A SPEED AND DELAY STUDY TO IMPROVE THE PUBLIC TRANSIT SYSTEM

[1]Guggilla Raju
Assistant Professor, Department of Civil Engineering, Geethanjali College of Engineering and Technology
[2]Akella Nagasaibaba
Assistant Professor, Department of Civil Engineering, Malla Reddy Engineering College,
[3]Dr. R. Prasanna Kumar
Professor in Civil Engineering and Registrar, Geethanjali College of Engineering and Technology

ABSTRACT:
The traffic signal design of the intersection has a direct control on its safety and operation from a design and user-ability point of view. We identified Dammaiguda x roads has been arise problems like road accidents, conflicts and congestions. Design elements that are particularly important include the number of lanes provided on each approach and for each movement. These problems can solve by providing an efficient traffic signal control at the intersection for continuous movement of vehicles through the intersection. According to traffic signal, most traffic signal timing plans are designed to minimize vehicle delay based on the volumes seen in the past, not the present. Traffic count studies are to be made to determine the number, movement and classification of vehicles at an intersection. Signal timing is most important which is used to decide green time of the traffic light shall be provided at an intersection and how long the pedestrian walk signal should be provided. By using Highway Capacity Manual (HCM) intersection saturation for identifying periods of time when cycle length could be substantially short. These data is used identify normal flow of the roadway; determine the influence of heavy vehicles or pedestrians on vehicular traffic volume. Webster's minimum delay cycle length equation overestimates the optimal cycle length compared to the results based on the HCM 2000 method. This is due to the restructuring of the HCM 2000 delay equation as compared to the original Webster's delay calculation.

Keywords: Public Transit System, HCM 2000 method, Road transportation

1.0 INTRODUCTION:

Automobile dependence in metropolitan areas, especially in cities with a large population, has caused a lot of hardship for people living there due to the unrestrained use of private cars. Some of the drawbacks of personal automobile use include traffic jams, air and noise pollution, excessive energy use, and negative effects on the environment. Construction of public transport systems and encouraging citizens to switch from private cars to the provided public transportation system has been a major strategy for many years [1]. This is to mitigate the negative effects of automobile dependence. However, it has been observed that traditional public transport systems are not so effective at attracting citizens due to certain complications that discourage private car users from choosing public transport for their transportation needs [2]. Automobile dependence has major consequences for the environment, and its negative effects on public health are now widely recognized. India is now suffering from complex problem of highly increasing vehicle population and that resulting in other transpiration problems like congestion, travel time delay, accidents etc. The increase in population and motor vehicles requires more efficient transportation systems to provide safe and economic transport of goods and passengers [3]. To study the traffic characteristics on road network there is a need to study the existing traffic conditions. For that the traffic surveys are carried out on selected stretches of Kalupuar area of Ahmedabad city. The specific purposes of this research is to identify Level of service and locations of delays to determine the significant factors causing these delays by using Floating car method, license plate method and GPS method to make recommendations for improving the flow of traffic [4,5]. Travel time data was collected by license plate method and by GPS during morning and evening peak hours on each stretches simultaneously. From the interpretation of the data collected Flow-Delay Model was generated.

Problem Description

Traffic engineering is a branch of civil engineering that uses engineering techniques to achieve that safe and efficient moment of people and goods on

roadways. If focus mainly on research for safe efficient traffic flow. This study is centered around addressing traffic-related challenges at Damayiguda and Rampally X Roads. The primary goal is to identify and recommend effective solutions to mitigate the existing traffic problems in these locations, aiming to enhance overall traffic management and improve the commuting experience for residents and travelers. Damayiguda X Junction and Ramaplly X junction faces severe traffic congestion during peak hours due to the rapid development of the area and the convergence of office working hours. The absence of a signaling system exacerbates the problem, leading to chaotic traffic conditions. The growing population and economic activities demand urgent implementation of a signaling system to regulate traffic, alleviate congestion, and enhance overall urban mobility. This intervention is crucial for the convenience of residents, the smooth functioning of businesses, and the sustainable development of the area.

2.0 LITERATURE REVIEW

A.R.Khanorkar, et al., **[6]** In their study to conducted on typical highways around Nagpur 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 five sections of Highway separately. Yahya Sarraj, et al., (2012) This paper presented an analysis of PCU values for buses and animal-driven carts in Gaza, using the headway method. This method was used because of its simplicity and suitability to determine PCU values on level terrain at a low level of service. Yahya Sarraj, et al., **[7]** This paper presented an analysis of PCU values for buses and animal-driven carts in Gaza, using the headway method. This method was used because of its simplicity and suitability to determine PCU values on level terrain at a low level of service. Sumner, R.,Hill, D et al., **[8]** he deliberated the problem of designing real-time traffic signal control strategies for large-scale congested urban road networks via suitable application of control and optimization methods. Three alternative methodologies are proposed, all based on the store-and-forward modeling (SFM) paradigm. Yin and chen et al., **[9]** In this survey to cover the research in the area of adaptive traffic control with emphasis on the applied optimization methods. Method uses Bi-level formulation, and dynamic for the online. There are several models for trace networks, which are not based on the periodic behavior of online systems to perform coordination. V.Thamizh Arasan et al., **[10]** he considered the optimal traffic signal setting for an urban arterial road by introducing the concepts of synchronization rate and non-synchronization degree. Method uses a mathematical model. They have developed algorithm to solve this optimal traffic control signal setting problem to each lane

3.0 METHODOLOGY

The study is mainly intended to design traffic signal at Dammaiguda x roads junction and carrying high traffic volume in peak hours(morning, evening) and it has no signal. Hence it is taken to study the area. The junction has three lanes, lane 1(from Ecil to Dammaiguda x roads), lane 2 (from Dammaiguda x roads to Ecil), lane 3 (from Dammaiguda x roads to GCET).

General Principles of Signal Design

Stop time or red phase R1 of a signal is the sum of go and clearance intervals or green and amber phases for the cross flow i.e., G2 +A2 a two-phase signal. During this interval pedestrian crossing time may also be incorporated for the road, if turning movements are not permitted.

Towards the end of red phase, there may be a short duration when the amber lights are put- on along with red light signal in order to indicate get set to go. This phase is last part of red phase itself and may be called red amber or initial amber. the vehicles are not supposed to cross the stop line during the red amber period.

Clearance time or clearance amber phase is provided jest after the green phase, before the red phase to fulfil the two requirements. Stopping time for approaching vehicle to stop at line after the signal changes from green to amber and not to cross the line by the time the signal changes to red phase.

Design parameters

The signal design depends on traffic parameters such as (Volume) and roadway parameters (carriageway width) as stated earlier and they are considered.

Design of Data Collection Sheets

Classified volume count by both directions and mode wise will be recorded in this sheet.

Manual Data Collection

In many field studies, manual data collection is considered essential. The group of members takes up

the Dammaiguda x roads junction and the vehicular volume is collected manually. The data is recorded manually is briefly explained below. For directional classified volume count, volume counts for each 2-3 hour were recorded in the data sheet

Identification of Parameter

The signal cycle is influenced by approaching traffic volume (in terms of PCU) and the road geometrics (such as approaching width, shoulder width etc).

keep in this mind, the traffic volume (PCU), approaching width is identified for present study.

Table 1: Saturation flow for widths 3 to 5.5 m

Width w in meters	3.0	3.5	4.0	4.5	5.0	5.5
S (PCU/hour)	1850	1890	1950	2250	2250	2900

Design of Data Collection Sheets

Data sheets for the collection of the traffic volume and the road geometric should be designed before the field studies being conducted. They should be designed in such a way that the vehicular composition should be collected accurately. Therefore, it is proposed to design a data sheet for the collection of data for the present study.

4.0 Data Collection

Data collection forms the backbone of any research activity and it is apparent that many meaningful conclusions can be drawn only based on the analysis of reliable data. The procedures adopted for data collection should fit in the framework of objectives and the surveys are to design with a view analysis aspect also. This chapter presents the various surveys conducted along with the details such as location factor, formats employed and procedures adopted.

Figure 1: Case study Area Ecil X roads

These are few google maps screenshots according to the time changes and also duration changes from Ecil x roads to Gcet college Traffic flow at Ecil x roads, this is main junction where we can travel to all areas easily and the reason for traffic flow is One main reason is that almost 3 to 4 food courts are situated at Ecil x roads even parking is provided but still because of that all the 4 wheelers,2 wheelers and also heavy vehicles got strucked in the traffic about 2 to 3 minutes

Survey Conducted

The basic objective of study to analyze the present geometry of the road, its problems and to evolve a methodology for designing the traffic control devices. Accordingly, one of the major survey is planned to fulfil the objectives. The survey that is conducted in the field using traffic data sheets.

Table 2: Traffic data sheets at Ecil x roads

Direction of traffic flow	Hour of count	Two wheelers	Cars ,pick ups,vans	Buses	Trucks	Pedal cycles	Animal drawn vehicles	Remaks including weather
Ecil x roads to A.S. Rao nagar	8 AM to 8 PM	10000	4000	500	300	3	0	Normal
Ecil x roads to Secunderabad	8 AM to 8 PM	5000	3000	400	500	0	0	Normal
Ecil x roads to Gcet college	8 AM to 8 PM	10000	3000	500	600	0	0	Normal

Table 3: Traffic data sheets at kushaiguda

Direction of traffic flow	Hour of count	Two wheelers	Cars ,pick ups, vans	Buses	Trucks	Pedal cycles	Animal drawn vehicles	Remaks including weather
Kushaiguda to Gcet college	8 AM to 8 PM	5000	2000	100	200	0	0	Normal
Kushaiguda to Ecil x roads	8 AM to 8 PM	5000	3000	200	300	0	0	Normal

Figure 2: Traffic flow at kushaiguda

Traffic flow at kushaiguda, from this junction we connect to all the major roads and the reason for heavy flow is Parking of vehicles is not provided and they are parked on the road itself. Even the crossings are difficult for people and also we can see many cracks on the road.

Day: 1

Direction of Traffic:

1) From Ecil x roads to Dammaiguda x roads
2) From: Dammaiguda x roads to Ecil x roads
3) From: Dammaiguda x roads to Gcet college

Table 4: Daily Summary sheet of Traffic flow

Direction of traffic flow	Hour of count	Two wheelers	Cars& pickup vans	buses	Truck	Pedal cycles	Animal drawn vehicles	Reamarks including weather
Ecil x roads to dammaiguda x roads	9-11 AM	300	300	20	70	0	0	Sunny
	5-7 PM	250	260	10	30	0	0	Normal
Dammaiguda xroads to Ecil x roads	9-11 AM	400	300	40	30	0	0	Sunny
	5-7 PM	210	170	15	20	0	0	Normal
Dammaiguda xroads to Gcet college	9-11 AM	400	450	60	70	0	0	Sunny
	5-7 PM	250	230	35	30	0	0	Normal

This is the data at dammaiguda x roads about a week in peak hour flow from morning 9-11 AM and in the evening from 5-7 PM, from this the number of two wheelers at morning time vary from number of two wheelers at evening time.

Day: 2

Direction of traffic flow:

1) Ecil x roads to Dammaiguda x roads
2) Dammaiguda x roads to Ecil x roads
3) Dammaiguda x roads to Gcet college

Table 5: Daily summary sheet for traffic census

Direction of traffic flow	Hourof count	Two wheelers	Cars& pickup vans	buses	Truck	Pedal cycles	Animal drawn vehciles	Reamarks including weather
Ecil x roads to dammaigudax roads	9-11 AM	250	200	20	60	0	0	Sunny
	5-7 PM	115	90	12	30	0	0	Normal
Dammaiguda x roads to Ecil x roads	9-11 AM	300	200	30	20	0	0	Sunny
	5-7 PM	145	95	14	10	0	0	Normal
Dammaiguda x roads to Gcet college	9-11AM	300	400	50	50	0	0	Sunny
	5-7 PM	160	210	22	25	0	0	Normal

This is the data at dammaiguda x roads about a week in peak hour flow from morning 9-11 AM and in the evening from 5-7 PM, from this the number of two wheelers at morning time vary from number of two wheelers at evening time.

Day : 3

Direction of traffic flow:

1) Ecil x roads to Dammaiguda x roads
2) Dammaiguda x roads to Ecil x roads
3) Dammaiguda x roads to Gcet college

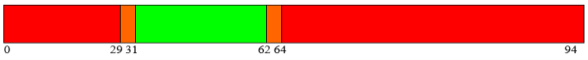
Table 6: Daily summary sheet for traffic census

Direction oftraffic flow	Hour of count	Two-wheelers	Cars & pickupvans	buses	Truck	Pedal cycles	Animaldrawn vehicles	Remarks including weather
Ecil x roads to dammaiguda xroads	9-11 AM	200	150	10	50	0	0	Sunny
	5-7 PM	90	70	05	23	0	0	Normal
Dammaiguda xroads to Ecil x roads	9-11 AM	150	150	20	10	0	0	Sunny
	5-7 PM	80	76	11	09	0	0	Normal
Dammaiguda xroads to Gcet college	9-11 AM	350	300	50	70	0	0	Sunny
	5-7 PM	170	160	24	40	0	0	Normal

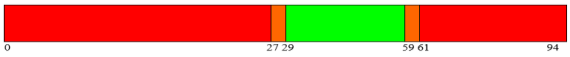
This is the data at dammaiguda x roads about a week in peak hour flow from morning 9-11 AM and in the evening from 5-7 PM, from this the number of two wheelers at morning time vary from number of two wheelers at evening time.

Phase 1:

Phase 2:



Phase 3:



A phase may control both a through movement and a right turn movement on an approach. The MUTCD defines a signal phase as the right-of- way, yellow change, and red clearance intervals in a cycle that are assigned to an independent traffic movement or combination of traffic movements

Discussions:

Traffic signals are one of the most effective and flexible active control of traffic and is widely used in several cities worldwide. The conflicts arising from movements of traffic in different directions is addressed by time sharing principle. The advantages of traffic signal include an orderly movement of traffic, an increased capacity of the intersection and requires only simple geometric design. However, the disadvantages of the signalized intersection are large stopped delays, and complexity in the design and implementation. Although the overall delay may be lesser than a rotary for a high volume, a user may experience relatively high stopped delay. Discuss various design principles of traffic signal such as phase design, cycle length design, and green splitting. The concept of saturation flow, capacity, and lost times are also presented. Traffic signal is an aid to control traffic at intersections where other control measures fail. The signals operate by providing right of way to a certain set of movements in a cyclic order

Conclusions

- The peak hours are identified as 09:00-11:00 in the morning and 17:00-19:00 in the evening.
- The Optimum cycle length was found to be 94 seconds for all the phases.
- The cycle length at intersection may be considered for upgradation.
- It can be concluded that the by replacing the pre timed traffic signals with the automatic traffic signals, capacity is being increased and LOS is also being improved.
- Detector technology to be used for the detection of vehicles is Inductive loop which is commonly used and simple to install, operate and maintain, when pretimed traffic signals fail to clear off the intersection traffic police have to clear off the intersection by turning off the traffic signals and handling the traffic manually on their own.
- This problem can be solved by placing automatic traffic signals.
- As automatic signals are saving the wasted time and increasing the capacity the expensive part can be tolerated and hence, they can be provided at Intersection.
- After 3 years Webster's method of signal design fails to design the signal for the traffic as the value of Y comes greater than 1.
- So at this situation automatic traffic signals comes into play as they will be detecting real-time traffic and assigning the green time for the approach lanes to clear off the traffic.

Following our research study, key recommendations for improving traffic conditions at Dammaiguda X Roads include immediate junction upgrades, the introduction of zebra crossings for pedestrian safety, road widening to accommodate current traffic volume, conversion to dual lanes, installation of traffic signals, enforcement of disciplinary measures against on-street parking, and ensuring the presence of security and traffic management agencies at junctions. Implementing these suggestions is essential for enhancing overall traffic management and safety at Dammaiguda X Roads.

REFERENCES

1. Chauhan S. J., Dr. Zala L. B., Prof. Amit A. A. (June 2014). "Traffic Studies for Selected Road corridor of Anand City: Ganesh Intersection to Janta intersection" - Journal of international academic research for multidisciplinary, Volume 2, Issue 5

2. Das A. K., Saw K., Katti B. K., (March 2016). "Traffic congestion modeling with reference to speed profile under mixed Traffic condition"- A case study of Surat Corridor - Global Research and Development Journal for Engineering.

3. GulhanP. M. e & Bambode K. M (2015). "Case study of Travel time Reliability for Various Routes in Amaravati city"- International Journal of Pure and Applied Science and technology.

4. Sharma R. K, A. Sharma K, A., (2016). "Speed Delay study- A case study from India gate to Jawahar Circle"- International Journal of Civil Engineering.

5. John j., Sia j. S., Philip C.H., Prakash R. (2009). "Travel time study of Auckland arterial road network using GPS data"- Department of Civil and Environmental Engineering.

6. A.R.Khanorkar,(2014),"Development of PCU value of vehicle under mix nature traffic condition in cities on congested highways",International journal of engineering and computer science, volume 3,Issue No.5,PP 6109-6113.

7. Yahya Sarraj and Israa Jadili ,(2012),"Analysis of PCU values for buses and animal driven carts in Gaza", The 4th International conference, PP 1-13.

8. Sumner, R.,Hill, D., and Shapiro,S ."Segment Passenger Car Equivalent Values for Cost Allocation on Urban Arterial Roads", In transportation reasearch Volume No. 18A,Issue No.5/6,PP 399-406.

9. Yin and chen ,(2009), "Optimum traffic signal setting for urban roads" ,Transportation Reasearch , volume 42,Issue No.10,PP 911-924.

10. V.Thamizh Arasan and shrinivas S.Arkatkar ,(2009),"Study of Effect of Volume and Road Width on PCU of Vehicle under Heterogenous Traffic", Journal of transportationengineering ,PP 406-415.