



# INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

## EVALUATION OF CAPACITY AND LEVEL OF SERVICE OF ROADS

C. V. YERAMWAR, A. A. KALEY, K. M. BAMBODE

Dept. Of Civil Engineering .DRGIT&R, Amravati-444601

Accepted Date: 15/03/2016; Published Date: 01/05/2016

**Abstract:** Intersections are considered as the critical points of network and estimation of their performance is very necessary. The road network also considered as a lifeline for a city. The largest city in vidharbha is Nagpur, the second largest city is Amravati. Traffic congestion has become a major problem in many cities like Amravati. Amravati is 8th most populous metropolitan area in the state. Population of city is 7, 45, 000 in 2015. It has flyovers slowly coming up and enhancing the beauty of the city. The objective of study is to improve the performance operation of road. Traffic surveys are conducted to collect data on vehicular volume and speed selected road section. Traffic volume study is carried out and existing level of service is calculated. The data is analyzed the peak hour traffic.. Traffic surveys are conducted on working days during morning and evening peak hours. Manual as well as ideography technique are used for traffic surveys. Synchro software is used for analysis of road network. Synchro software is easy to use. It is optimization software & user can optimize the entire network. The results are useful for evaluation of capacity and level of service of road.

**Keywords:** Capacity, Highway Capacity Manual, level of service, saturation headway , spot speed, Traffic Volume study, Volume Count.



PAPER-QR CODE

Corresponding Author: C. V. YERAMWAR

Access Online On:

[www.ijpret.com](http://www.ijpret.com)

How to Cite This Article:

C. V. Yeramwar, IJPRET, 2016; Volume 4 (9): 26-32

## INTRODUCTION

Traffic congestion has been one of major issues that metropolises are facing. Traffic congestion causes waste of time and energy such as fuels, thereby causes pollution and stress also imposes cost on society. The Highway Capacity Manual (HCM 2000) designates six levels of service for each type of facility, from A to F, with LOS "A" representing the best operating conditions and LOS "F" the worst. It uses distinct values as boundaries for the various levels of service, each of which represents a range of operating conditions. The classification of urban streets into number of street classes and speeds into different levels of service categories is well defined in HCM 2000 are well applicable in homogenous traffic flow condition.

Scope of transportation system has developed very largely. This led to the increase in vehicular traffic especially in private transport network. Thus road space available was becoming insufficient to meet the growing demand of traffic and congestion started. The population of country is growing day by day. The intensity of the traffic and pedestrians crossing has increased significantly and there is no scope for increasing the road length and widening due to land acquisition problem especially at junctions in multiple directions. For a variety of reasons such as population, economic and auto ownership growth, increasing traffic demand can exceed the carrying capacity of the road during peak periods. As a consequence, traffic condition deteriorates and safety risk worsens. Capacity of a road is represented by the maximum rate at which vehicles can pass through a given point in an hour under prevailing operational conditions. Intersection capacity or volume-to capacity ratio is one of the operational measures of effectiveness used in measuring LOS. Present study is carried out to determine peak hour traffic and also to determine capacity of road. Also it is carried out to determine level of service of road. The results are very useful for evaluation of traffic quality.

## 2.0 LITERATURE REVIEW:-

Reference [1]", Speed ranges of Level of Service (LOS) categories of urban streets are not well defined for highly heterogeneous traffic flow condition on urban streets in Indian context. Average travel speed on street segments is used as the measure of effectiveness, which in this case has been derived from second by second speed data collected. Bhuyan and Rao (2011) defined the free flow speed ranges of urban street classes and speed limits of LOS categories. HCM The current definition of LOS being followed is that defined in HCM 2010 "LOS is a quantitative stratification of a performance measure. The measure employed to determine LOS for transportation system elements are called "service measures". The HCM describes "level of service" is a qualitative measure that describes traffic conditions in terms of speed, travel time,

freedom to manoeuvre, comfort and convenience, traffic interruptions and safety. Six classifications are used to define LOS, designated by the letters “A” to “F”. Where LOS A represents the best conditions, while LOS F represents heavily congested flow with traffic demand exceeding highway capacity. The current definition of LOS being followed is that defined in HCM 2010 “LOS is a quantitative stratification of a performance measure. The measure employed to determine LOS for transportation system elements are called “service measures”.

Reference [2]”,The present study provides PCU values for different types of vehicles typically found on interurban multilane highways in India at different levels of service (LOS Finally, PCU values are suggested for different type of vehicles at different LOS and for different traffic composition on four-lane and six-lane divided highways.

Reference [3]”,The road network of any city is its lifeline and the evaluation of their performance is very necessary for future traffic planning, design, operation and maintenance, etc. Traffic flow in most cities of India is a mixed traffic characteristics and also the traffic congestion is the common problem in most major cities in India.

### 3. METHODOLOGY

#### 3.1.1 Synchro Software

#### 3.1.2 Highway Capacity Manual

#### 3.1.3 Manual as well Video technique method

#### 3.1.4 Saturation Headway Calculation =

#### 3.1.5 $C = 1000V/S$

Where C = Capacity in vehicles per hour per lane

V= Speed, in K.P.H.

S = Average spacing in meters of moving vehicles

#### 3.1.6 Methodology:-

- 1) Select the study stretch.
- 2) Collect data manually as well as by videography technique.

- 3) Classify traffic volume count.
- 4) Calculate spot speed for a stretch.
- 5) Use of software for calculating capacity and level of service of roadway

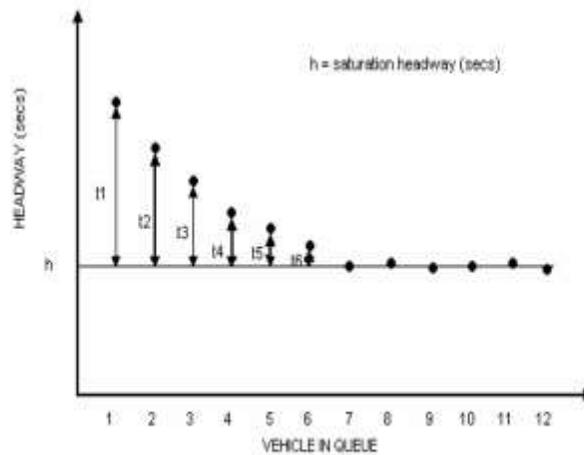
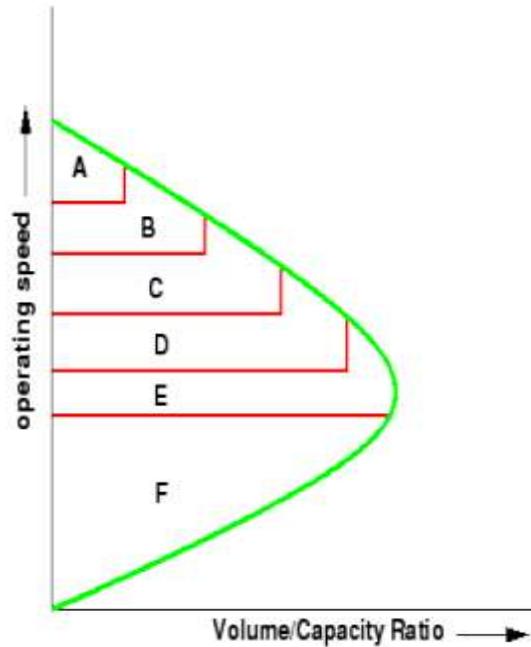


Figure 1: Headways at a traffic interruption

#### 4.0 Study Area

The population of Amravati city is growing day by day. Study of basic traffic flow characteristics such as volume is used for the effective planning, design, operation and management of roadway systems. Operation and performance of signalized intersections is influenced by the roadway parameters, traffic condition, operating parameters and environmental conditions along with user's behavioral characteristics, which significantly differ among locations. The concept of level of service (LOS) describes operating conditions within a traffic stream. Traffic volumes is the observed extreme value method which estimates the capacity of a road over a certain period. Road capacity estimation based on both traffic volume and speed data.

Saturation headway of the first four vehicles leaving an intersection after a red light will have a higher value so the saturation headway will not be realized until the 4<sup>th</sup> and last queued vehicle leaves the intersection. This paper analyses capacity and level of service of road.

#### 5. RESULT AND DISCUSSIONS:-

##### Traffic count:

On the basis of data collections at the various locations throughout the study route (Irvin to Rajapeth station square)

There are mainly three major intersections with highest traffic volume and peak hour factor (PHF) are as follows. :

Intersections	Traffic volume	PHF
1) Irvin	2249.89veh/hr.	0.94
2) Rajkamnal	3283.94veh/hr.	0.92
3) Rajapeth	3504.60veh/hr.	0.99

##### Spot Speed

##### Formula -:

Spot Speed =Distance/time

- Spot speed at Rajkamal intersection ranges from 10km/hr to 41km/hr.
- Spot speed at Irwin intersection ranges from 16km/hr to 54km/hr.

- Spot speed at Rajapeth intersection ranges from 21km/hr to 42km/hr.

#### Saturation headway Study

- Saturation headway for IRWIN intersection is 1 to 5.
- Saturation headway for RAJKAMAL intersection is 1 to 5.
- Saturation headway for RAJAPETH intersection is 1 to 10.

$$C_A = 1900 * N * f_w * f_{HV} * PHF * g/C$$

where:

$C_A$  = intersection approach capacity

$N$  = number of lanes on the segment (one direction)

$f_w$  = adjustment factor for lane width

$f_{HV}$  = adjustment factor for heavy vehicles

$PHF$  = Peak Hour Factor

$g/C$  = effective green time-to-cycle length ratio

highest flow rate ( Rajkamal to Rajapeth) lane width -7.1 m.

$$\begin{aligned} f_w &= 1 + (W - 3.6) / 9 \\ &= 1 + (3.55 - 3.6) / 9 \\ &= 0.99 \end{aligned}$$

$$\begin{aligned}f_{HV} &= 100 / [100 + \% HV (ET - 1)] \\ &= 100 / [100 + 15\% (2 - 1)] \\ &= 0.99 \\ C_A &= 1,900 * N * f_w * f_{HV} * PHF * g/C \\ &= 1900 * 2 * 0.99 * 0.99 * 0.98 * 0.27 \\ &= 989.89 \text{ Veh./hr.}\end{aligned}$$

#### CONCLUSION:-

Capacity of Rajkamal to Rajapeth intersection is 989.89veh/hr. Capacity of road can be increased by considering different parameters.

#### REFERENCES:-

1. Defining level of service criteria of urban streets in Indian context(2011) Prasanta Kumar Bhuyan , K. V. Krishna Rao
2. Passenger Car Units at Different Levels of Service for Capacity Analysis of Multilane Interurban Highways in India- Mehar; S. Chandra; and S. Velmurugan
3. A Study on Urban Road Widening Project based on Prediction of Level of Service (LOS) – Breeten Singh Konthoujam D r . M . R . Rajashekara
4. Transportation Research Board, Highway Capacity Manual, 2000.
5. IRC: 106-1990. “Guidelines for Capacity of Urban Roads in Plain Areas”. Indian Road Congress, New Delhi.
6. Dr. L.R. Kadyali. “Traffic Engineering and Transportation Planning”. Khanna Publishers, Seventh Edition 2007.