

**IMPACT OF LANE WIDTH OF ROAD ON PASSENGER CAR UNIT  
CAPACITY: A REVIEW****<sup>1</sup>Prof. J. R. Deshmukh, <sup>2</sup>Prof. Poonam V. Sarode**Assistant Prof. of Civil Department Manav School of Engineering and Technology, Akola<sup>1,2</sup>  
[jrdmktce4@gmail.com](mailto:jrdmktce4@gmail.com)<sup>1</sup>, [Pvsmktce2@gmail.com](mailto:Pvsmktce2@gmail.com)<sup>2</sup>**ABSTRACT**

Passenger car unit is used to show the outcome of different mixed vehicle types on traffic flow. The study of basic traffic flow features like traffic volume, it is obligatory for the effectual drafting, designing and performance of roadway system. India is a developing country and consisting of heterogeneous traffic in which different dimensional and operational features of vehicle occupying same lane. Different vehicle type occupy different spaces on the road, move at different speeds and start at different speeds. Besides, the behaviour of drivers of different types of vehicle can also differ considerably. The moving vehicles of heterogeneous traffic occupy any convenient lateral position on the road without any lane discipline, based on the availability of space. This study is related to determine the value of PCU values of different vehicles in under mix traffic flow at on congested highways. Passenger Car Unit (PCU) of different types of vehicles are required to convert a mixed traffic stream into a homogeneous equivalent, and thereby to express the mixed traffic flow in terms of equivalent number of passenger cars. In this paper the required data is collected at some highways around Amravati city. Data collected and analyzed the traffic characteristic. Nowadays traffic is increasing rapidly which is responsible for congestion on highway due to which accidents rate is accordingly increases. Our aim is to work out the passenger car unit for different types of vehicles under mixed nature traffic conditions.

**Keywords:** Data collection, Highway capacity, PCU, Traffic volume**1. INTRODUCTION**

Two-lane highways represent the majority of road networks in the world. Different types of vehicles with varying dynamic and static characteristics share the same road space without much segregation and control of speed. Indian traffic streams consist of heterogeneous traffic which also includes non-standard vehicles the behaviour of Indian driving on highways such heterogeneous, that is, the lane discipline and lane change behaviour affects roadway capacity on highways. The different types of vehicle and their size and speed of that vehicle create a number of problems for traffic operations. In this research, an attempt has been made for the first time to study on the highways around Amravati city to identify the impact of lane width on the capacity of highways under mixed nature traffic conditions. The Indian Roads Congress (IRC) code specifies the PCU values for different vehicle types also such as car, truck, trailer tractors, hand carts, motor cycle, rickshaws, bullock carts, etc. However, these PCU values are fixed and only depend on traffic composition on highways. The capacity of two-lane highways includes lane width and type of shoulder influence volume of traffic. Lane and shoulder width can be a great impact on traffic flow on congested highways. This paper is focused on the study of the effect of variation in nature of traffic volume, road width and size of the vehicles, on PCU value of vehicles.

**2. OBJECTIVES**

The main aim of the study is to examine the credibility of PCU values given in IRC for the present roadway and traffic condition. In view of the main aim of the study, the following objectives are

- 1) To estimates the value of PCUs for mix traffic conditionof moving vehicles in the traffic stream.
- 2) To develop new PCU values applicable to currenthighway and traffic conditions.
- 3) To avoid congestion and avoid discomfort to drivers.
- 4) To compare the PCU values obtained by current studiesto know whether they are different with IRC.

### **3. LITERATURE SURVEY**

Satish Chandra 2002 this paper include data are collected at ten sections of two-lane roads in different parts of India the PCU for a vehicle type increases linearly with the width of carriageway. This is attributed to the greater freedom of movement on wider roads and therefore a greater speed differential between a car and a vehicle type. V.Thamizh Arasan and Shriniwas S. Arkatkar (2010)reported traffic volume as number of vehicles passing a given section of road or traffic lane per unit time several types of vehicles with widely varying static and dynamic characteristics are comprised in the traffic.. This study is concerned with the estimation of PCU values of vehicles in such traffic conditions, using microscopic simulation. The PCU values obtained for different types of vehicles, show that the PCU value of vehicle significantly changes with change in traffic volume and width of roadway. : Florence Rosey (2009) in this paper the driving simulator study investigated differences in the influence of lane width reduction on speed profiles and lateral positions in real world and simulator conditions. The main part of this study describes the experimentation in virtual reality with the driving simulator of INRETS (French National Institute for Transport and Safety Research). S.Anand and V.C. Sekhar (1999) reported Passenger Car Unit (PCU) value of each class of vehicle is very important for any mixed traffic flow studies at highways. the PCU values is used for different classes of vehicles has been proposed for Malaysian roads Parvathy R, Sreelatha T, Reebu Z Koshy (2013) reported determine the PCU values for various types of vehicles, And therefore a comparison of results with PCU factors recommended by IRC code. It is found that the estimated PCU values are different from those being used in India, and they are indirectly related to the length of passenger car. Studies reveal that PCU values have a great impact on signal design, in this study can be used as a guideline in the design and analysis of signalized intersections

### **4. DATA COLLECTION**

The data for this study were collected at different sections of highways around Amravati city to determine the impact of lane width and shoulder's condition on capacity of highways, during the time of data collection as to cover the total trap length with some margin on either side with stop watch for determine time to cross the trap length. This time 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 as shown in Table1

Table 1: vehicle categories and their size

| Category of vehicle | Average Dimension in (m) |       | Projected area on ground (m <sup>2</sup> ) |
|---------------------|--------------------------|-------|--------------------------------------------|
|                     | Length                   | Width |                                            |
| Car                 | 3.72                     | 1.44  | 5.39                                       |
| Bus                 | 10.1                     | 2.43  | 24.74                                      |

|           |      |      |       |
|-----------|------|------|-------|
| Truck     | 7.5  | 2.35 | 17.62 |
| L.C.V     | 6.1  | 2.1  | 12.81 |
| trailer   | 7.4  | 2.2  | 16.28 |
| 3-wheeler | 3.2  | 1.4  | 4.48  |
| motorbike | 1.87 | 0.64 | 1.2   |
| Bicycles  | 1.9  | 0.45 | 0.85  |

### RAFFIC VOLUME DATA

The proportion of vehicles in a traffic stream is very important parameter for geometric and structural design of any pavement. Analysis of traffic composition gives the idea of proportion of wide verity of vehicles. So, it is crucial to know the traffic composition of various sections. Vehicle class percentages on N.H-06 are shown in below Fig.1.It is Found that, Truck, trailer, by-cycle, light commercial vehicle has the lowest percentage in the traffic stream and percentage of car shows slightly variation in volume of traffic. All these locations are presented through pie charts in Figs. 1 to 2. It is observed from these figures those two wheelers traffic is predominant at all the locations and the percentage shares of vehicles are also given.

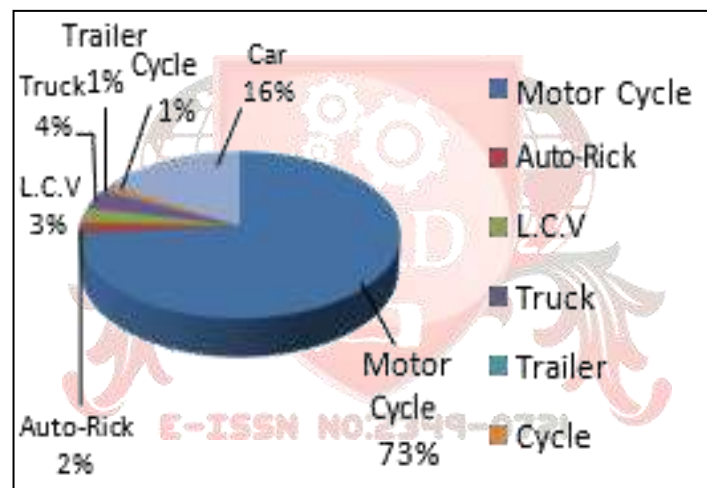


Fig. 1: Observed traffic composition on N.H-06 section

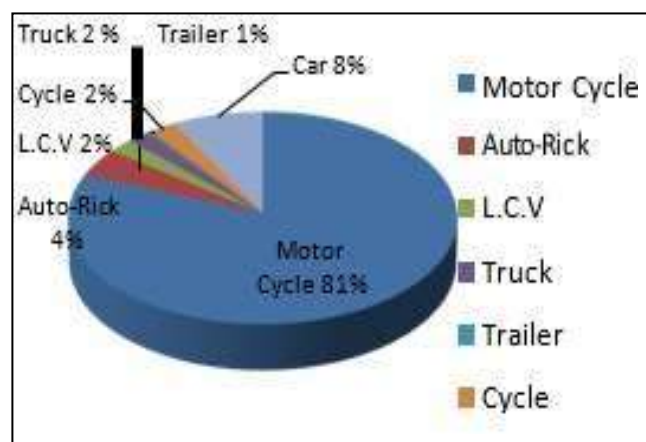


Fig. 2: Observed traffic composition on S.H sections

Table 2: shoulder condition on different highways CW=Carriageway width

| Name of the Road | C W | Shoulder            |           | Physical condition Of shoulder     |
|------------------|-----|---------------------|-----------|------------------------------------|
|                  |     | Type                | Width (m) |                                    |
| Rajkamal section | 7.2 | Earthen             | 1.2       | Drop at pavement edge was 8.0 cm.  |
| Rajapeth         | 7.8 | Earthen             | 1.6       | Drop at pavement edge was 12.0 cm. |
| Loni             | 7.0 | Soil and gravel mix | 1.2       | Drop at pavement edge was 10.0 cm. |
| Arjun nagar      | 7.8 | Earthen             | 1.8       | Drop at pavement edge was 10.0 cm. |
| Rahatga-on       | 7.8 | Earthen             | 1.8       | Drop at pavement edge was 12.0 cm. |

## 5. SPEED DISTRIBUTIONS

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. The distance between entry and exit points kept according to the site conditions. Synchronized stop watches were used to record the timings of all vehicles passing through the traveling the section. To analyses these parts and determine the speed - flow relationships accordingly in the present study. Table no.3 shows the average speed of vehicle at different section of highways.

Table 3: Speed Statistics of Individual Vehicles

| Type of vehicle          | Mean Speed (Km/h) |
|--------------------------|-------------------|
| Car                      | 54.40             |
| Truck/bus                | 41.00             |
| Two-wheeler              | 39.54             |
| Light Commercial Vehicle | 39.69             |
| Rickshaw                 | 39.18             |
| cycle                    | 11.32             |

## 6. DETERMINATION OF PCU VALUES

In British practice it is usual to express capacity in The different types of vehicle offer different degree of interference to other traffic and it is necessary to bring all types to a common unit adopted is the passenger Car Unit (PCU). In the present study on the highways to determine PCUs values are follows. To estimate the PCU values is that it is directly proportional to the ratio of clearing speed of vehicle, and inversely proportional to the space occupancy ratio of vehicle with respect to the standard Area of vehicle i.e. a car,. The PCU of a vehicle type is taken as given by Chandra and Kumar (2003).

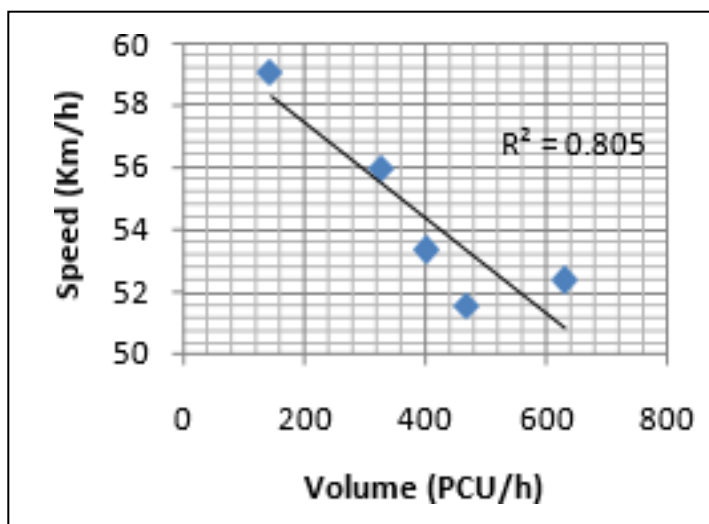


Fig.-3 PCU

Table 4: Passenger Car Unit for different types of vehicles at different highway sections.

| Highway Section  | Truck | Two Wheeler | Car | Light Commercial Vehicle | Trailer | Cycle | Rickshaw |
|------------------|-------|-------------|-----|--------------------------|---------|-------|----------|
| Rajkamal section | 5.51  | 0.35        | 1.0 | 3.1                      | 6.29    | 0.42  | 1.14     |
| Rajapeth         | 6.19  | 0.31        | 1.0 | 3.65                     | 7.31    | 0.83  | 1.32     |
| Loni             | 4.31  | 0.27        | 1.0 | 3.38                     | 6.84    | 1.02  | 1.18     |
| Arjun nagar      | 5.04  | 0.26        | 1.0 | 3.21                     | 6.49    | 0.62  | 1.04     |
| Rahatgaon        | 5.26  | 0.28        | 1.0 | 3.17                     | 6.51    | 0.75  | 1.13     |

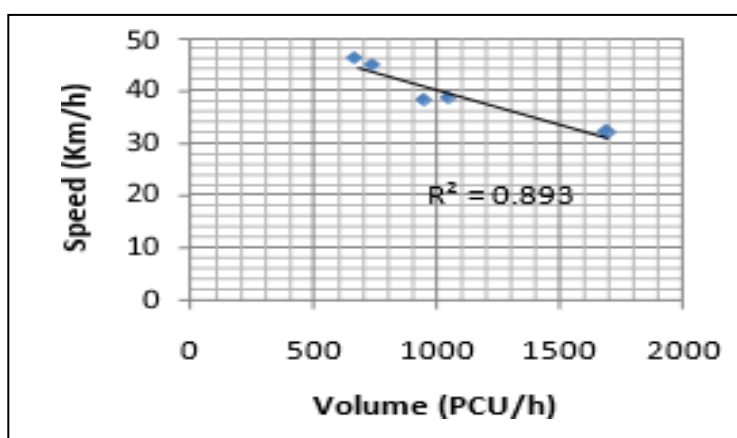


Fig. 3: Speed - Volume relationships for Two Wheeler.

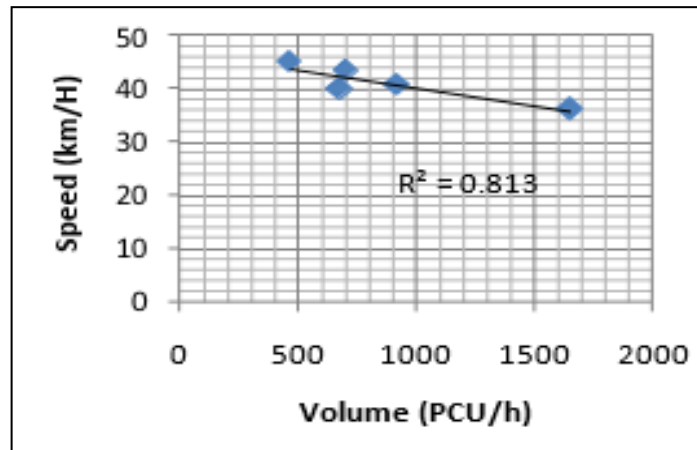


Fig. 4: Speed - Volume relationships for Car

## 7. SPEED–VOLUME RELATIONSHIP

A growth of motor vehicle population, the traffic on the road has been increasing, both in terms of volume and intensity. Speed, density, and volume are the most important components. The knowledge of traffic characteristics is useful for a traffic stream for estimating the traffic carrying capacity of a road. The relationships help the traffic engineer in planning, designing and the effective implementation of traffic-engineering measures on a road or highway system. The performance of roadway networks depends on capacity and volume of traffic in the network. The average stream mean speed calculated at highway section was plotted against the traffic volume. Typical curves showing speed–volume relationships are given in Fig 3, Fig. 4 and Fig 5.

Table 5: Capacity of Two-Lane Roads with Different Carriageway Width

| Highway section  | carriageway width(m) | Total Capacity (pcu/h) |
|------------------|----------------------|------------------------|
| Rajkamal section | 7.0                  | 1897.3                 |
| Rajapeth         | 7.8                  | 2675                   |
| Loni             | 7.2                  | 3738.4                 |
| Arjun nagar      | 7.8                  | 4652                   |
| Rahatgaon        | 7.8                  | 3139.74                |

## 8. RESULTS & CONCLUSIONS

The analysis is based on the field studies conducted on typical highways around Amravati 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 for different sections of Highway separately. New PCU values obtained from site are quite different from the values given in IRC code. It is found that PCU values obtained for motor cycle, auto rickshaw, from all sections are smaller than the values given in IRC and for Truck, Trailer and L.C.V found higher than the value given in IRC 64-1990 Code. This study has shown the impact of lane width on the PCU for different categories of vehicles and on the capacity of a two-lane Highways. It is found that the PCU for a vehicle type increases with increasing lane width. The main aim of this study is to

assess the credibility of PCU given in IRC for the present type traffic and Highway way condition. Impact of highway lane width on the PCU is apparently linear. The capacity of a 7.2 m wide road is PCU values is estimate 3348.48 PCU/h which is larger than the value of 3,200 PCU/h suggested in HCM 2000 These results is shows the importance of increase the a lane width in congested areas.. It is found that PCUs of different categories of vehicle are inversely related to length of passenger car PCU values applicable to current conditions need to be developed instead of depending on the old PCU values given in code. The narrow width of lanes does not provide an adequate margin o for vehicles movement so therefore, speeds of individual vehicles drop.

## 9. REFERENCES

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