RESEARCH PAPER | Engineering | Volume : 4 | Issue : 8 | August 2014 | ISSN - 2249-555X

Identification of Counteractive Scheme to Alleviate Traffic Distribution At An Intersection

KEYWORDS: Intersection, Passenger Car unit, Traffic projection, Y-intersection, Flyover.

Praba M	Samuel Simron Rajkumar J	Vanitha S
Assistant Professor, Department of Civil Engineering, Sathyabama University, Chennai	Research Scholar, Department of Civil Engineering, Sathyabama University, Chennai	Assistant Professor, Department of Civil Engineering, Sathyabama University, Chennai

ABSTRACT *The purpose is to identify the cause of traffic at an intersection and to identify a remedial measure to reduce the congestion. The proposal of a flyover at Y-intersection will elicit the difference at the locality. Bringing up few standpoints the study area was selected for vehicular traffic survey at intersection. The analysis is done to identify the traffic in PCUs/hour and the traffic is projected for three conditions like pessimistic, optimistic& most likely. A nominal design procedure is followed for the flyover in order to reduce the conflict points, to reduce the congestion & delay. It was identified that about 50-70% of the total traffic volume can be diverted to the flyover resulting in less travel time. The weaving behavior would result to fewer delays in entering the flyover but its effect is minimal as compared to the delay incurred at ground level.*

INTRODUCTION

CHENNAI city is all set to get new link roads, more grade separators and bridges all along. The initiatives are part of efforts to strengthen the burgeoning city's transport infrastructure. Making new project announcements for 2012-13 in the State Assembly, Minister for Highways and Minor Ports said a grade separator would be constructed in Medavakkam- Sholinganallur Road junction.

Medavakkam is administered by Village Panchayat, which comes under the Sholinganallur MLA Constituency and South Chennai MP Constituency. This location is a fast developing residential locality due to its close proximity to the IT corridor OMR (approx 4 km from Sholinganallur) and SEZ in Medavakkam Sholinganallur Road.

Overall Road widening work would be taken up at a cost of 740 crore during 2012-13 across Tamil Nadu under the Comprehensive Road Infrastructure Development Programme (CRIDP) in which a sum of about Rs.6 crore was spent under the Chennai Metropolitan Development Plan to widen Perumbakkam Main Road between Medavakkam and Sholinganallur, a distance of 4.5 km. A huge share of the amount was spent on land acquisition. Raised medians were built and pavements provided around Medavakkam intersection resulting in the road ruled under the classification of Other District Road, even though the intersection is facing maximum traffic problems during Peak hours. Hence CMDP and Highways (General) were attending to the problem coming out with a proposal of a Flyover since due to certain problems over land acquisition; the road could not be widened at a few spots.

A flyover is a bridge constructed along an intersecting highway over an at-grade intersection. It allows two –direction traffic to flow at free flow speed on the bridge. The flyover is one of the methods for solving traffic problems at at-grade junctions on highways including capacity, congestion, long delay and queue length.

STUDY AREA

The current scenario observed from this junction reveals that the road section is of two-lane divided carriageway with proper median. The three arms at the intersection is of mixed traffic flow and the road pattern form Medavakkam junctions connects places like Sholinganallur towards north, Tambaram towards west, Velachery towards east as shown in Fig.1. It is an un-signalized intersection which is controlled by traffic police officers only during peak hours. Both side of the road are occupied by commercial building irrespectively these leads to on street parking resulting in occupying the shoulders at their edges causing congestion.

Fig.1. Medavakkam Intersection

DATA COLLECTION AND ANALYSIS

The site investigation and observation were likewise utilized for the main reason of providing factual situation and ascertain the usefulness of the study as it progress. The process prioritizes the collection of traffic data through various traffic surveys in which Turning Volume Count survey at the intersection was accomplished. The left turning, right turning of the vehicle movement is observed on three arms: 1. Tambaram – Velachery & Sholinganallur 2. Velachery – Tambaram & Sholinganallur 3. Sholinganallur to Velachery & Tambaram. The analysis is concluded with the identification of peak hour traffic in Vehicles per hour and also in PCUs per hour.

Volume : 4 | Issue : 8 | August 2014 | ISSN - 2249-555X

Table.1. Average Vehicle Volume Count at Medavakkam Intersection

Sl. No.	Location	No. of Vehicles/hour	No. of vehicles in PCU
1	Sholingalnallur to Tambaram	7130	6629
2	Sholingalnallur to Velachery	4270	3785
3	Tambaram to Velachery	6258	5665
4	Tambaram to Sholinganallur	6865	6217
5	Velachery to Tambaram	6665	6091
6	Velachery to Sholinganallur	3179	2813

The stretches with the maximum traffic during peak hour's value in the morning are Tambaram-Sholinganallur with 1475 (PCU), Tambaram-Velachery with 1405(PCU), Velachery-Tambaram with 1255(PCU), and stretches with least peak hour value in morning are Velachery-Sholinganallur with 608(PCU), Sholinganallur-Velachery with 928(PCU) and Sholinganallur to Tamabaram with 933(PCU). It states that the congestion and delay occurs during the peak hour which lies between 08:00 a.m to 11:00 a.m in morning and 05:00 p.m to 09:00 p.m in evening. During this peak hour the design speed of the vehicle is reduced upto 20kmph and the delay at the junction takes upto 10 minutes maximum.

The Fig.2 explores that the vehicles moving from Sholinganallur to Tambaram is maximum at the junction. The traffic projection for the particular arm is given in Fig.3. The three conditions that are preferred to project the growth rate of vehicle population for the corresponding years are a) PESSIMISTIC: Expecting the worst possible outcome of traffic growth rate b) MOST LIKELY: Expecting the possible outcome of traffic growth rate c) OPTIMISTIC: Expecting the best possible outcome of traffic growth rate. The Fig.3 shows the projected traffic which aids to identify the long term and the short term measures.

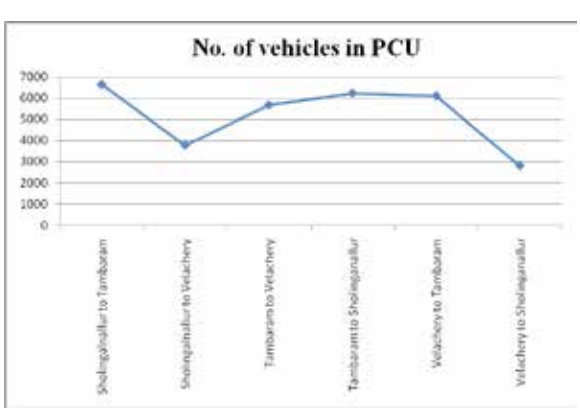

Fig.2. Traffic at Junction in PCUs/hour

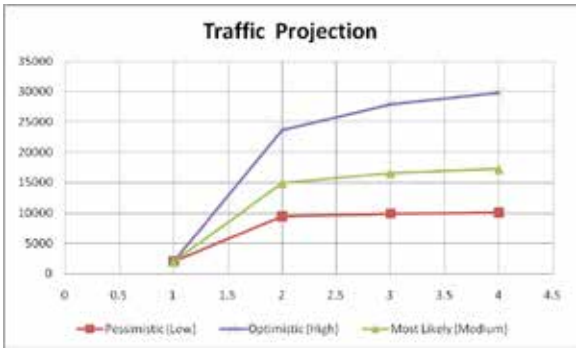

Fig.3. Projected traffic for Sholinganallur to Tambaram arm

The long term remedial measure for the delay and congestion for this junction comes out with a recommendation of a flyover. This study proves that the flyover construction will reduce the conflict points and congestion at the junction during peak hours. The specifications of the flyover are as follows should have two-lane carriage width without Krebs, the lane width has to be 7m wide, Clear head 5m, Gradient 1:30 or 3.33%, Total length of the flyover 1.5km or 1500meters, Radius of curvature 60-90m, Slopping sight distance should be 45-60m.

For the design of the flyover the tentative capacity of urban roads as per IRC for two-lane without Krebs, the lane width has to be 7m wide with the flow of traffic on one-way. For the road with frontage access but no standing vehicle and high capacity intersection the PCUs per hour of the traffic condition should be 2500. The ramp design for the highway design of 80km/h, the ramp design speed has to be 40-50km/h, radius of curvature 60-90m and slopping sight distance should be 45-60m. For the design of ramp terminals of the flyover the entrance terminal (i.e.) acceleration lane should be 180-250m and for the exit terminal (i.e.) deceleration lane should be 90-120m. Fig.4 represents the directional flow of traffic on the existing intersection which has major three conflict points.

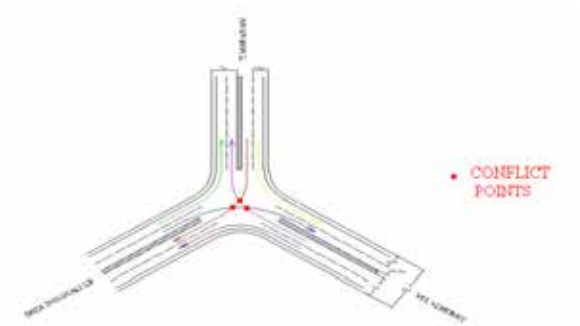

Fig.4 Directional flow on flyover and its conflict points

The flyover is recommended for the stretches from Tambaram to Sholinganallur and Velachery to Sholinganallur as shown in Fig.5.

Volume : 4 | Issue : 8 | August 2014 | ISSN - 2249-555X

Fig 5 Proposed Flyover at intersection

The impact of the flyover induces the diversion of traffic for the stretches Tambaram- Sholinganallur and Velachery – Sholinganallur over the flyover. From the analysis it seems that total no. of vehicles using the flyover for the diverted stretches are of 30%. After the diversion of traffic takes place, there will be reduction in the flow of traffic on the existing road beneath the flyover will be 70%. As the flow of traffic is diverted there will be reduction in travel time and the delay of vehicle is reduced. The trip generation and the trip distribution will get its uniformity in mixed traffic flow conditions. As of now the ramp design speed is 40-50km/hr, but after the existence of the flyover it will be increased to 60-70km/hr. The prologue of a flyover decreases the conflict points at the intersection as shown in Fig.6.

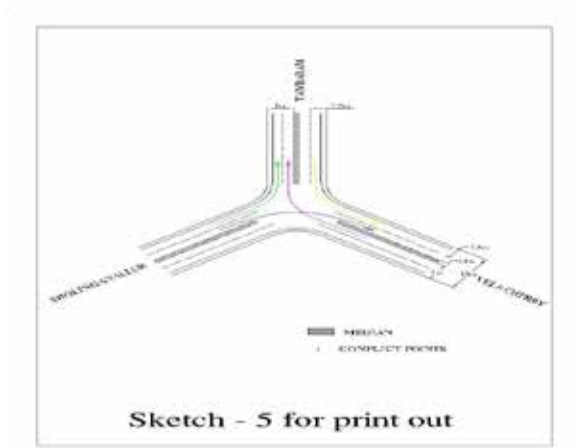

Fig.6. Conflict points after proposed flyover

CONCLUSION

In order to mitigate traffic congestion, uniform distribution is required as an inventive measure. The Traffic System Management (TSM) always suggests an easy, economical and effective measure when impending for up-gradation at junction. As soon as the junction enhancement is done the traffic congestion at the intersection will be reduced and pollution is reduced automatically at the. In an urban network, one intersection may be more congested than other adjacent intersections. But, decision for construction of flyover at the most congested intersection should not be based on only the present day operating condition. This is because the less congested operating conditions for adjacent intersections can be simply due the bottleneck and constrained outflow from the existing congested intersection.

If a flyover is planned and operating condition is improved, other adjacent intersections may become congested due to the change in traffic flow pattern. Therefore, during the planning of flyover, the traffic impact analysis should be carried out considering adjacent traffic intersections. This will reduce the Vehicle Operating Cost and less fuel consumption.

A flyover will come with a positive impact in and around the area economically adding it also gives less pollution, less traffic congestion, less delay, decreased travel time, easy mobility, tolerable queue length, affordable signal timings etc.,

However the negative impact also occurs by a flyover construction which includes significant damage of infrastructure in proximity, facts of health hazards may potentially occur due to pollution of maximum traffic utilizing the flyover, impacts on environment, increase of traffic in the adjacent areas. Due to current economic situation of India, the facility should be provided within the available funds and a balance must be achieved between the cost and construction time frame without compromising the safety of the structure.

It can be concluded that the flyovers will be a good measure at the intersection only if the capacity approaches at the other links are considered. The other approach links should be given importance and a proper traffic management system has to be implemented. The signalization and approach link enhancement with the increase in number of lanes can only perform a positive impact to convene the future traffic desire.

REFERENCE

1. Arasan, V. T. and Jagdeesh, K. "Effect of Heterogeneity of Traffic Delay at Signalized Intersections". Journal of Transportation Engineering, ASCE, 121(5),PP. 397-404 (1995). | 2. Arnold Jr., E. D "Evaluation of Congestion Reducing Measures Used in Virginia".Transportation Research Record 1404, TRB, National Research Council, Washington D.C.,PP 4-7.(1993) | 3. Auttakorn Sala Ph.D, "Assessment of traffic flow benefit of flyover", Journal ofsociety for transportation and traffic studies, Volume 4, PP 1-9. | 4. Emer T.Quezon, Msc.CE, "A study of the effects of flyover construction on traffic flow: A case of Metro Manila, PP 520-526, November 27 1977. | 5. Hall, M. D., Vliet, D. V., and Willumsen, L.G. "SATURN: A Simulation Assignment Model for the Evaluation of Traffic Management Schemes". Traffic Engineering and Control, 4, PP.168-176 (1980) | 6. IRC-86-1983, Geometric design standards for urban road in plains, 1983. | 7. IRC-92-1985, Guidelines for the design of interchanges in urban area, 1985. | 8. IRC-SP-41, Guidelines for the design of AT-GRADE intersection in rural & urban areas, 1994. | 9. Kadiyali L.R, "Traffic engineering on transportation planning", 7th Edition (2007). | 10. Lindley, J. A. "Urban Freeway Congestion Problem and Solutions: An Update."ITE Journal, PP 21-23 (1989) | 11. Maitra.B, Azmi.M, "Modelling traffic impact of flyover at an urban intersection", PP 57-68, November 27 2004. | 12. Maitra, B., Sikdar, P. K., and Dhingra, S. L "Modeling Congestion on Urban Roads and Assessing Level of Service". Journal of Transportation | 13. Pratsch, L. W "Reducing Commuter Traffic Congestion." TransportationQuarterly, PP 591-600 (1986). | 14. Tanner, J.C. "A Theoretical Analysis of Delays at an Uncontrolled Intersection, PP 163-170 (1962). | 15. Tissa U.Liyanage, "Flyover as a measure to improve intersection capacity", PP 1-8, August 1 2009. |