Intersection Improvement at Sholinganallur in Rajiv Gandhi Road

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ABSTRACT Intersection Improvement at Sholinganallur in Rajiv Gandhi Road is studied. It is one of the major junctions in CMA which need attention to decongest. It is supported just by roadways. The increase in traffic volume with lack of road geometry results in congestion. Rajiv Gandhi Road has IT companies with lakhs of employees travelling along this road. This intersection has roads along north to south and east to west which connects to the major regions. It struggles with more volume than the capacity which leads delay and queuing of vehicles. This static delay will increase journey time. Traffic system management is suggested by avoiding right turn movements and diverting the vehicles will decrease the volume. As a long ter.0m measure, a grade separator is suggested as per standards along north- south will control the volume and sustain for the coming years.

INTRODUCTION

Road forms an integral part to build the economy and wealth of the country. Economic development of a country depends on the roads and transportation system. India has 4.5L km of roads in 2013, the 2nd largest road network in the world. Union Government took initiatives to develop the National Highways at the rate of 20km per day which create easy access and help the people to migrate into cities. Tamil Nadu has about 2L km of road out of which 14500 km of National and State Highways. There are 25 National highways in Tamil Nadu out of which12 runs within Tamil Nadu. State has 153 km of road per 100 km^2 area, which is higher than the National average of 103 km. Chennai Metropolis with latitude between 12°50'49" and 13°17'24" and longitude between 79°59'53" and 80°20'12" is the gateway of South East Asia, and act as a backbone of economy of national development of the country. Chennai city is being the fastest growing city with a road length of 2780 km in radial and ring pattern. It has 4.40L jobs in the year 2011, by the Employment Trends Survey. 60% of road traffic consists of personalized modes and the two wheeler contribution is of 50% flow of goods carriers is high at location in the periphery. Roadways are highly flexible in travel which has its stops for every half to one kilometer.

The road intersection is not sustainable if its capacity exceeds the volume, but this condition exists only in certain intersections and it has dominated over entire city. Rajiv Gandhi Road seems to be talk of the town, specifically the first 20 km from Madhya Kailash to Siruseri, has been the biggest growth engine for Chennai city. It provides jobs for 2L IT professionals and this are expected to grow by another lakh over the next years. Since 2005, about 1L people have moved into Rajiv Gandhi Road. It becomes an alternative residential hub. The volume of traffic on the IT corridor is more than 5L vehicles on weekdays. The duration of rush hour traffic has extended to 3 hours each in the mornings and evenings. In 2012, there were 35 fatal accidents and 194 non-fatal accidents on Rajiv Gandhi Road, making the travel a worst case scenario. Residents and employees of firms have been waiting for about 2 years for road improvements. The choice is between flyover at junctions including Tidal Park, Sholinganallur and Lifeline Hospital at Perungudi and a bus rapid transport system.

STUDY AREA

Rajiv Gandhi Road consists of5 intersections at Madhya Kailash near Thiruvanmiyur, Tidal Park at Taramani, Perun-gudi, Thoraipakkam and at Sholinganallur which connects the ECR shown in the Figure 1. Out of 5 intersections the maximum congestion occurs at Sholinganallur which is shown in Figure 2. This intersection is an important junction in southern part of Greater Chennai now comes within in Chennai Municipal Corporation after extension. Sholinganallur is surrounded by many IT based suburbs and home to a number of IT and enable service companies. The rapid growth of Sholinganallur is attributed by economy, population and infrastructure. Sholinganallur connects ECR to Tambaram and Adyar to Mahabalipuram, along Rajiv Gandhi Road. Popular hospitals, colleges and schools are located nearby and their trips need to cross this intersection to reach their destination. Many upcoming apartments and townships are around.

DATA COLLECTION AND ANALYSIS

At Sholinganallur intersection the vehicles moving in different directions want to occupy same space at the same time. 3000 pedestrians per hour also seek same space for crossing. Rajiv Gandhi Road with 41m wide and Karunanidhi Road with 20.5m wide make the intersection; the geometry is shown in the Figure 3. It is a four legged intersection which has 32 numbers of conflicts. Speed reduces considerably and the journey time of vehicles increases enormously. The difference in journey time to running time from Madhya Kailash
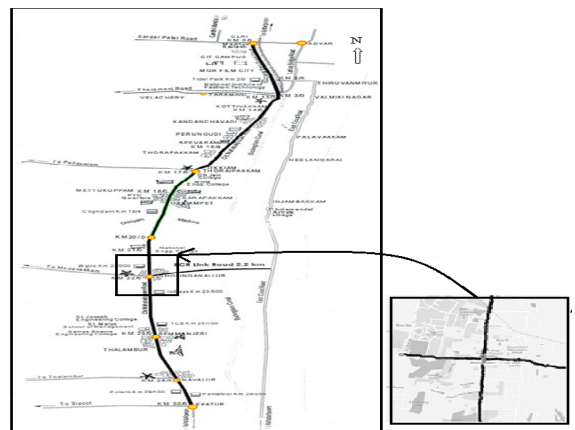

Fig.1. Sholinganallur Intersection at Rajiv Gandhi Road

Fig. 2. Traffic Congestion at Sholinganallur intersection

to Siruseri is more than 30 minutes and journey speed (21.5kmph) is lesser than running speed (33.5kmph) due to delay at intersections. The study junction is alone has a maximum delay of 15minutes. It is the major congested intersection along the road, a simple error in the judgment will cause severe accidents. On an average there are over one lakh vehicles crossing the intersection and an average of 25 cases on traffic violation and 10 accidents are reported every day. Both by accident and capacity perspective, the study of intersection are very important for the traffic engineers. Inventory survey and volume count at the intersection and speed delay survey along Rajiv Gandhi Road is carried out on a week day to access the accumulation and find out the peak time of traffic. Vehicles towards Perungudi (North) are categorized as location 1, towards ECR (East), towards Siruseri (South) and towards Tambaram (West) are categorized as location 2, 3 and 4 respectively. The volume of traffic plying left, right and straight from the locations are shown in Table 1. From the table it is observed that the peak volume occurs between 19.00 and 19.30 hrs. Volume accumulation curve of intersection is developed from 07.00 to 20.00 hrs in which morning peak occurs at
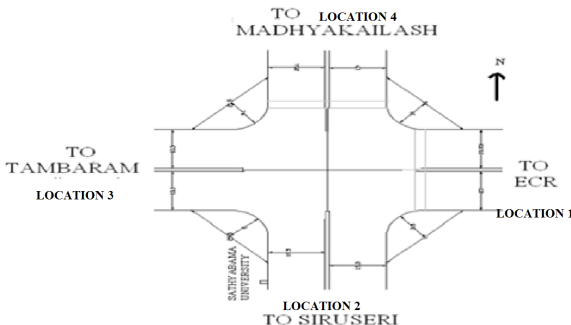

Fig.3. Geometry of Sholinganallur intersection

Table 1. Volume of traffic from different arms at Sholinganallur

LOCATION	LEFT	RIGHT	STRAIGHT	PEAK HOUR
Location 1	939	643	1013	19.00-19.30
Location 2	222	123	528	09.00-09.30
Location 3	177	335	709	07.30-08.00
Location 4	176	382	433	09.00-09.30

09.00-09.30 with 4,700 PCE, maximum peak in the evening between 19.00 and 19.30 with 5005 PCE and nonpeak occurs at 14.00-14.30 (2100 PCE) which is shown in Figure 4. In the maximum peak hour the volume to capacity reaches maximum of 1.3 which need immediate attention. The distribution of vehicle volume at the peak hour is shown in Figure 5. More than 3378 PCE vehicles are using Rajiv Gandhi Road and remaining 2000 PCE use the other perpendicular road.
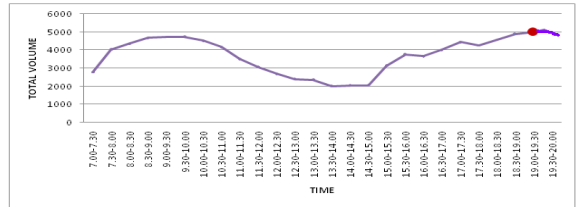

Fig.4. Volume accumulation curve at Sholinganallur intersection (07.00-20.00)
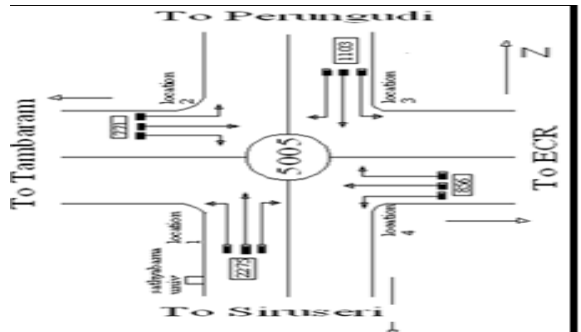

Fig.5. Distribution of traffic Volume at Sholinganallur intersection between 19.00-19.30 hrs

The gradual increase in volume is observed from 2009 to 2012 and the trend is polynomially forecasted up to 2018 when the volume to capacity ratio expected to exceed 2.3 is shown in Figure 6. The annual rise comes to 7.5% which is equal to IRC recommendation. To improve the traffic flow at intersection short and long term measures are suggested as scenarios. Transport System Management is a package of short term measures to make the most productive and cost-effective use of existing transportation facilities. Re-orient of traffic pattern on the streets will reduce the conflicts between vehicles and pedestrians. As first scenario, by restricting the right turn movements and provide T-turn, G-turn which is shown in Figure 7 will reduce the peak volume to 1250 PCE which is lesser than the capacity. Volume to capacity ratio comes down to 0.32 which may sustain up to 2018 with less than saturation capacity.
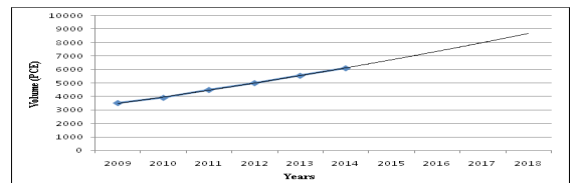

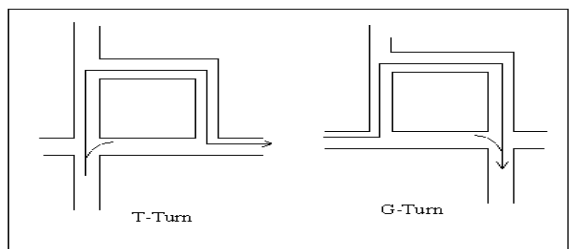Fig.6. Forecasting of traffic volume at Sholinganallur intersection

Fig.7. Traffic system management strategies

Two and four wheelers are predominant using this intersection. As second scenario by diverting them to alternate routes as shown in Figure8 in order to reach Siruseri without passing through Sholinganallur intersection, the volume to capacity ratio reduces to 0.8, lesser than the current volume.

Link roads between Rajiv Gandhi Road to ECR, are exist near Tidal Park, Sholinganallur and at Kelambakkam. These roads are already facing traffic congestion, irregular road geometry and under the proposal of widening. As per the next scenario additional link roads near Perungudi, Chemmencherry and Siruseri will attract riders to use either road to reach Siruseri. To avoid additional running length and to economize the fuel a grade separator of two way two lane road is
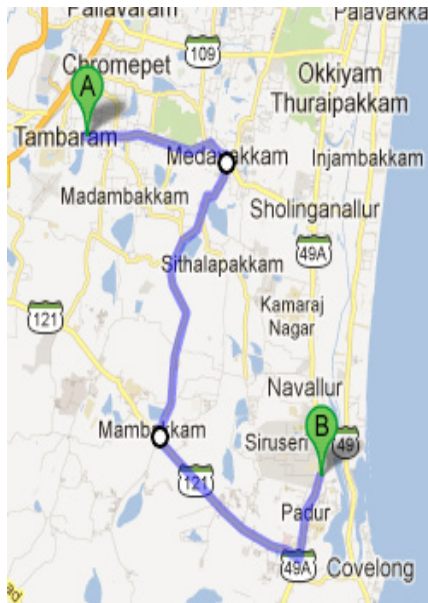
suggested at the intersection as a long term remedial measure. A grade separator along the centre of road towards north and south to have a clear head of 4.5m from existing road, minimum width of 7m, 1 in 30 gradients with sufficient street lighting as per IRC recommendation will elevate this traffic in both the direction and reduce the volume considerably to 3300 which is lesser than the recommended capacity. Operating public transport on grade separators will help to maintain free movements in future.

CONCLUSION

CMA is the 4th largest city in India with 0.34 million population raise over 10 years but the vehicle volume increases 10% per annum. The increase in traffic volume with lack of road geometry results in haphazard movements of vehicles at intersection in the past years. An attempt is made to improve the intersection at Sholinganallur in Rajiv Gandhi Road in Chennai Metropolitan Area. This is the most congested location which has 2 major roads namely Rajiv Gandhi Road along north to south and Karunanidhi Road along east to west which connects to the regions such as Perungudi, East coast road, Siruseri and Tambaram. This intersection struggles with more than 5005 PCE of vehicles during the peak hour and with 2100 PCE during nonpeak hour and leads a minimum 15 minutes of waiting delay and queuing of vehicles to a longer distance.

To improve the traffic flow at the intersection short and long term measures are suggested. As a short term measure, by restricting the right turn movements, by restricting straight and right turn traffic from both Karunanidhi road and Medavakkam road permitting them as left turn and approaching the intersection after a U turn located about 100m away, diverting 2 and 4 wheelers to alternate routes to reach Siruseri without passing through the intersection, providing additional link roads near Perungudi, Chemmencherry and Siruseri will attract riders to use either road to reach Siruseri. As a long term remedial measure, a grade separator along the centre of road toward north and south as per IRC recommendation will reduce the volume at intersection to the recommended capacity. Application of TSM concepts will reduce the level of congestion at intersection. This type of studies will help to manage the traffic flow in an economical way. The statistical forecasting approach will justify a need of upgrading intersection by providing grade separators, widening and strengthening of existing pavements to decongest the situation and improving the traffic flow in smooth manner.

Fig.8. Alternate routes for Rajiv Gandhi Road via Medavakkam and ECR

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