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## STUDY OF MICROSCOPIC PARAMETERS OF HETEROGENEOUS TRAFFIC FOR AMRAVATI CITY

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**Abstract:** Developing countries like India are climbing the ladder of development very fast. So in relation to the development there is rapid increase in traffic volume. Mainly traffic in developing country is heterogeneous nature that means it consist of vehicles that move with different speed, have different size, have different operating characteristics and vehicle spacing may also vary. There is acute need of an efficient and intelligent traffic system to deal with problems arising due to heterogeneous nature of traffic. Traditionally in India whatever design equations are used to design roads, considered the traffic nature as homogeneous but as said earlier Indian traffic conditions are heterogeneous in nature. This paper reviews the mixed traffic in cities and finds out which factor need to be considered in such mixed traffic conditions. In this paper we considered the microscopic parameters such as speed, flow, density at a signalized intersection, which intern will help to develop new equations for heterogeneous traffic conditions in Indian cities.

**Keywords:** Traffic Flow, Traffic Density, Speed, Intersection



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## INTRODUCTION

Indian transport system is very large and extensive. There is very close relation between economic development and transportation. Millions of people in India use the large transportation system; even the local transportation in India is getting developed day by day. India's economy is growing at 5.5-7% yearly and its road transport is growing at 12-13 %.

In most of the Asian countries, has heterogeneous traffic. This traffic is characterized by a mix of vehicles having diverse static length, width, etc. and dynamic acceleration/deceleration, speed, etc. properties.

The existing model of traffic stream relate to the highly homogeneous traffic evident in European and American countries, which can't be applied directly to the traffic evident in Asian countries in general and India in particular. Hence different models are required to be design for traffic stream in developing countries. Traffic stream in developing country is also characterized by slow speed of vehicles. The existing model of traffic stream are designed for high speed vehicles ranging from (80-150) kmph. Hence application of this model to Indian traffic stream gives highly erroneous result.

Due to lack of infrastructure in developing countries sufficient lane width is not available for dedicated length for each type of vehicle. This result in use of same right of way is shared by all categories of vehicles. This results in typical nature of traffic stream characterized by diverse traffic condition, lack of lane discipline, changing composition etc. This transportation involves the vehicles like buses, auto-rickshaws, trucks, two wheelers, four wheelers, multi-axle vehicles etc.

Level of service shows the present traffic situation on a given facility. The fundamental diagrams of traffic flow can be used in the representation of level of service. Level of service ranges from level A to F. The Indian traffic is put under the level of service A. This Level of service represents the zone of free flow. Here the traffic volume will be less. The drivers will be having the complete freedom to choose their desired speed. Even at maximum density, for this LOS the average spacing between vehicles is 167 m. Lane changes within the traffic stream, as well as merging and diverging movements, are made relatively easy. But in actuality the scenario is much different in country like India and its cities.

The different models have been developed to describe the relationships among traffic stream characteristics. Most of the work dealing with these relationships has been concerned with uninterrupted traffic flow, primarily on the freeways or expressways but here as the traffic

conditions in India and its cities are different relationship for heterogeneous traffic will be established.

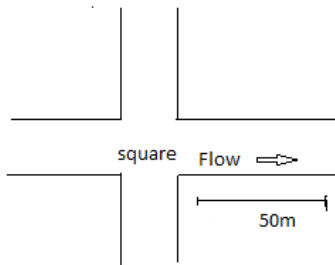
### **Flow:**

Number of vehicles coming on road can be counted as follows.

Flow or volume: Number of vehicles that pass a point on a highway during a specific time interval. For measurement number of vehicles are counted,  $nt$ , which are passing a particular point on road in a defined period  $t$ . The flow  $q$  expressed in vehicles/hour is given by

$$q = nt/t$$

Flow is expressed in planning and design field taking a day as the measurement of time.



### **Speed**

Passengers are more concerned with the speed of the journey. Speed of journey determines the quality of travel. It can be defined as distance travelled in per unit time. Mathematically speed or velocity  $v$  is given by,

$$V=d/t$$

Where, ' $v$ ' is the speed of the vehicle in  $m/s$ , ' $d$ ' is distance traveled in  $m$  in time  $t$  seconds. Speed of different vehicles will vary with respect to time and space. There are different types of speed. Important among them are spot speed, running speed, journey speed, time mean speed and space mean speed.

### **Spot Speed**

Spot speed can be defined as 'the instantaneous speed of a vehicle at a specified location'. For designing of geometry of road, super elevation etc. Location and size of signs, design of signals, safe speed, and speed zone determination, spot speed data is required. In the analysis of Accidents, road maintenance, and congestion spot speed data is used as the basic input. Endoscope, pressure contact tubes, radar speedometer, time-lapse photographic methods can be used to calculate spot speed. It can be determined by speeds extracted from video images by recording the distance traveling by all vehicles between a particular pair of frames.

### **Density**

Density can be defined as the number of vehicles occupying a given length of road or lane. It can be expressed as vehicles per KM. Photograph of a length of road  $x$  can be taken, Number of vehicles on the road can also be counted,  $n_x$ , at that point of time and the density can be calculated as

$$K = n_x / x$$

The density is the number of vehicles between the point A and B divided by the distance between A and B. Density is also equally important as flow but from a different angle as it is the measure most directly related to traffic demand. Density measures the proximity of vehicles on the road which in turn affects the freedom for comfortable driving.

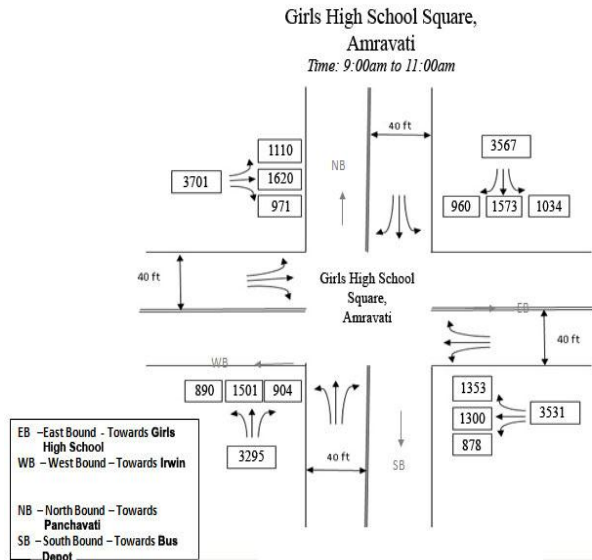
### **Method of data collection**

We collected data about volume of Traffic by video recording at a particular intersection in Amravati city. Further data for spot speed will be collected by similar method.

## **RESULT AND DISCUSSION**

### **Data collection**

Traffic data was collected on Amravati roadway section at girls high school square .which was collected by using digital video camera.



### Traffic volume

Direction: Girls high school To Irwin

Time: 9:00am To 11:00am

Time	Right			Through			Left		
	2W	3W	4W	2W	3W	4W	2W	3W	4W
9:00-9:15	100	8	15	100	10	20	50	3	5
9:15-9:30	115	10	7	98	12	10	60	5	8
9:30-9:45	155	15	12	100	12	25	76	5	6
9:45-10:00	185	15	21	117	18	17	88	12	12
10:00-10:15	150	20	18	145	15	25	98	12	15
10:15-10:30	122	21	12	150	19	18	109	15	10
10:30-10:45	125	24	20	140	25	19	110	20	12
10:45-11:00	120	19	19	138	22	20	100	18	11
<b>Total</b>	<b>1072</b>	<b>132</b>	<b>124</b>	<b>988</b>	<b>133</b>	<b>154</b>	<b>691</b>	<b>90</b>	<b>79</b>
<b>Total</b>	<b>1353</b>			<b>1300</b>			<b>878</b>		
<b>Total</b>	<b>3531</b>								

### Traffic volume

Direction: Panchwati To depot

Time: 9:00am To 11:00am

Time	Right			Through			Left		
	2W	3W	4W	2W	3W	4W	2W	3W	4W
9:00-9:15	90	13	11	125	15	12	95	13	8
9:15-9:30	105	11	10	118	12	10	98	8	9
9:30-9:45	100	8	8	150	18	15	100	15	18
9:45-10:00	95	6	8	180	20	12	99	15	15
10:00-10:15	111	12	10	130	21	21	115	12	12
10:15-10:30	100	9	10	195	20	20	98	14	11
10:30-10:45	99	9	10	200	18	25	120	10	15
10:45-11:00	95	10	12	180	15	19	100	10	10
<b>Total</b>	<b>795</b>	<b>78</b>	<b>69</b>	<b>1278</b>	<b>98</b>	<b>134</b>	<b>825</b>	<b>97</b>	<b>92</b>
<b>Total</b>	<b>960</b>			<b>1573</b>			<b>1034</b>		
<b>Total</b>	<b>3567</b>								

### Traffic volume

Direction :Irwin To Girls high school

Time:9:00am To 11:00am

Time	Right			Through			Left		
	2W	3W	4W	2W	3W	4W	2W	3W	4W
9:00-9:15	90	8	9	100	15	15	98	10	4
9:15-9:30	90	9	11	135	13	18	100	8	10
9:30-9:45	98	9	12	130	12	20	99	8	12
9:45-10:00	95	7	11	115	15	15	107	12	8
10:00-	117	10	18	150	18	18	85	10	15

<b>10:15</b>									
<b>10:15-10:30</b>	100	12	12	178	20	20	120	13	11
<b>10:30-10:45</b>	101	14	15	167	21	23	115	11	14
<b>10:45-11:00</b>	95	10	10	155	25	25	101	10	7
<b>Total</b>	786	79	98	1260	165	154	931	87	81
<b>Total</b>	971			1620			1110		
<b>Total</b>	3701								

**Traffic volume**

Direction: Depot To Panchwati

Time: 9:00am To 11:00am

<b>Time</b>	<b>Right</b>			<b>Through</b>			<b>Left</b>		
	<b>2W</b>	<b>3W</b>	<b>4W</b>	<b>2W</b>	<b>3W</b>	<b>4W</b>	<b>2W</b>	<b>3W</b>	<b>4W</b>
<b>9:00-9:15</b>	86	6	7	121	10	11	77	4	6
<b>9:15-9:30</b>	95	5	9	125	13	13	89	7	8
<b>9:30-9:45</b>	101	8	12	123	9	13	87	6	10
<b>9:45-10:00</b>	112	9	10	156	12	18	93	8	9
<b>10:00-10:15</b>	106	11	10	169	18	19	111	11	11
<b>10:15-10:30</b>	80	7	12	163	15	23	100	5	13
<b>10:30-10:45</b>	83	12	9	155	25	15	99	10	8
<b>10:45-11:00</b>	85	10	8	158	23	18	95	6	9
<b>Total</b>	748	68	77	1180	125	130	751	57	74
<b>Total</b>	904			1501			890		
<b>Total</b>	3295								

**Traffic volume**

Direction: Girls high school To Irwin

Time: 5:00pm To 6:00pm

Time	Right			Through			Left		
	2W	3W	4W	2W	3W	4W	2W	3W	4W
5.00-5:15	150	15	12	135	15	18	95	11	15
5.15-5:30	185	20	20	159	17	20	99	12	12
5.30-5:45	167	19	16	125	20	27	115	15	11
5.45-6:00	130	13	18	128	19	23	100	10	13
<b>Total</b>	632	69	66	547	71	88	409	48	51
<b>Total</b>	789			718			512		
<b>Total</b>	2019								

**Traffic volume**

Direction: Panchwati To depot

Time: 5:00pm To 11:00pm

Time	Right			Through			Left		
	2W	3W	4W	2W	3W	4W	2W	3W	4W
5.00-5:15	95	10	9	120	11	17	89	10	15
5.15-5:30	129	17	10	117	20	19	98	13	18
5.30-5:45	138	19	10	139	15	24	105	15	23
5.45-6:00	157	21	12	128	20	18	112	12	13
<b>Total</b>	519	67	41	504	66	78	404	50	69
<b>Total</b>	635			653			526		
<b>Total</b>	1814								



From this data we can calculate Flow of traffic at particular intersection.

After Working on this data, Speed and density will be calculated by collecting spot speed data and equation between flow density, speed density and speed flow will be formed. These traffic parameters depend on geography and population of city

Above equations will be compared with existing equations of traffic.

## CONCLUSION

From the data collected it can be concluded that Indian traffic is mixed in Nature. Thus we need to form new equation for heterogeneous traffic of India.

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