© 2016 IJSRSET | Volume 2 | Issue 3 | Print ISSN : 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology

Development of Dynamic PCU value of vehicle at Padra-Jambusar SH-160

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ABSTRACT

State Highway have widely different static and dynamic characteristics. Traffic is essentially consists of bicycles, two-wheelers, three-wheelers, Light commercial vehicle, cars and trucks this work aims to study of traffic flow on Indian highways by evaluating Passenger Car Unit (PCU) of different vehicle categories at different section of highways around Padra-Jambusar Vadodara. Our aim is to work out the passenger car unit Dynamic PCU for different types of vehicles under traffic conditions. The capacity of highways also increases with use of shoulder area and its positive effect on PCU value for type of vehicle increases with increases lane width. The relationship between the volume and speed at different highway section developed a second-degree curve. This relationship is used to calculate capacity of highways.

Keywords : Traffic Study, Dynamic PCU

I. INTRODUCTION

The study comprises of conducting various surveys in the city of Vadodara on Padra-Jambusar. Data collection in traffic survey should be done carefully as it is the base for the analysis to be carried out later. There are number of ways in which data can be collected by manually and by videographic technique. These surveys are to be carried out with aim to study the present traffic characteristics and traffic flow of Padra-Jambusar Vadodara city.

Traffic surveys like spot speed study, traffic volume count are to be carried out to collect data for the analysis on selected stretch which are helpful in deciding geometric features of road, and traffic control techniques for safe and efficient movement of vehicles on the road. These are the different traffic surveys are to be carry out on the selected stretch.

1) Road Inventory survey
2) 12-hour Classified Volume Count survey
3) Spot Speed study by Videographic technique.

ROAD INVENTORY SURVEY

Section	Total length	Formation width	Existing carriage way width
Km 8/4 to 16/0	7.60 km	12.00mt	10.00mt

Figure 1

II. METHODS AND MATERIAL

A. Classified Volume Count

Traffic volume counting is the number of vehicles passing a point or entering a stretch is considered in the analysis of roadway operations. Traffic volume can be counted by different techniques like manual method, detectors, moving-car observe, and videographic techniques. Here videographic techniques are used for the measurement of volume.12 hour classified traffic volume count is carried out from 8:00AM to 8:00 PM.

Date	Time	2 Wheeler	3 Wheeler	4 Wheeler	Bus		Truck			LCV	Tractor		Bicycle	Total
					mini	Std.	2-Axial	3-Axial	Multi Axial		With Trailer	Without Trailer		
17/3/2016	8am-8pm	2290	1487	1160	747	496	1013	656	453	1546	642	600	85	11175
18/3/2016	8am-8pm	2395	1304	1153	818	498	1111	609	507	1513	673	617	66	11264
19/3/2016	8am-8pm	2613	1270	1199	1015	701	987	743	528	1634	842	648	96	12276
Total for 12 hrs		7298	4061	3512	2580	1695	3111	2008	1488	4692	2157	1865	247	
Average for 12 hrs		2433	1354	1170	860	565	1037	669	496	1564	719	622	83	
Classification of assumed weight PCU		0.5	1 .5	1	3	3	3	3	4.5	1.5	4.5	1.5	0.5	
Total Average PCU/ 12 hrs		1216	1354	1170	**2580**	1695	**3111**	**2007**	**2232**	**2346**	1078	933	42	

Speed of vehicle

The PCU factor is based on the mean speed values of different vehicle classes. This is calculated by dividing the mean speed value of passenger cars by the mean speed value of any vehicle class.

Table - 1

Vehicle Type	Speed (Kmph)		
	MAX	MINI.	AVG.
Two Wheeler	35	24	29.5
Three wheeler	39	18	28.5
Car	43	20	31.5
LCV	39	18	28.5
Bus	46	22	34
TRUCK	41	20	30.5
	40.5	**20.33**	**30.4**

Dimensions of Each Vehicle Category

The data for this study were collected at two-lane highways around pdra –Jambusar SH-160 to determine the impact of lane width capacity of two lane highways by using a video recording technique. Data was used to calculate the maximum and minimum speed of a vehicle passing through the section. The vehicles were divided into different categories and Average dimensions and projected areas of different type of vehicle category are also given in Table.1 and in Table 2.

Table - 2

No.	Category	Vehicles Included	Average Dimensions (m)	Projected Rectangular Area (m2)
1	2 W	Scooter, Motorbike, Mopeds	2.0 x 0.74	1.48
2	3 W	3-wheeled goods/passenger Vehicles	2.73 x 1.20	3.28
3	Car	Car, Jeep, Small Van	3.69 x 1.55	5.72
4	Bus	Standard Bus	10.50 x 2.45	25.73
5	LCV	Small 4-wheeled goods vehicles	5.00 x 1.50	7.5
6	Truck	All large trucks	7.50 x 2.35	17.63
7	Cycle	Bicycles	1.90 x 0.45	0.86

III. RESULTS AND DISCUSSION

A. Data Analysis

Determination of PCU Values

$$PCU = \frac{\frac{Vc}{Vi}}{\frac{Ac}{Ai}}$$

Where,
PCU = passenger car unit value of ith type vehicle
Speed ratio of the car to the ith vehicle = Vc/Vi
Space ratio of the car to the ith vehicle = Ac/Ai
Vc = speed of car (km/h)
Vi = speed of I th type vehicle (km/h)
Ac = static (projected rectangular) area of a car (m2)
Ai = static (projected rectangular) area of ith type of vehicle (m2)

The PCU values for different categories of vehicles were calculated at different sections of highways. This shows the variation in PCU for different types of vehicles with lane width at different section. The PCU factor is based on the mean speed values of different vehicle classes. This is calculated by dividing the mean speed value of passenger cars by the mean speed value of any vehicle class. To analyze these parts and determine the speed - flow relationships accordingly in the present study.

car	car area	speed	area	DCU	vehicle type
32	5.72	30	17.63	**3.287645688**	truck
32	5.72	28	1.48	**0.295704296**	2w
32	5.72	24	3.28	**0.764568765**	3w
32	5.72	29	7.5	**1.446829033**	lcv
32	5.72	34	25.73	**4.233648704**	bus

Table – 3

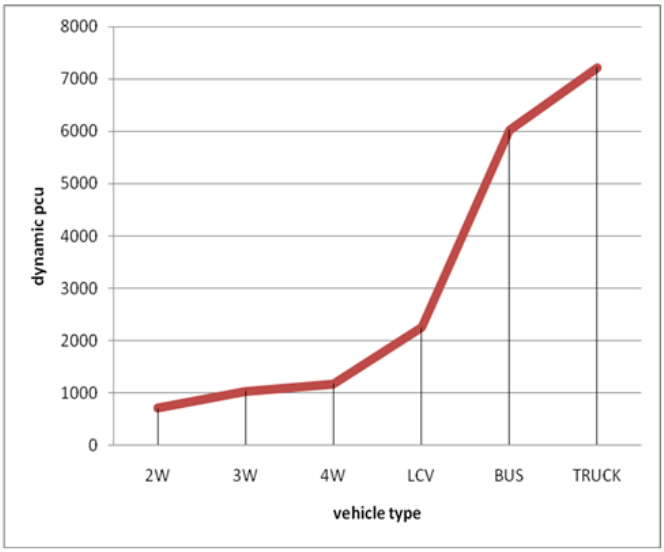

Figure 2. DCU Graph

IV. CONCLUSION

The analysis is based on the field studies conducted on typical state highways Padra-Jambusar vadodra city considering almost all classes of vehicles commonly found in India The present type of traffic and Highway condition PCU values for different categories of vehicle are determined on state Highway New PCU values obtained from site are quite different from the values given in IRC 64-1990 code. These results is shows the importance of increase the lane width in congested areas. The narrow width of lanes does not provide an adequate margin for vehicles movement so therefore, speeds of individual vehicles drop.

V. REFERENCES

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