

TRAFFIC MANAGEMENT OF AN URBAN ROAD BY DESIGNING COORDINATED TRAFFIC SIGNAL SYSTEM

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Abstract

Transportation should be safe, rapid, comfortable, convenient, economical and ecofriendly. But transportation also consumes a lot of resources like time. Traffic management plays a vital role in the field of transportation engineering to reduce congestion and travel time to improve service volumes especially in urban areas. Present road stretch is of length 2.5Km, from Uppal X roads to N.T.R statue, Pirjadiguda crossing roads with three crossings (Uppal bus stand x roads, Asian x roads, Pirjadiguda x roads) and four blocks. In the present study an effort is made to understand and evaluate the performance of the study road stretch. After traffic engineering survey, optimum cycle length and saturation flows, green time signal phase are designed and likewise red, amber phases based on Webster's method & IRC guidelines. In this road stretch, adjacent signals are coordinated and the coordinated signal time plans are also developed. This paper solves the traffic congestion causing delays, decrease the travel time and increases the travel speed of vehicles by design of coordinated traffic signals and gives the management measures to reduce the traffic congestion which is of low cost and easily executable.

Keywords: Traffic Volume 1, PCU 2, Coordinated Traffic Signal System 3, and Webster & IRC method 4 etc ...

1. INTRODUCTION

The site selected is from Uppal cross roads to the Perjadeguda cross roads which is a busy stretch of 2.5 Kms. This is the road connecting Hyderabad city with Warangal state highway, many schools, RTC and colleges, industrial trucks and buses and a plenty of personal vehicles like cars, bikes is running on this road.

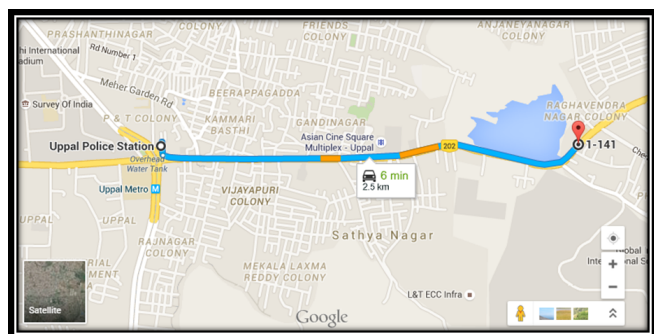


Fig -1: Google map of the road

The above picture shows the stretch of the road which is used for regulation of traffic by signal designing. Here three cross roads are selected one at Uppal bus stand, second at Asian multiplex theater, third at the Pirjadiguda turning. I.e. after Uppal nallacheruhu. Three cross roads are selected to install signals and to regulate the traffic by signals.

1.1 Boduppal Q Bakers to Perjadiguda Mid-Block

Actually this is a spacious area there is no problem with this mid-block to the traffic. This mid-block act as a queue area for the traffic at Perjadiguda signals.

The total length of this segment is 250m

1.2 Perjadiguda Mid-Block to Asian Theater Mid-Block

The encroachments are because of the fruit market which occupied almost one complete lane, because of which the capacity was getting reduced. Because of the U turn at Asian theatre the major moving vehicles are made to form a queue for their turn and this making the queue. The total length of this segment is 970m.

1.3 Asian Theater Mid-Block to Uppal Bus stand Mid-Block

This is a busiest and in other term we can call it as a congested area where the speed of vehicles comes down rapidly and the movement of vehicles is very slow. This block is filled with bus stands on either side of the road. Most of the road is occupied by the busses and auto rickshaws for the passenger pickups and drops. This causing the additional jam in this block. Cinema theatres in this block causing problem to the movement of vehicles.

The total length of this segment is 480m.

1.4 Uppal Bus stand Mid-Block To Uppal Cross Roads Mid-Block

The Gandhi bus stop causing the congestion in this block. Apart from that illegal median openings which is allowing the through traffic on both the sides to make an U turn in the mid segment, which is causing inconvenience to the major road vehicles.

The total length of this segment is 800m

2. PICTURES OF CONGESTION



Fig -2: Congestion at PJD cross road



Fig -3: Congestion at Asian theater cross road



Fig -4: Congestion at Bus Stand cross road

2.1 ROAD TRAFFIC VOLUME COLLECTION DATA SHEETS

The equivalent PCUs Factors are obtained from IRC: 106-1990.

No of PCUs at respected cross roads are listed below in the table form. These values are collected with the video recording data counting.

Table 1: Hourly traffic volumes at PJD cross roads with directions.

DIRECTION	PCUs
BPL-UPL	3323
UPL-PJD	669
PJD-BPL	158

Table 2: Hourly traffic volumes Asian cross roads with directions.

DIRECTION	PCUs
BPL-UPL	4173
UPL-L&T	510
L&T-BPL	426

Table 3: Hourly traffic volumes at Bus Stand cross roads with directions.

DIRECTION	PCUs
BPL-KMN	664
KMN-UPL	565
UPL-BPL	3697

2.2 TRAFFIC SIGNAL TIMINGS AT THREE INTERSECTIONS

Phase	Direction	Green	Inter Green	Red	Total
1	BPL-UPL	130	5	45	180
2	UPL-PJD	22	5	153	180
3	PJD-BPL	16	5	159	180

Figure 5: Traffic signal timings at pirjadeguda cross roads with directions.

Phase	Direction	Green	Inter Green	Red	Total
1	BPL-UPL	270	5	55	330
2	UPL-L&T	30	5	295	330
3	L&T-BPL	18	5	307	330

Figure 6: Traffic signal timings at Asian cross roads with directions.

Phase	Direction	Green	Inter Green	Red	Total
1	BPL-KMN	40	5	245	290
2	KMN-UPL	24	5	261	290
3	UPL-BPL	214	5	71	290

Figure 7: Traffic signal timings at Bus stands cross roads with directions.

2.3 DETAILED EXPLANATION OF SIGNAL TIMINGS FROM UPPAL CROSS ROADS TO PIRJADEGUDA CROSS ROADS

The first cross road is at a distance of 800 m (BUSSTAND cross roads) from Uppal cross roads, second cross roads at a distance of 1280 m (ASIAN cross roads) from Uppal cross roads, third cross road is at a distance of 2250 m (PJD cross roads) from Uppal cross roads. Then the remaining road is left free from 2250 to 2500 m from Uppal cross roads.

ASIAN cross roads and PJD cross roads signal doesn't need the coordination as they have a straight way and it is not obstructed by any turning vehicles.

With a 30 km/ph speed, the vehicle reaches Uppal bus stand cross roads in 96 sec, from there it reaches Asian cross roads in 57.6 sec, from there it reaches Pirjadiguda cross roads in 156 sec.

2.4 DETAILED EXPLANATION OF SIGNAL TIMINGS FROM PIRJADEGUDA CROSS ROADS TO UPPAL CROSS ROADS.

At Uppal bus stand cross roads the vehicle will gets 214 sec green time and 76 sec red + intergreen time.

The first cross road is at a distance of 250 m (PJD cross roads) from "Q" bakers, second cross roads at a distance of 1220 m (ASIAN cross roads) from "Q" bakers, third cross road is at a distance of 1700 m (BUSSTAND cross roads) from "Q" bakers. Then the remaining road is left free from 1700 to 2500 m from "Q" bakers.

BUSSTAND cross roads signal doesn't need the coordination as they have a straight way and it is not obstructed by any turning vehicles.

With a 30 km/ph speed, the vehicle reaches PJD cross roads in 30 sec, from there it reaches ASIAN cross roads in 116.4 sec, from there it reaches BUSSTAND cross roads in 57.6 sec.

At PJD cross roads the vehicle will get 130 sec green time and 50 sec red + intergreen time.

At ASIAN cross roads the vehicle will gets 270 sec green time and 60 sec red + intergreen time.

From Uppal x roads to bus stand x roads the length is 800m, so it takes 96 secs.

If the vehicle starts at Uppal cross roads at 8.02.59 it travels 96 secs and reaches the bus stand cross roads at 8.04.35.

2.5 MANAGERIAL MEASURES FOR TRAFFIC MANAGEMENT

1. Sustainable transportation promotes a balance of the economic and social benefits of transportation with the need to protect the environment.
2. Minimize the number of conflict areas and multiple threat locations through roadway design, parking layout, proper loading facility design, consolidation access/driveways and pedestrian concentration and channelization.
3. BUS BAYS are not recommended on busy streets, as buses may experience difficulty attempting to re-enter traffic
4. When the number of phases increased, drivers might get nervous due to driver frustration and might try to complete the manoeuvre quickly, which may lead to severe injury and fatal collisions.
5. On street parking restrictions should be maintained.
6. U turns should be avoided as far as possible.
7. Speed humps should be installed wherever necessary.
8. Alternate routes should be used by the two and three wheelers to reduce the congestion.
9. Bottle necks are identified and the solution should be given to reduce the congestion at that places. mitigation strategies for this bottleneck would involve an enhanced use of the public transportation system, since there might no further scope to improve the area infrastructure in some areas
10. Sidewalks are non-existent or fully obstructed in most places, forcing pedestrians to walk on the road, compromising both traffic flow and safety.
11. The Uppal bus stop, Gandhi bus stop and Asian theatre U turn making the bottleneck in this segment because out of the three lanes one lane was dedicated for the bus stop. If two busses come on the row the traffic gets slow down for more than 200m beyond.
12. To improve the flow in this segments all the illegal median openings has t be closed and the encroachments needs to be controlled.
13. It is observed that the delays are mostly due to pedestrian crossings at the bus stops and also due to the temporary median openings which were opened manually by the road users.

3. CONCLUSIONS

The average speed of the vehicles in the Uppal stretch was 10 km/ph, level of service is F, and there are many crossings just in 2.5 km distance road, due to mixed traffic and improper moving or turning of vehicles. This caused a major disturbance to the major road traffic.

The design of signals had been done with proper cycle lengths and coordinating among themselves with the headway and the distance travel time. This had increased the speed of the vehicles to 30 km/ph. and the level of service had reached to C, and it indirectly decreases the travel time. A major road vehicle can pass through this stretch of 2.5 m in 5 minutes.

Finally the travel time is improved (decreased) and the flow is stable. It also allowed the minor road vehicles to cross the road in given intervals.

Some management techniques have to be changed time to time for the better performance. The management measures can be suggested for the future traffic flow by forecasting the existing and the past traffic flow.

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BIOGRAPHIES



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