

# Capacity Determination of an Arterial Road - A Case study of Modasa Town (Bus station to Malpur cross road)

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**Abstract** - In Modasa, newly born City of north Gujarat (INDIA), faces severe traffic congestion due to rapid and uncontrolled development by an unacceptable level of disparity in transportation demand and supply scenario resulting in environmental degradation as well. Capacity analysis is essential for planning, design and operation of road. Planning and development of road systems require an understanding of capacity standards for assessing economic consequences of important road development schemes. Among other things, it provides the basic of determining the total width to be provided for bus-station to state bank of India with regards to volume, composition and other parameters of traffic. The factors affecting capacity of road are physical road way, traffic, environment and control conditions. Speed-flow relationship is the basic relationship depicting traffic behavior. In this study speed-flow relationship, speed-density relationship and flow-density relationship for SBI to bus-stand and bus-stand to SBI road link in Modasa city are developed using video recording technique. The capacity is derived from the speed-flow relationship, which can be helpful for working out improvement plans.

## I. INTRODUCTION

Modasa is situated in the northeast portion of the Gujarat State (INDIA). with latitude of 23.47N and longitude of 73.30E. Population in Modasa city is 94 thousands (2011). Density of population is 5300 per sq.Km.

Traffic and transportation problems in Modasa City have not been commensurate with the increasing demands for its usage. The city expanded dynamically without any planning and control due to the rapid socioeconomic changes. Modasa City is the nucleus of the greater Modasa regions and all of the divisional head office of corporate offices, the higher educational facilities ( Two Pharmacy college, Two public engineering college, three private College, thirty industrial Cources, private hospitals and clinics, government colleges and schools), so many business and shopping complexes are located in or around the Modasa city. Thus, the city plays a big role in controlling the economic development of not only Modasa region but also the entire Gujarat.

## II. BASIC FORM OF SPEED-FLOW-DENSITY RELATIONSHIP

Knowledge of relationship between speed, volume and density is very important in traffic studies. In this the speed-volume relationship is used to find the capacity of roads.

### A. Speed-density relationship

With increase in density the speed decreases. When there is no vehicle (density=0), the speed is maximum. This speed is called "Free speed". At very high density, the vehicles approach zero speed. This density is called "Jam density".

### B. Speed-Flow relationship

At very low speeds the volume would also be low. With increasing speed, traffic volume also increases up to a certain limit, as headway initially decreases. But as the speed further increases the spacing between the vehicles increases and becomes so large that volume decreases. There is an optimum speed at which the flow is maximum.

### C. Flow-density relationships

As the density increases from zero, volume increases up to the point of critical density . the density corresponding to maximum flow. It is called "Optimum density". There after volume decreases as density continues to increases to a maximum value known as "Jam density" when all vehicles are stopped. As density increases the speed of vehicle is reduced, reducing the flow, till it reaches jam density when there is no movement or flow.

## III. METHODOLOGY & DATA COLLECTION

The study has been conducted by the Department of Civil Engineering, GOVT. Engineering College, Modasa. For assessing the existing traffic condition in Modasa City

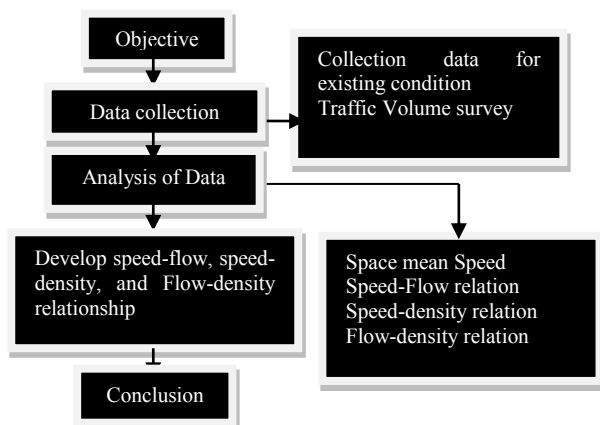


Fig.1. Stages of the Study work

A. Road Geometry Data

Road Name	Number of Lane/ Direction	Carriage Way width(m)/Direction	Average volume PCU/hr	surface type	Data collection Technique
SBI to BUS Station connecting road	2	7.00	1875	Bitumen	Videography

Table.1 Present situation of the Road And Data Collection Technique

B. Traffic Volume Survey

The most important data are generated through the modern survey techniques like traffic volume count at Malpur Cross Road to Bus-Station Link road. The extent of variation of traffic flow was ascertained by carrying out twelve hour (7:30 to 19:30) weekday counts on Study road. By analyzing the twelve-hour traffic volumes, the period of peak flows are assessed. The traffic volume is expressed as passenger car unit per hour (PCU/h).

IV. ANALYSIS OF COLLECTING DATA

Data collecting from volume count survey are Analysis and measure Space mean speed on selected 27 m long street through 2 min Flow count in Peak hour and Density is measured through the equation 4.1. After completed Analysis developed Relationship of Speed-Flow, Speed-Density and Flow-Density and measured Capacity of Urban Arterial Street.

$$v_s = \frac{Q}{K} \quad (1)$$

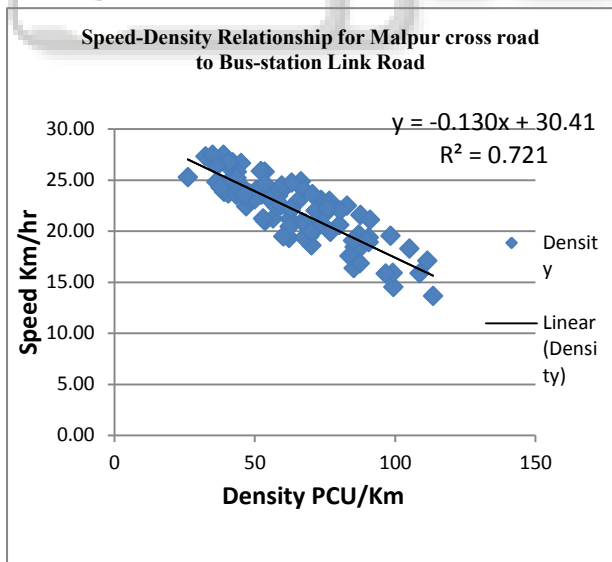


Fig. 2 Speed-Density Relationship for Malpur cross Road to Bus-station Link Road

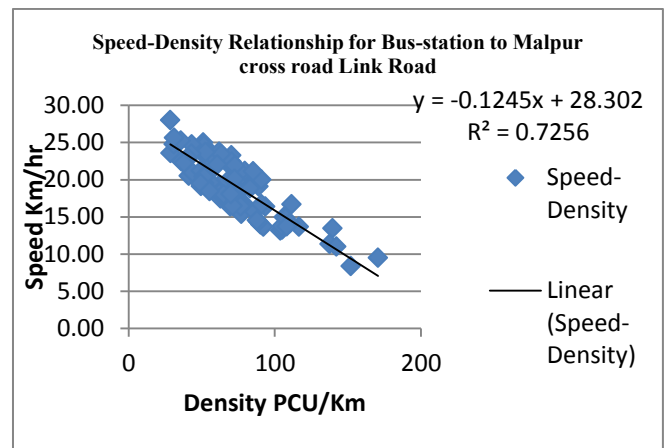


Fig. 3 Speed-Density Relationship for Bus-station to Malpur cross road Link Road

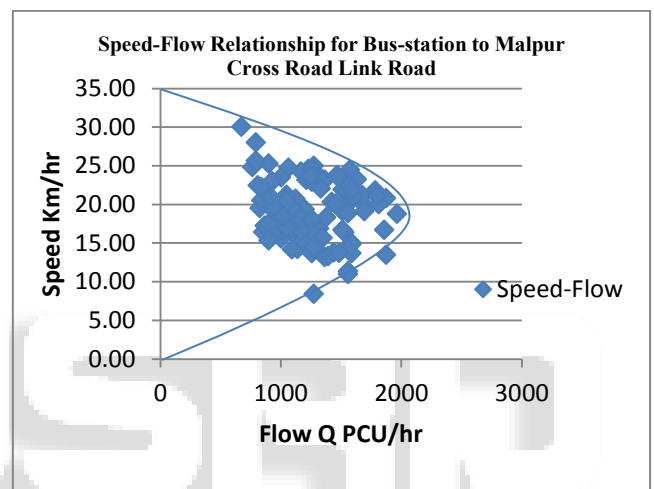


Fig.4 Speed-Flow Relationship for Bus-station to Malpur cross road Link Road

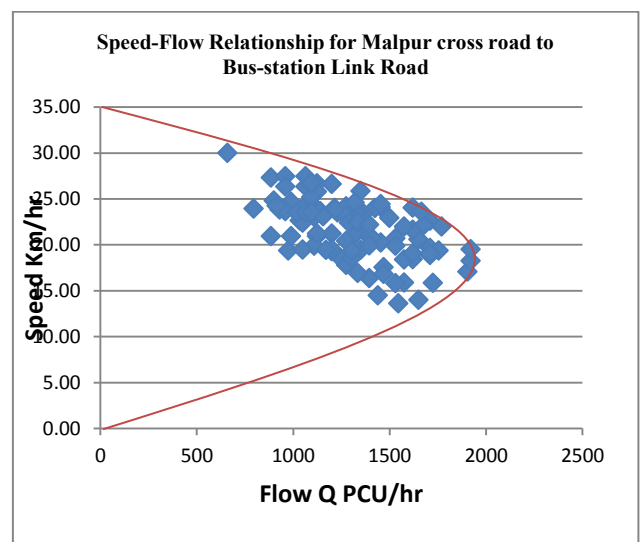


Fig.5 Speed-Flow Relationship for Malpur cross Road to Bus-station Link Road

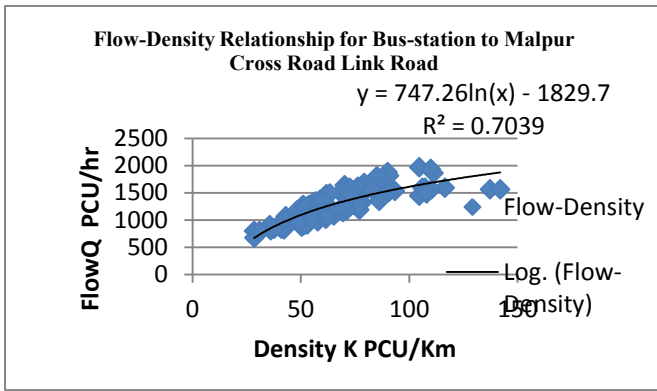


Fig.6 Speed-Density Relationship for Bus-station to Malpur cross road

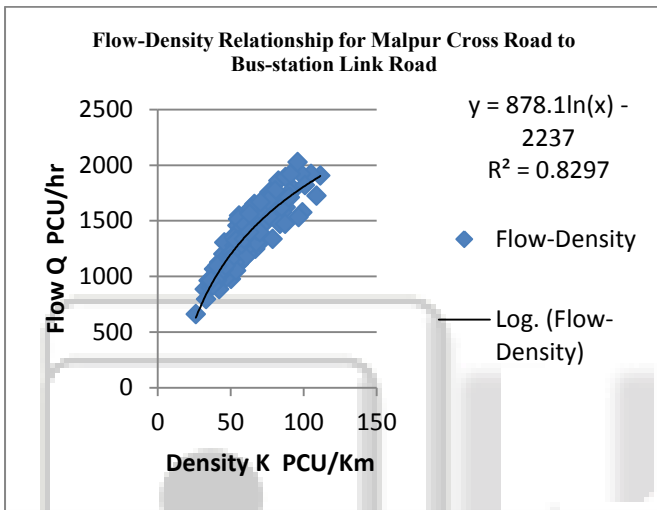


Fig.7 Flow-Density Relationship for Malpur cross road to Bus- station

C. Capacity study of Arterial Street of Modasa Town is Useful for the Future Transportation planning, Traffic management, Improvement and Changes in Geometrics features etc.

REFERENCES

- [1] IRC:106 (1990), “Guidelines for capacity of Urban roadin plain area”, (First revision), Indian code of practice, Indian Roads Congress, New delhi.
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- [3] Justo, C.E.G. and Tuladhar, S.B.S. (1984), “PCU Values for Urban Roads”, Journal of IRC, 45-1.
- [4] Shah pankil B (May 2006), “Urban Road Link Capacity Determination by Dynamic PCU Concept”.

Link Name	Capacity From study conducted	Capacity as per $Y=234.58X+303.27$	Capacity as per IRC
Bus-station to Malpur Cross Road	2025	1946	2400
Malpur Cross Road to Bus-station	1975	1946	2400

(Source- [1] [2] [4])

Table. 2 Comperision of Capacity

V. CONCLUSION

- A. Reduction in the Capacity is observed which may be due to effect of encroachment and on-Street parking.
- B. Behavior of Pedestrians may have effect on Capacity of Road, which needs to be quantified by separate study.