

# Traffic Management along an Arterial in Bhimavarm Town in Andhra Pradesh

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**Abstract:** *To improve the traffic flow at the Bhimavaram intersection along State Highway 165 in Andhra Pradesh, traffic survey is conducted which include road inventory, volume count and turning movements along the four arms towards the intersection. Volume accumulation curve is developed and the peak volume and peak time is obtained. From the analysis it is found that the peak volume is of 2896 passenger car equivalence during 9.30 to 10.30 hours at this intersection. Volume to capacity ratio is found as 0.8 and it will reach one before 2024 which will make high level of congestion and poor level of service. To manage this Transport System Management concepts are suggested in various scenarios which may reduce the volume well lesser (0.3) than the capacity.*

**Keywords:** Traffic Congestion, Traffic Survey, Transport System Management, Volume Count, Volume accumulation

## 1. Introduction

The problem of traffic congestion has always been an essential part of human civilization. However, it was not until the second of the last century that the rapid rise in the number of motor vehicles and demand in virtually all modes of transport became predominant. The amount of traffic is determined by the number of vehicles which are travelling over certain time span. Traffic engineering studies involve daily volume, volume per hour and peak hour volume. The volume in Passenger Car Equivalence (PCE), movements and classification of mode at a given location is determined via traffic volume studies. Data from traffic volume may calculate peak flow time, peak volume and determine the impact of large size modes with others.

## 2. Review of Literature

Traffic congestion was a condition in transport that is characterized by slower speeds, longer trip times, and increased vehicular queuing. Traffic congestion on urban road networks had increased substantially, since the 1950s. When traffic demand was great enough that the interaction between vehicles slowed the speed of the traffic stream, this results in congestion (Wikipedia, the free encyclopedia)[1]. John F. Gilmore and Khalid J. Elibiyari (1993) [2] said that traffic management systems have historically been limited to addressing the control of street signal lights. Algorithmic solutions to this problem have proved to be very restrictive, while expert system solutions have only shown valid results with small signal networks. John L. McLin and William T. Scherer (2011) [3] said that traffic congestion was a worsening problem in metropolitan areas which would require integrated regional traffic control systems to improve traffic conditions. They presented a regional traffic control system which could detect incident conditions and provide integrated traffic management during non recurrent congestion events. Harsha Priya. Ka et al (2013) [4] said that traffic management was the term used to describe a wide range of technical practices undertaken to

manage traffic across networks, which include prioritization, slowing down. A model had been developed using micro simulation software VISSIM and the deficiencies of the network had been found. Hasan Omar Al-sakran (2015) [5] said that in recent years popularity of private cars was getting urban traffic more and more crowded. As result traffic became one of important problems in big cities in all over the world. Some of the traffic concerns were congestions and accidents which had caused a huge waste of time, property damage and environmental pollution. Jiandong Cao (2016) [6] said that in urban traffic monitoring, traditional methods used video image acquisition equipment to collect all the data and then rely on the manpower to complete the monitoring process, not only waste a lot of artificial resources, but also the efficiency was low, the error rate was high. On the basis of computer and intelligent technology, the video image processing technology was adopted. Allan M de Souza et al (2017) [7] said that in cities, where the number of vehicles continuously increases faster than the available traffic infrastructure to support them, congestion was a difficult issue to deal with and it becomes even worse in case of car accidents. This problem affected many aspects of the modern society, including economic development, traffic accidents, increase in greenhouse emissions, time spent and health damages.

Robert L. Bertini and Ahmed El-geneidy (2019) [8] described how Advanced Traffic Management System (ATMS) data were being used to contribute toward the evaluations. With the implementation of Intelligent Transportation Systems (ITS) for system management purposes, there was the ability to extract archived data that could be used to evaluate the implementation of new operational strategies. ITS components that were integrated could result in synergistic effects when considered as an entire system. Mamata Rath et al (2020) [9] said that traffic congestion control and smart traffic regulation were a great challenge for the engineers of smart applications in smart urban areas. Regardless of many smart applications such difficulties had not yet completely been overcome because of assortment of unpredicted traffic situations in various areas.

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Selecting correct parameters for decision taking in highly mobile traffic situation was always a problem.

### 3. Study Area

Bhimavaram is a town located in West Godavari district in Andhra Pradesh with a population up to two lakhs. The town has become a hub of educational institutions, being surrounded by six engineering colleges, seven schools and other institutions. Bhimavaram is commercially well developed and culturally forward than surrounding towns and villages. The town always entertain people with cultural programmes and fairs. This attracts a lot of people from surrounding regions into the town. This raise in traffic leads to congestion at many intersections. In a town like Bhimavaram, where the growth of traffic is too rapid, it is quite essential to take enough measures to reduce the number of road accidents taking place. In this regard, it is planned to study the traffic volume at a selected intersection located along a major corridor (SH 165) of the town. The growth of Bhimavaram during the last decade can be cited due to the growth of the engineering institutions and drastic increase in population and increase in commercial sectors. It acts as an important hub as the prices of the land has drastically increased. Lot of opportunities has been increased in every sector. The rapid growth of Bhimavaram as a commercial and residential hub, could be attributed to its geographical advantage in terms of the connectivity to other parts of the district. The objectives of this work involve to study the current traffic conditions in Bhimavaram town, determine turning movements of traffic at study intersection and to suggest effective traffic improvement measure and their future volume.

Bhimavaram junction is a four road intersection which are orthogonal to each other. B.V. Raju road in North is one of the road with more number of conflicting points. Road width here is of 15m. Straight movement, East and West turnings are dominating. This road connects Bhimavaram, Juvvalapalem and Undi. A Petrol Bunk is located near intersection on this road. Due to the increasing day-by-day traffic volume, introduction of a mini-round about can serve to manage the volume. Halt of autos on the Bhimavaram to Juvvalapalem road also cause delay to the flow. Palakollu road in East at this intersection has many on road stalls nearby and halt of auto rickshaws are causing delay. Road width is of 12m near intersection. Compared to straight movement, North and South turnings are more. This road is connecting Bhimavaram, Juvvalapalem and Mavullamma temple. Here there is a least chance to widen the road width which will lead to a need for short term management measure. Mavullamma temple road in South is already a no entry road from where no vehicles towards the intersection. Road width is of 9m. Due to increasing traffic volume towards South improvement is must towards the level-crossing present nearby the Mavullamma temple. An alternate roads may be used to bring down the volume towards the junction. S.R.K.R. College Road in West is connecting nearby bus Stand, road from Over-Bridge and Bhimavaram. Road width is of 12m. Here also North and South turnings are more than the straight movement. The traffic volume do vary on daily basis. Heavy volume is recorded on the week days. Many vegetable stalls are there

which lead to a need of alternate road links to minimize the volume here.

### 4. Traffic Survey

Road inventory survey, traffic volume survey, intersection volume count survey and Pedestrian count surveys are carried out. volume survey is conducted manually at 30minutes interval. Manual counts are used to collect information about type of the vehicle, turning movements, travel pattern, pedestrian movements and occupation of the vehicle.

The size of the data collection team depends on the length of the counting period, the type of count being performed, the number of lanes or crosswalks being observed, and the volume level of traffic. Traffic volume count with directional movement of vehicles is carried out at the study intersection and the vehicles including cars, Jeep, van, private and government buses, 2, 3 and multi axle trucks, Light Commercial Vehicles and two wheelers are counted.

#### 4.1 Volume count survey at Bhimavaram intersection along SH 165

Volume count survey is done at Bhimavaram intersection along SH 165. It is a four arm intersection with existing turning restrictions from South. Here the volume count survey has been done between 8.00 and 21.00 hours on an ideal day (Tuesday). The volume accumulation curve obtained is shown in Figure 1. The peak of peak of peak volume occurred between 9.30 and 10.30 hours and it is 2896 PCEs. This peak volume is 20% of the 13 survey hours. Average daily traffic at this station are found as 22455 in numbers and 20847 in PCE. Vehicles towards B.V. Raju road in North is 20% and towards Palakollu road in East is of 22%. Vehicles towards Mavullamma temple road in South is 37% and towards S.R.K.R. College Road in West is of 21%. the directional movement of vehicles at intersection is shown in Figure 2. The modal split of vehicles at this intersection in the peak hour is shown in the Figure 3 in which volume of two wheelers are dominating up to 66% followed by the cars with 30%.

### 5. Traffic Flow Management

The recommended capacity on 4 lane divided (Two-way) arterial is 3600 PCU/hr (IRC:92-1985). IRC-62-1976, guides that grade separations as a long term remedial measure should be provided at intersecting streets if the estimated traffic volumes within the next 5 years are in excess of the capacity of the intersection

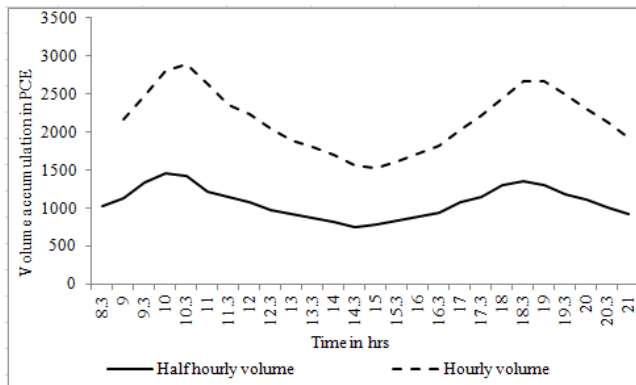


Figure 1: Volume accumulation at Bhimavaram intersection

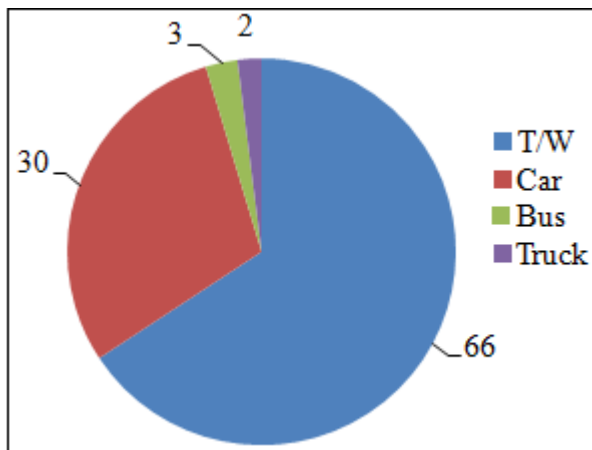


Figure 2: Modal split of vehicles in percentage at Bhimavaram intersection in peak hour (09.30-10.30)

Improvement proposals for four this four arm intersection is recommended based on the volume study at intersections, land use and the physical constraints. At intersection the peak hour turning movements are analyzed and compared with IRC guidelines to arrive future proposals. TSM concepts may be adopted at study intersection to reduce the peak volume. G turn is recommended to divert right and left hand movement of vehicles and allowing only straight traffic at intersection will reduce the volume and congestion at the study intersections. Roads with adequate width (7.50m min) are selected to divert the left and right turn vehicles from the intersection. Vehicles will be diverted well ahead the intersection to their new path as shown in the Figure 4. This shows the route of diverted traffic at the study location. The reduced peak volume at intersections after diversion is shown in the Table 1 and it is inferred that the volume to capacity ratio come down from 0.8 to 0.3 at the intersection. This proposed improvement will sustain for the next 15 years within which a long term measure may be planned. Erecting sign boards for speed limit, introducing parking regulation and providing a signal will further improve the flow well at the intersection. The recommended capacity on 4 lane divided (Two-way) arterial is 3600 PCE/hr and the recommended capacity on 6 lane divided (Two-way) arterial is 5400 PCE/hr and on sub-arterial is

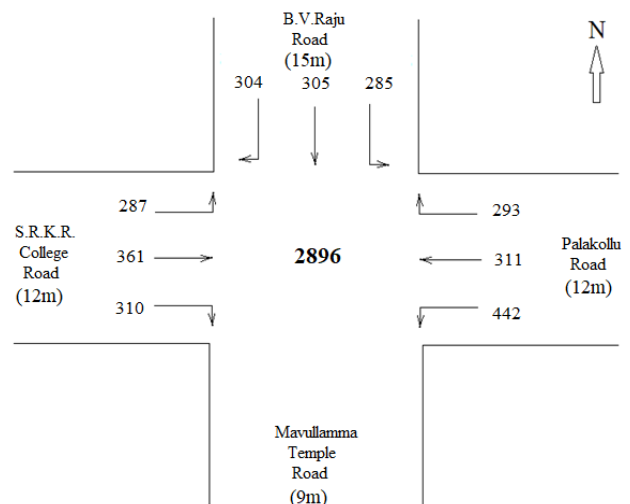


Figure 3: Traffic Volume in PCU at peak hour (9.30-10.30) in Bhimavaram intersection

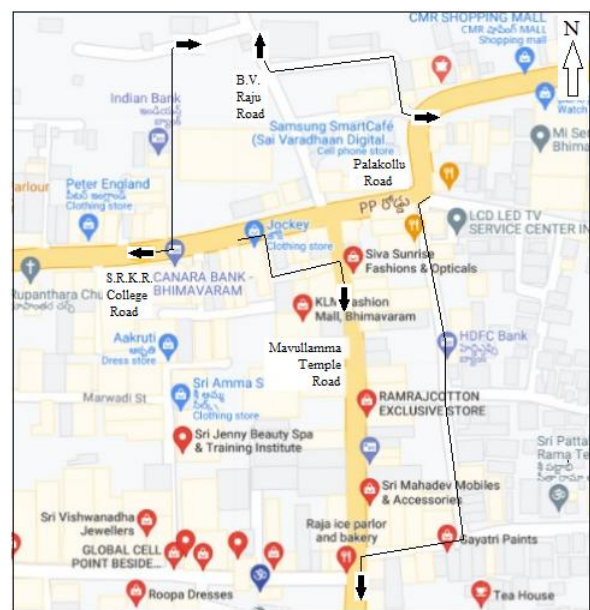


Figure 4: Proposed traffic diversion at study intersection

4300 PCE/hr (IRC:92-1985) [10]. IRC-62-1976 [11], clause 6.13 said that grade separations should be provided at intersecting streets if the estimated traffic volumes within the next 5 years are in excess of the capacity of the intersection.

## 6. Conclusion

- The problem of traffic congestion has always been an essential part of human civilization.
- Bhimavaram is a town located in West Godavari district in Andhra Pradesh. It is commercially well developed and culturally forward than surrounding towns.
- Bhimavaram attracts a lot of people from surrounding regions into the town. This raise in traffic leads to congestion at many intersections.
- The traffic volume at a selected intersection along a major corridor (SH 165) of the town is selected.
- The objectives of this work involve to study the current traffic conditions, determine turning movements of traffic at study intersection and to suggest effective

traffic improvement measure.

- are orthogonal to each other. B.V. Raju road in North (15m width), Palakollu road in East (12m width), Mavullamma temple road in South (9m width) and S.R.K.R. College Road in West (12m width).
- Road inventory survey, Intersection volume count survey and Pedestrian count surveys are carried out.

**Table 1:** Future volume without and after intersection improvement

Year	Without improvement		After improvement	
	Volume	V/C	Volume	V/C
2021	2896	0.8	977	0.3
2024	3598	1.0	1214	0.3
2027	4469	1.2	1508	0.4
2030	5552	1.5	1873	0.5
2033	6898	1.9	2327	0.6
2036	8569	2.4	2891	0.8
2039	10645	3.0	3591	1.0

- Bhimavaram junction is a four road intersection which
- Volume survey is conducted manually at 30 minutes interval and it has been done between 8.00 and 21.00 hours.
- peak of peak of peak volume occurred between 9.30 and 10.30 hours and it is 2896 PCEs. This peak volume is 20% of the 13 survey hours. The Average daily traffic at this station are found as 22455 in numbers and 20847 in PCE.
- The modal split here in peak hour shows that the volume of two wheelers are dominating up to 66% followed by the cars with 30%.
- As per IRC-62-1976, the recommended capacity on 4 lane divided (Two-way) arterial is 3600 PCU/hr and it guides that grade separations as a long term remedial measure may be provided at intersecting streets if the estimated traffic volumes within the next 5 years are in excess of the capacity.
- TSM concepts is suggested and G turn is recommended to divert right and left hand movement of vehicles and allowing only straight traffic at intersection by which the volume to capacity ratio will come down from 0.8 to 0.3 at the intersection.
- Erecting sign boards, introducing parking regulation and Providing a signal at the junction will further improve the flow well.
- This proposed improvement will sustain for the next 10 years within which a long term measure may be planned.

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