49	8
17:30 to 17:35	77	31	9	17:30 to 17:35	57	19	2
17:35 to 17:40	74	31	3	17:35 to 17:40	81	54	3
17:40 to 17:45	82	63	6	17:40 to 17:45	63	39	3
17:45 to 17:50	82	47	6	17:45 to 17:50	63	30	3
17:50 to 17:55	66	37	1	17:50 to 17:55	49	36	4
17:55 to 18:00	82	39	7	17:55 to 18:00	81	52	5
18:00 to 18:05	61	48	3	18:00 to 18:05	66	40	8
18:05 to 18:10	42	25	3	18:05 to 18:10	48	30	4
18:10 to 18:15	69	24	9	18:10 to 18:15	69	48	4
18:15 to 18:20	81	31	4	18:15 to 18:20	75	38	6
18:20 to 18:25	71	45	3	18:20 to 18:25	79	51	2
18:25 to 18:30	56	40	10	18:25 to 18:30	61	41	5
18:30 to 18:35	75	51	8	18:30 to 18:35	79	48	1
18:35 to 18:40	95	49	7	18:35 to 18:40	66	42	9
18:40 to 18:45	71	43	4	18:40 to 18:45	59	52	1
18:45 to 18:50	60	50	6	18:45 to 18:50	75	41	8
18:50 to 18:55	71	52	4	18:50 to 18:55	62	38	5
18:55 to 19:00	66	42	6	18:55 to 19:00	58	44	3
Sub Total	1774	1004	138	Sub Total	1626	996	116
PCU value	0.5	1.0	1.0	PCU Value	0.5	1.0	1.0
PCU	887	1004	138	PCU	813	996	116
Total PCU	2029			Total PCU	1925		

• RESULTS

The results of the CVC counts shows that maximum number of vehicles passing through the mid block at peak hours. Maximum numbers of vehicles passing out at that And when vehicles capacity is passed out the speed gets slow due to side friction on that area. Traffic volume data is directly linked with the speed of the vehicles and time delay problems.

Travel Time Delay

Moving car observer method is a procedure commonly used to estimate the average flow and journey time of traffic on a road link through collected data of moving vehicle.

Table 4.3 Travel Time Delay of Morning Period

Morning Peak Hour (10 am To 11 am)				
Sr No	Time Delay		No Of Vehicles	
Laps	Fixed Delay (sec)	Operational Delay (sec)	Over Taking	Over Taken
1	19	17	12	25
2	29	28	6	26
Total	48	45	69	

The method was first described in a paper by Wardrop and Charlesworth (1954) and developed by the road research laboratory in U.K.

Table 4.4 Travel Time Delay of Evening Period

Evening Peak Hour (5 pm To 6 pm)				
Sr No	Time Delay		No Of Vehicles	
Laps	Fixed Delay (sec)	Operational Delay (sec)	Over Taking	Over Taken
1	40	45	28	29
2	26	38	18	36
Total	66	83	111	

V. CONCLUSION

The Rapid urbanization is a serious issue faced by most of the metropolitan cities in India. So the vehicular growth follows an exponential trend, the infrastructure expansion does not commensurate at the same level, thus results in traffic congestion on city roads. Less usage of public transport also a one side of congestion situation.

Hence in the present study, analysis of traffic capacity at the Bapunagar, Ahmedabad, India. Traffic volumes coming from different approach roads were collected using video graphic techniques and analyzed for peak hour traffic volume. And also found out the Travel Time Delay data using Moving Car Observer Method. The total side friction values were estimated for all sections and correlated to see the variation with average speed. The average speed of vehicle decreases with increase in side friction. So, time delaying can be seen from side friction data.

Here, we can see from CVC data PCU is 3036 and 2722 in morning peak hours from 10:00 am to 12:00 pm and PCU is 2029 and 1925 in evening peak hours from 17:00 pm to 19:00 pm. Travel time delay data shows total of fixed delay, operational delay and no of vehicles overtaking and overtaken for morning and evening data as shown in table.

Table 6.1: Side Friction

Area	Types Of Side Friction		
	Clothes Stall (m)	Food and Vegetables Stall (m)	Vehicles Parked (m)
Shubhlaxmi Complex	-	-	4.8

Bhid Bhanjan	8.1	7.1	-
Amber Cinema	-	-	4.2
Saraspur	-	7.6	6.4

Travel time delay data shows LOS E for fixed delay and LOS F for operational delay which is calculated by total time upon no of vehicles. Capacity calculated in PCU for 2 lane road (2 ways) per hour is 900 and here it is more than 1000 from morning and evening data. Therefore, we can say that LOS from Travel Time Delay and CVC data suggests that side friction is main reason in increase in PCU and Travel Time. Using these LOS, as per the IRC we can remove side friction to allow smooth flowing of vehicles by this effective solution.

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