ANALYSIS OF TRAFFIC CAPACITY AT INTERSECTION CASE STUDY: SARANGPUR INTERSECTION, AHMEDABAD

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Abstract: This research paper presents data collection and traffic analysis of Sarangpur intersection, Ahmedabad, India. Inventory surveys including road inventory and traffic volume studies like classified volume count survey and spot speed study surveys were conducted and data was collected. Data analysis yield that road is overloaded and traffic jams are because of poor management. On the basis of results and location of road, various suggestions and recommendations were hence put for resolving traffic problems.

***Index Terms*- Traffic, Intersection, Analysis, Volume, Capacity, Delay, Accidents.**

I. INTRODUCTION

1.1 General

Currently the traffic on the road rises constantly and traffic volume overdoes normal limit. Study of several features of highway traffic is required for preparation, design and maneuver of roadway facilities. For the improved vehicular road traffic it needs better roadway structure with greater capacity. So it needs to analyze capacity for urban roads in heterogeneous condition. For the capacity estimation it is relatively tough to estimate traffic volume on the road. The problem of traffic flow measuring by using Dynamic PCU values.

Traffic behavior in developing countries is largely differ from those or developed countries. Traffic composition of each type of vehicles is slightly different with different static and dynamic characteristics called a fast moving vehicles and slow moving vehicles. Exclusive lanes especially for un-motorized or slow moving vehicles are very uncommon. Impact from large different in speed could be serious problem. Impact from large different in speed could be serious problem in traffic operation, safety and capacity.

II. LITERATURE REVIEW

2.1 Pratik U. Mankar et. al. April 2016 in this paper The Capacity of urban roads is find out by green shield model and the results are compared with Microscopic simulation model. The sudden increase in width of lane on the road is checked and result shows that with the increase in road width Capacity of road also increases.

The increasing capacity measured by using micro simulation method and also used a VISSIM software to simulate the data of the capacity of traffic flow. And further the studies of the traffic data, the dynamic PCU values found. The further increase in road width the PCU values for traffic composition are increases as well as capacity of road increases.

2.2 Zhao Tian. et. al. 2015 Main focus in this paper to found out the urban road traffic weighted network model with considering the functional properties of urban road network and presents the traffic efficiency concept of the road section in the urban road traffic network.

This paper redefines the urban road traffic weighted network model with considering the functional properties of urban road network and shows the traffic efficiency concept of the road section in the urban road traffic network. Then the structural characteristics analysis of the urban road traffic network is provided based on the following three models, the length weighted network model, the traffic capacity weighted network model and the traffic efficiency weighted network model. Then they take the urban road traffic network of study area as an example to analyze the structural characteristics of the road traffic network...

2.3 Ramesh Surisetty et. al. 2014 in this study found out the capacity of un signalized intersection was calculated from Conflict technique. These Surveys were conducted in Visakhapatnam, to measure different traffic parameters Volume, Flow and Capacity.

In this study movement capacities of that area were evaluated by using HCM (2000) for comparison with approach wise capacities obtained from conflict technique from different directions.

This research found that maximum mixed traffic condition found on a peak hour which is 9 to 11 AM at morning and 6 to 8 PM at evening. And also critical gap and time delay is higher than the capacity of HCM (2000).and also a pedestrian movements have not a safest way.

2.4 Rajko Horvat According to the studies the contemporary traffic development has raised the complexity of interaction between traffic branches and intensified the interdependence within the road traffic subsystem, and also their interaction with the surrounding systems.

The methodology is suitable for researching traffic parameters of traffic flows in urban areas. At comparatively low cost it gives results that significantly contribute to designing optimal elements of road infrastructure. Further research should be suggested that including more road types within different environments and cross-sections in order to gain more detailed relationship between specific conditions in which traffic flow operates and consequential relationship between basic traffic flow characteristics

III. STUDY AREA

3.1 Briefing of the Location

The study area must be in such way that it could define the problem in the objective of the study. Sarangpur area is a nearest place to the CBD area of Ahmedabad city. Ahmedabad is the primary stations of rail transport for the city of Ahmedabad in the state of Gujarat. And an important Centre of the western railways zone of the Indian railways. Almost people of Ahmedabad refer to kalupur station. Sarangpur is the central part of Ahmedabad city. Sarangpur bus depot runs buses to all major destinations in Ahmedabad city. The station is operated by Ahmedabad municipal transport service (AMTS).And also BRTS corridor available on that intersection which is connected with many major areas of Ahmedabad.

Figure 3.1 Sarangpur intersection

The road inventory details of the location is given below in the tabular forms.

Table 3.1 Road Inventory Primary Data

Name of Location	Land use				Terrain Condition	Drainage Condition
	North	South	East	West		
Sarangpur intersection	Sarangpur BRTS stand	Kalupur railway station	Relief road side	Sarangpur bridge road	Plain Terrain	Covered Drain

The road inventory details of the location is given below briefly with side elements.

Table 3.2 Road Inventory Secondary Data

Intersecting roads	Number of lanes	carriageway			Median(m)	Side walk (m)	BRTS lane		
		Type	Width(m)	condition			Type	Width	condition

								(m)	
Sarangpur BRTS road	1	BT-Bitumen	11.5	Good	0.3	1.2	R.C.C.	3.7	Good
	2		10.5			1.2		3.7	
Kalupur railway station road	1		25		Nil	2.2	Nil		
Sarangpur bridge side road	1		8.3		0.3	1.5	Nil		
	2		8.5			1.5			
Relief road side	1		7.4		Nil	1.2	Nil		

IV. DATA COLLECTION

4.1 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.

Table 4.1 CVC for Sarangpur BRTS to Kalupur Railway Station

Towards the Station								Towards the Sarangpur BRTS							
Time Duration	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**	**Time Duration**	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**
10:30 to 10:35	233	26	24	14	2	0	19	10:30 to 10:35	251	41	37	9	1	2	19
10:35 to 10:40	241	25	26	13	0	0	18	10:35 to 10:40	249	38	34	11	1	0	22
10:45 to 10:50	247	33	29	12	0	1	14	10:45 to 10:50	256	42	39	12	2	2	18
10:55 to 11:00	234	31	29	14	0	1	16	10:55 to 11:00	261	46	30	12	3	2	15
Time Duration	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**	**Time Duration**	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**
11:05 to 11:10	239	32	25	12	1	0	12	11:05 to 11:10	253	38	38	8	2	1	12
11:10 to 11:15	237	35	30	14	0	1	13	11:10 to 11:15	249	42	35	7	2	1	14
11:15 to 11:20	248	29	22	11	1	1	15	11:15 to 11:20	231	43	31	11	1	1	12
11:20 to 11:25	228	26	29	13	0	2	11	11:20 to 11:25	254	47	32	12	1	1	13

11:25 to 11:30	238	37	28	10	1	0	19	11:25 to 11:30	259	43	31	9	2	1	16
Sub Total	2836	360	313	146	10	7	180	**Sub Total**	2999	517	408	121	22	14	192
PCU value	**0.5**	**1.0**	**1.0**	**3**	**3**	**4.5**	**0.5**	**PCU Value**	**0.5**	**1.0**	**1.0**	**3**	**3**	**4.5**	**0.5**
PCU	1418	360	313	438	30	31.5	90	**PCU**	1499.5	517	408	363	66	63	96
Total PCU	**2680.5**							**Total PCU**	**3012.5**						

The purpose classified volume count is to draw inferences on the basis of data collected. To provide possible solutions and improvement suggestion for the problem identified. The objectives covered in it includes identifying the hourly distribution of vehicles and peak hour, identify level of service and compare modal composition on different hierarchy of road.

Table 4.2 CVC for Sarangpur Bridge to Relief Road side

Towards the Sarangpur Bridge								Out from the Sarangpur Bridge							
Time Duration	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**	**Time Duration**	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**
10:30 to 10:35	156	25	19	3	2	1	14	10:30 to 10:35	121	24	21	2	1	1	15
10:35 to 10:40	148	24	24	4	1	1	17	10:35 to 10:40	119	24	24	1	1	0	18
10:40 to 10:45	136	24	23	3	2	1	11	10:40 to 10:45	117	21	23	2	1	1	17
10:45 to 10:50	128	23	19	3	2	1	14	10:45 to 10:50	109	26	20	2	3	1	16
10:50 to 10:55	141	25	22	4	3	2	13	10:50 to 10:55	116	23	24	2	2	2	17
10:55 to 11:00	132	21	21	3	3	0	14	10:55 to 11:00	123	22	23	2	2	1	15
11:00 to 11:05	122	24	25	2	2	1	12	11:00 to 11:05	117	23	21	1	1	0	16
11:05 to 11:10	123	27	23	3	1	0	16	11:05 to 11:10	115	24	25	1	2	0	17
11:10 to 11:15	126	22	23	2	2	2	15	11:10 to 11:15	115	21	27	2	1	1	14
Time Duration	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**	**Time Duration**	**Two Wheeler**	**Three Wheeler**	**Four Wheeler**	**Bus**	**Truck**	**Tractor**	**Cycle**
11:20 to 11:25	119	22	24	3	1	0	19	11:20 to 11:25	118	24	24	2	1	1	17
11:25 to 11:30	118	29	28	2	2	1	16	11:25 to 11:30	124	28	29	2	1	0	18
Sub Total	1581	292	272	35	22	11	179	**Sub Total**	1407	286	284	20	16	9	193
PCU value	**0.5**	**1.0**	**1.0**	**3**	**3**	**4.5**	**0.5**	**PCU Value**	**0.5**	**1.0**	**1.0**	**3**	**3**	**4.5**	**0.5**
PCU	790.5	292	272	105	66	49.5	89.5	**PCU**	703.5	286	284	60	48	40.5	96.5
Total PCU	**1664.5**							**Total PCU**	**1518.5**						

- **RESULTS**

The results of the CVC counts shows that maximum number of vehicles passing through the intersection at peak hours. Maximum numbers of vehicles passing out at that intersection. As per IRC guideline, it should be design a rotary at intersection

when more than 1500 vehicles passing out at a peak hour. And when vehicles capacity is passed out more than 3000 it should be design a signals at the intersection. Traffic volume data is directly linked with the speed of the vehicles and time delay problems

4.2 SPOT SPEED DATA

Table 4.3 Spot Speed Data of Morning Period

Observation No.	Time (Sec.)	Distance (Met.)	Speed (M.P.S)	Speed (K.P.H)	Observation No.	Time (Sec.)	Distance (Met.)	Speed (M.P.S)	Speed (K.P.H)
1	3.55	22	6.20	22.31	18	2.75	22	8.00	28.80
2	3.56	22	6.18	22.25	19	2.61	22	8.43	30.34
3	3.23	22	6.81	24.52	20	2.81	22	7.83	28.19
4	3.24	22	6.79	24.44	21	2.35	22	9.36	33.70
5	3.17	22	6.94	24.98	22	2.43	22	9.05	32.59
6	3.09	22	7.12	25.63	23	2.70	22	8.15	29.33
7	2.31	22	9.52	34.29	24	2.72	22	8.09	29.12
8	3.09	22	7.12	25.63	25	2.82	22	7.80	28.09
9	2.65	22	8.30	29.89	26	3.35	22	6.57	23.64
10	2.37	22	9.28	33.42	27	3.69	22	5.96	21.46
11	2.42	22	9.09	32.73	28	3.33	22	6.61	23.78
12	2.34	22	9.40	33.85	29	3.09	22	7.12	25.63
13	2.74	22	8.03	28.91	30	2.66	22	8.27	29.77
14	3.78	22	5.82	20.95	31	3.28	22	6.71	24.15
15	3.68	22	5.98	21.52	32	3.23	22	6.81	24.52
16	2.65	22	8.30	29.89	33	3.22	22	6.83	24.60
17	2.66	22	8.27	29.77	34	3.22	22	6.83	24.60

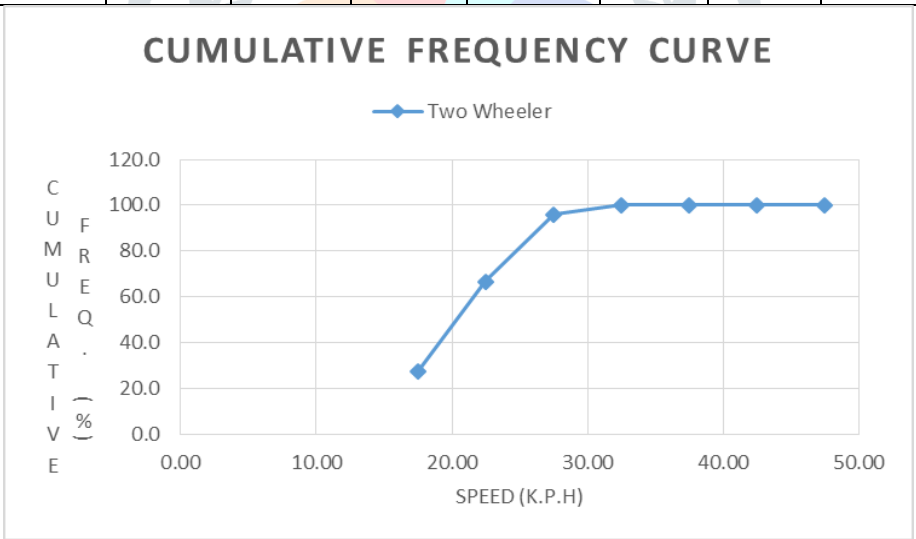

Figure 4.1 Cumulative Freuency Curve of Spot Speed Study Data

V. CONCLUSION

The Rapid urbanization is a serious issue faced by most of the metropolitan cities in India. Many people are migrating from rural to urban areas and this urbanization results in the increase a vehicle capacity on the road. 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 Sarangpur Intersection, Ahmedabad, India. Traffic volumes coming from different approach roads were collected using videographic techniques and analyzed for peak hour traffic volume.And also found out the Spot Speed Study data using Radar Gun Method. Hence the results would be found out that intersection was not design by IRC guideline. So, time delaying and accident problems are facing out.Using these datas, as per the suggestion the design of the rotary following IRC guidelines was attempted .When compared to grade separators, constructing a rotary is a cheap and effective solution.

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REFERENCES

JOURNALS

[1] Pratik U.Mankar; Dr. B.V Khode 2016, Capacity Estimation of Urban roads under Mixed Traffic Condition published in journal of international Research Journal of Engineering and Technology. ISSN: 2395 -0056.

[2] Zhao Tian 2015, Analysis of Urban Road Traffic Network Based on Complex Network, published by science direct.

[3] Ramesh Surisetty, Estimation of Capacity at Un-Signalized Intersections under Mixed Traffic Flow Conditions published by Journal of American Journal of Engineering Research, ISSN: 2320-0847.

IRC CODE

[1] Guidelines for recommended practice for traffic rotaries IRC 65:1976

BOOKS

[1] Kadyali, L. R. and Lal, N. B. 2007, Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi-110006

[2] S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Highway Engineering, Nem Chand & Bros., Roorkee 247667, India, ISBN 978-81-85240-80-0