A Study on Effect of Road Width on Highway Capacity

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Abstract- *For the present study road width is selected as the main parameter to study on variation of capacity, optimum speed and passenger car unit on it. The different road widths such as 6.5, 7.0, 9.3, 16.5 m were chosen for the study on national highway - 75. For each vehicle classes the passenger car unit is determined on different road width, and studied how it is affected by variation of road width. Capacity of stretch is calculated on each section by using linear regression equation obtained by plotting the speed flow relations. Free flow speed is calculated on each section. The optimum speed is calculated for each section. Setting linear regression equation for variation of capacity and speed on different road width and variation of capacity with speed. The coefficient of determination is also calculated for each variation.*

Keywords- Capacity, Passenger Car Unit, Width

I. INTRODUCTION

Most of the National highways and State highways in India are mixed traffic condition. Different types of vehicles having different dynamic and static characteristics, and also having different size and speed of the vehicle create a number of problems for traffic operations. Capacity analysis for National highways needed to the planning, design and maintenance of roads and for determining the carriage way width to be provided for a particular road network with respect to the volume and composition of traffic. Capacity analysis is very important for evaluation of investments needed for future road construction and improvements and for setting priorities between competing projects, this capacity analysis understanding of speed and volume characteristics of roads with different pavement widths and types under various conditions. Highway capacity can be defined as the ability of roadway or traffic lane to allow maximum traffic movement per unit time, which is vehicles in a lane or roadway that can pass a given point in unit time at highest rate. The units used for this is vehicles per hour per lane or roadway. The capacity expressed in passenger car units (PCUs) per hour.

II. OBJECTIVE OF THE STUDY

To study the impact of road width on optimum speed of vehicles. To find linear regression equations for variation of capacity with respect to road width. To determine the capacity on different road width using speed-flow relations.

III. LITERATURE REVIEWS

Impact of Lane Width of Road on Passenger Car Unit Capacity under Mix Traffic Condition in Cities on Congested Highways In this paper they concluded that new PCU values obtained from sections are different from values given in IRC code. This study shows the impact of lane width on the capacity of a two lane national highways and also impact on PCU values of different categories of vehicles, this paper results and shows the importance of increase of road width in congested areas.**Capacity of Road with vehicle Characteristics and Road Geometrics Interface Modelling**In this paper explains factors like side walk, service road, carriage way, median, unpaved shoulder, parking lane etc, how effects on variation of capacity of road, and analysed that service road connection towards arterial roads at junction points also affects the road capacity.**Capacity estimation procedure for two lane road under mixed traffic condition**In this paper the objective has study of traffic flow data and analysed on two lane roads under different road and traffic conditions, and analyse the factors such as gradient, shoulder width, lane width, pavement surface condition and directional split affects on the capacity of road.After the analysis of results in 40 sections concluded that capacity increases on downward gradients and capacity decreases on upward gradient and as the lane width decrease capacity also decreases and as the lane width goes on increases capacity also increases. **Effects of gradients on capacity of two lane roads**In this paper has an objective of study on variation of PCU and capacity in the different downwards and upwards gradient and study on free flow speed characteristics, and variations speed in each category of vehicles, Draw graph on speed volume relationship gives the linear regression equation at each sections, by substituting the half of free flow velocity can determine the capacityAfter the analysis concluded that PCU values decreases on downgrades and increases on

upgrades, for each 1 percent of downgrade capacity increases by 3.09% and in upgrade capacity decreases by 2.61%.

IV. DATA COLLECTION

For the study and to determine the capacity of National highway-75 the required data were collected in four stages as follows .Selecting location, Collecting the width data of road,Classified volume count ,Speed data
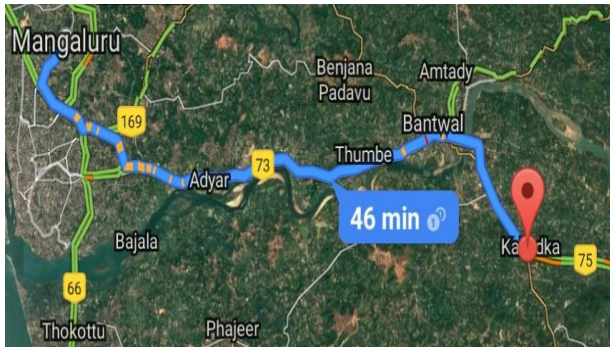
Stretch of Mangaluru to kalladka

In the stretch of 32 km selected 4 sections with different road width between Mangaluru to Kalladka

Sl no.	Location	Width (metres)
1	Padil	6.5
2	Melkar	7.0
3	BC Road	9.3
4	Valachil	16.5

V. DATA ANALYSIS AND DISCUSSION OF RESULTS

The capacity of road at different road width can be calculated by using the speed-volume relations. Speed calculated is mean stream speed at different volumes. 12 hours volume data is collected, corresponding to those data speed also noted. Then by plotting volume to mean stream speed we will get a linear regression equation. The example of equation is given below.

$Y = AX + B$ Where,
Y = Speed
X = Volume in PCU/hr.

B is free flow speed and A is constant

After we get equation, we can get capacity of stretch by substituting the half of free flow speed in equation, the corresponding volume is Capacity under consideration which
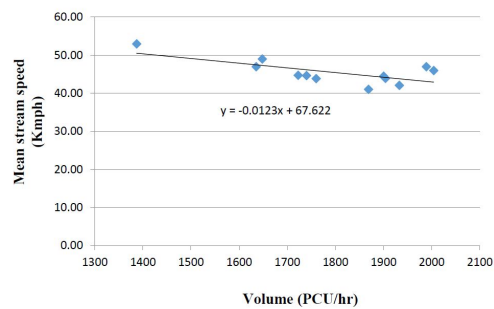
took from literature (Chandra & Goyal 2001). Free flow speed is speed at low volumes and speed at capacity is optimum speed.
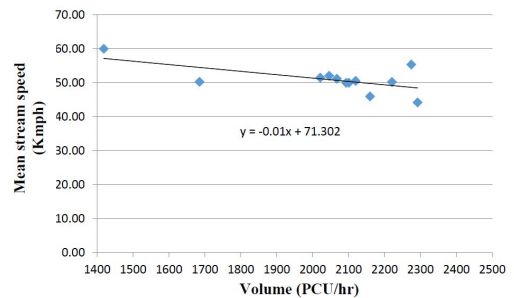
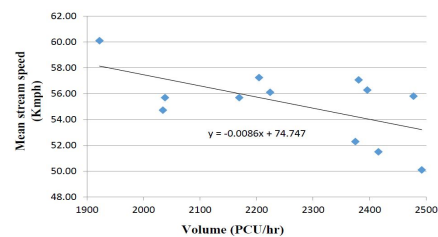## VI. DETERMINATION OF CAPACITY AT EACH SECTION
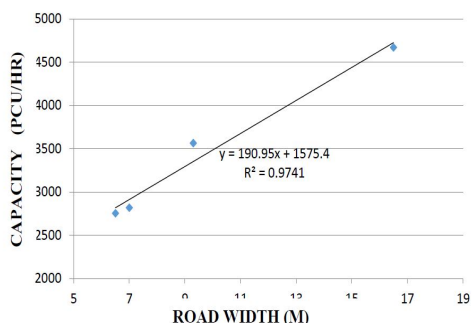
Padil section
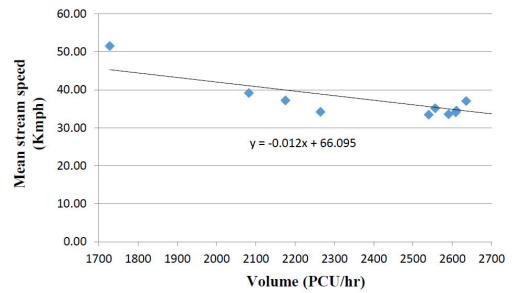
Melkar

BC Road

Valachil

Optimum speed and capacity at different width

Width (m)	Linear regression equation	Optimum speed (Kmph)	Capacity (PCU/hr)
6.5	Y = -0.012X + 66.09	33.04	2753
7.0	Y = -0.0123X + 67.62	33.81	2817
9.3	Y = -0.01X + 71.30	35.65	3565
16.5	Y = -0.0086X + 74.74	37.37	4671

VII. CAPACITY VARIATION ON DIFFERENT ROAD WIDTH

By observing graph it easily shows that the capacity will increase with increase of road width similarly capacity will decreases with decrease of road width.

Linear regression equation for capacity variation with road width

Y = 190.9X + 1575

Where

Y = Capacity (PCU/hr)
X = Road width

VIII. CONCLUSION

1. In this study can conclude that capacity of road will increase as the width of the road increases, For width 6.5, 7.0, 9.3, 16.5 m capacity is 2753, 2817, 3565, 4671 PCU/hr respectively.
2. The Optimum speed of every vehicle will increase as the width of the road increases, for width 6.5, 7.0, 9.3, 16.5 m optimum speed is 33.04, 33.81, 35.65, 37.37 Kmph respectively.
3. The level of service is determined at Padil, Melkar, BC Road and Valachil sections are E, C, C and B respectively

4. The $R2$ value is nearing to 1 it shows that the major portion of variability is explained by equation. The linear equation at every road width to find capacity is a best fit.

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