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INTERSECTION IMPROVEMENT AT THIRUVANMIYUR ALONG LATTICE BRIDGE ROAD IN CHENNAI

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ABSTRACT: This paper focuses on improving traffic flow at congested intersection located at Thiruvanmiyur along Lattice Bridge road in Chennai. Road inventory survey and volume count survey have been conducted at the four arm intersection. Volume accumulation curve is developed to find peak volume and the peak time. The analysis has found that the volume is about 2731passenger car equivalence (PCEs) in North, 4577 PCEs in South, 3018 PCEs in East and 1657 PCEs in West at four arms of the intersections during the peak hour (18.00-19.00 hrs). The volume of capacity ratios has seems to be 0.98, 1.63, 1.08 and 0.59 respectively which creates a high level of congestion and poor level of service, indicating the urgent need for a traffic management measure. Transport system management concepts are suggested to manage traffic flows which will improve flow at the study intersection.

Index Terms **- Traffic survey, Volume count, Transport system management, Intersection improvement.**

I INTRODUCTION

Traffic congestion is a condition on transport networks that occurs as use increases, and it is characterizedby slower speeds, longer trip times and increased vehicular queuing. When vehicles are fully stopped for a period of time, called as a traffic jam. With the high growth of city traffic, the contradiction between traffic demand and supply has increased, and the vehicle flow become congested. Estimate their influence to the study area and how to improve the connectivity and accessibility of the whole road network through local traffic reformation, have become important issues to transportation planners and managers. Traffic congestion can be characterized by the decrease in speed, the increase in travel time and the increase of vehicle's queue on the road. In addition, traffic congestion happens when the road demand exceeds the road capacity. 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. Lattice Bridge (LB) road and ECR road seems to be talk of the Chennai City, specifically at Thiruvanmiyur intersection.The daily volume of traffic on Information Technology (IT) corridor is more than 3.5L vehicles on weekdays. Our focus is to suggest geometric improvements and adopting transportation system management to reduce the severity of the study intersection.

II REVIEW OF LITERATURE

Many researches are concentrating on intersection improvements, a few are narrated here. Velmurugan S et al (2005), said that the traffic was growing at a rapid rate in urbanareas of India and the management of traffic operations on the limited road network of the cities had become a gigantic task to the concerned authorities. Phillips S (2006) said that transport played a key role in our lives, transforms our outlook and had a massive impact on social and economic development. In addition, emerging of the technologies were also associated with the social and economic development. Accordingly, Intelligent Transport System (ITS) has evolved with Chinese social and economic transformation. In the 1990s, China started a large-scale construction of road infrastructure, and ITS was considered as a futuristic and expensive tool box. It was crucial for Chinese government to identify when and how to integrate new technologies into transportation systems and to formulate an appropriate development strategy with ITS. Manuj Darbari et al (2008) said that unless attention was immediately directed for designing and implementing an optimalsystem and efforts were made on a continuous basis to build up adequate carrying capacity,we would never be able to remove congestion, Lucknow was eight most upcoming cities in India which had witnessed sudden rise in population during past years. Issac L (2008) focused on measuring subgrade stresses from vehicular traffic and the Falling

Weight Deflect meter were compared. Both loading techniques were employed on a heavily instrumented pavement under identical conditions during a period immediately after construction.

Gong Yan (2009) adopted Cyber-physical systems which offer a new theory to the application of information to improve traffic control system performance. His paper, oriented to the integration of information and transportation processes, discusses the gateway role of the control instruction information of the information flow, control command, behavioral control utility and behavioral control and the reconstruction of the traffic control system model. Geethu lal et al (2010) said that the spectacular increase of number of motor vehicles on the road was mainly attributed in generation of traffic problems like accidents, congestions, delays etc., especially in the urban premises of developing countries. Bhargavi P.S and N. Kannaiya Raja (2011) studied and analyzed the reasons for road traffic accidents in Tamil Nadu. Also investigates the different causes of accidents occurred in past years in Tamil Nadu. Amudapuram Mohan Rao and Kalaga Ramachandra Rao (2012) said that the traffic congestion has been one of major issues that most metropolises were facing. It was believed that identification of congestion is the first step for selecting appropriate mitigation measures. Congestion - both in perception and in reality - impacts the movement of people. Traffic congestion wastes time, energy and causes pollution. There were broadly two factors, which affect the congestion; (a) micro-level factors (b) macro-level factors that relate tooverall demand for road use. Congestion was triggered at the micro level on road and driven at the macro level. Absar Alam.M and Faisal Ahmed (2013) said that the traffic congestion was a public policy issue and solicits a policy response which can strike a balance between urbanization and urban mobility. In the case of India, several policy initiatives had been undertaken but had not yielded desired outcomes. This was primarily because the focus had only been on public transport improvement measures, while traffic demand management measures had largely been neglected.

III STUDY AREA

Thiruvanmiyur is a largely residential neighborhood in the south of Chennai in Tamil Nadu. It witnessed a spike in its economy with the construction of Chennai's first dedicated technology office space, the Tidel park, IT park in neighboring of Taramani. The subsequent rise of several IT businesses, research centers and offices around Tidel park proved fortuitous for Thiruvanmiyur, as many of the workers at these offices often made Thiruvanmiyur as their home. The Marundeeswarar temple, previously defined the area, leading it to be mentioned in Sangam Tamil epics. Other famous locations are Ashtalakshmi temple and Aarupadai Murugan temple. The study intersection at Thiruvanmiyur connects LB road (cotton house) in North, LB road (police booth) in South, ECR (HP) in the East and ECR (Aavin signal) in West. During 18.00 to 19.00 hours the volume of vehicle attains peak. It takes about 5 minutes to travel just about 300m (3.6kmph) during this peak time. The study location on map is shown in Figure 1.

Fig. 1 Study intersection at Thiruvanmiyur in Chennai

IV DATA COLLECTION

Road geometric survey and traffic volume study are conducted to determine the volume, movements and the composition of road-way vehicles at the study intersection. These data can help to identify the peak flow hour, peak volume and to determine the influence of huge vehicle volume on pedestrian movement. A continuous manual volume count have been conducted and the obtained traffic volume data is converted into passenger car equivalence (PCEs) to bring various vehicles into a single unit using conversion factor as per Indian Road Congress (IRC-106-1990) specification. At Thiruvanmiyur intersection the vehicles moving in different directions want to occupy same space at the same time. 1800 pedestrians per hour also seek same space for crossing. Thiruvanmiyur Junction has four roads of two way and road widths are 21.70m (N), 21.30m (S), 25.30m (E) and 20.10m (W). The road geometry of intersection is shown in Figure 2 and the vehicle movements are shown in Figure 3.

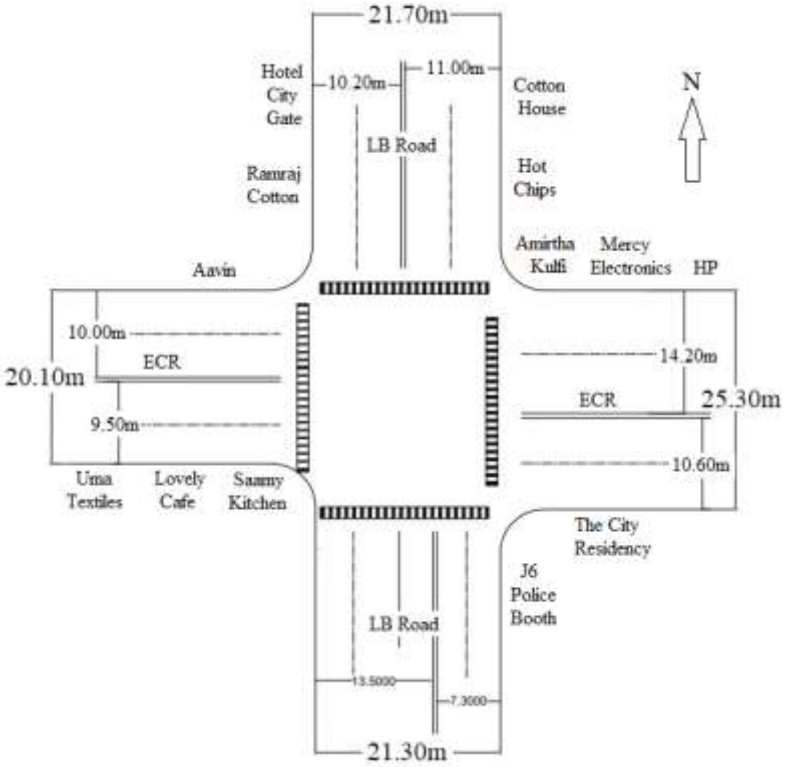

Fig.2 Road geomentry at Thiruvanmiyur intersection

Fig. 3 Traffic movement at Thiruvanmiyur intersection

Volume count survey is done at Thiruvanmiyur intersection along LB road. It has four arms with existing turning restrictions. Here the vehicular movements from North to West and South to East are restricted. The volume count survey has been done between 7.00 and 21.00 hours on an ideal day. The volume accumulation curve obtained for this 13 hours is shown in Figure 4. The total volume between 7.00 and 21.00 hrs is 95009 PCE. The peak hour (18.00-19.00) traffic is 11983 PCEs and it is 12.50% of the 13 survey hours. Average Daily Traffic (ADT) at this station is found to be 138150 vehicles in numbers and 123140 in PCEs. Vehicles towards LB road (cotton house) in North is 23% and towards LB road (police booth) in South is of 38%. The modal split of vehicles at this intersection in the peak hour is shown in the Figure 5 in which volume of two wheelers are dominating up to 59% followed by the car and auto with 33%.

Thiruvanmiyur intersection has major roads on both the sides, Since both the roads act as major road equal distribution of vehicle movement is taking place. In this, majority of traffic (61%) is plying along LB road (North and South). The directional movement of vehicles at peak hour in Thiruvanmiyur intersection is shown in Figure 6.

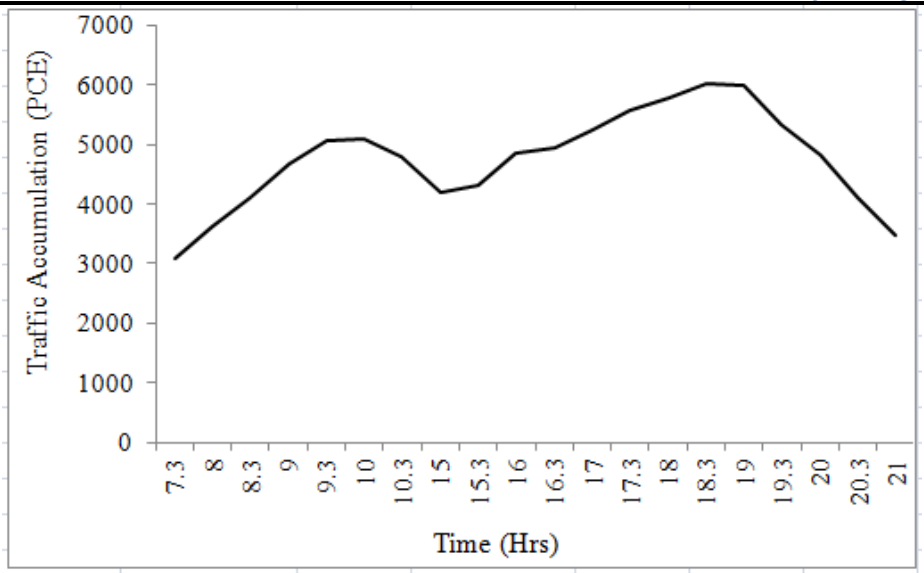

Fig. 4 Traffic accumulation at Thiruvanmiyur intersection in PCE

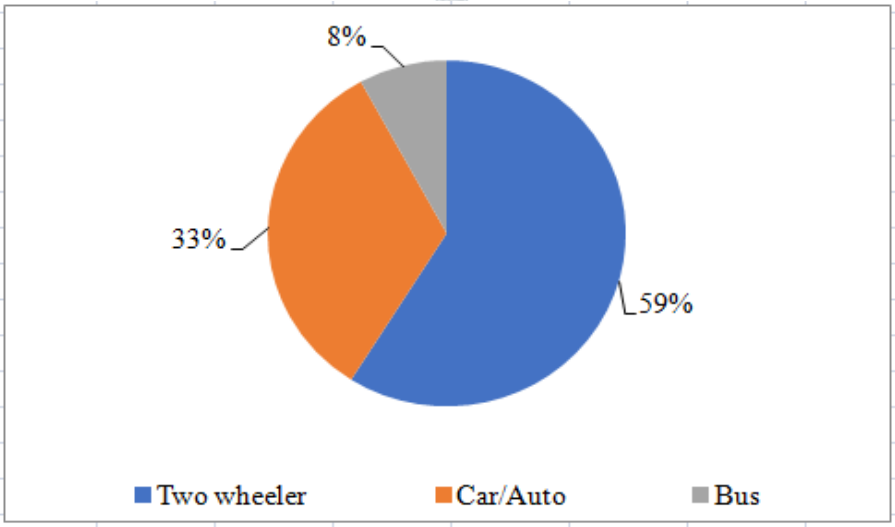

Fig 5. Vehicle composition at Thiruvanmiyur intersection in peak hour (18.00-19.00 hrs)

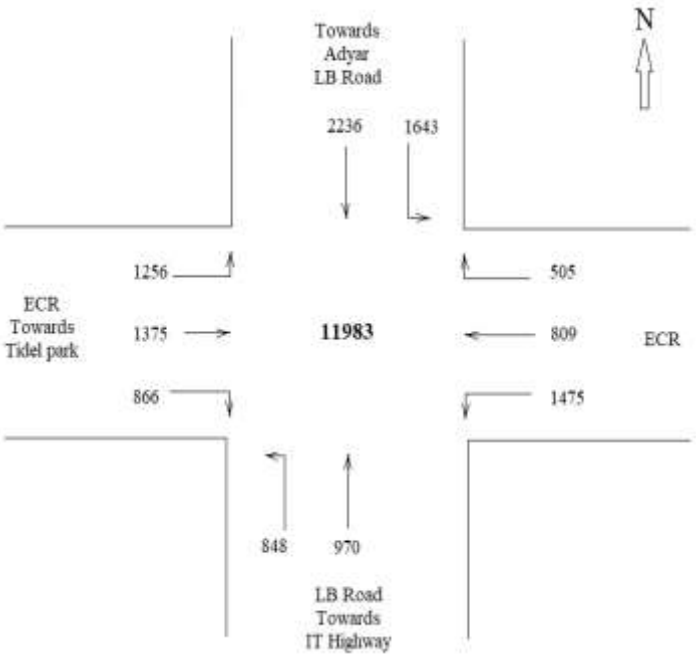

Fig. 6 Directional movement of vehicles at Thiruvanmiyur intersection in PCE at peak hour (18.00-19.00)

The practical capacity of all-purpose roads with high volume junction where no standing vehicles are allowed on a multi-lane two-way urban road is 2800 PCEs. Here the volume to capacity ratio is greater than one except ECR (Aavin signal) in West is shown in Table 1in which other three roads needs immediate remedial measure to improve the flow.

Table 1 Volume to Capacity ratio at Thiruvanmiyur intersection

Sl.No	Roads in Thiruvanmiyur Intersection	Volume (V) in PCE	Capacity (C) in PCE	V/C
1	LB road North	2731	2800	0.98
2	LB road South	4577	2800	1.63
3	ECR East	3018	2800	1.08
4	ECR West	1657	2800	0.59

Ref: Table 21.19 Practical capacities of two-way roads, pg.535, Chapter 21, Section 11, Highway capacity, "Traffic engineering and transportation planning" by L.R.Kadiyali, Khanna publishers, 8th Edition 2013, ISBN 81-7409-220-X.

V TRAFFIC MANAGEMENT AT THIRUVANMIYUR INTERSECTION

As the traffic on the study road grows, congestion becomes a serious problem. Medium and long term solution like widening roads, constructing elevated flyovers and bypasses and urban expressways are costlier. Short term and inexpensive solution can tide over the crisis for which Transportation System Management (TSM) may be adopted. From LB road North as a short-term management measure G turn under TSM may be introduced. Allowing East turn at Kalakshetra road will drags 1643 PCEs and the peak volume will comes down to 1088 PCEs. Diversion of the flow towards East from LB road has to move towards East through Kalakshetra road and taking Sivasundar avenue (West) which leads to East 2nd street to reach ECR in the East. The proposed diversion of flow is shown in the Figure 7. Same way in LB road South as a short-term measure by avoiding the vehicular volume form West to South (866 PCEs), East to South (1475 PCEs) and South to West (848 PCEs) the volume will be dragged to 1388 PCEs for which a G turn may be introduced under TSM. Diverting the vehicles in the early road to the intersection and they may reach their exit roads without using the study intersection which is shown in Figure 8. After the proposed TSM measures the V/C of roads will ranges between 0.28 and 0.50 which is shown in Table 2. The intersection volume also will come down to 7151 PCEs which can be managed easily for the next two years.

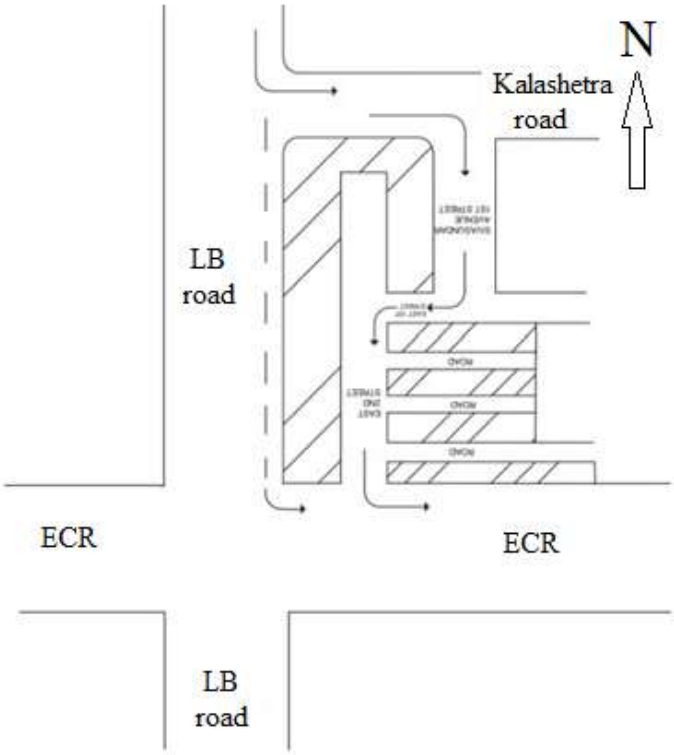

Fig 7. Proposed traffic flow Improvement at LB road North at Thiruvanmiyur intersection

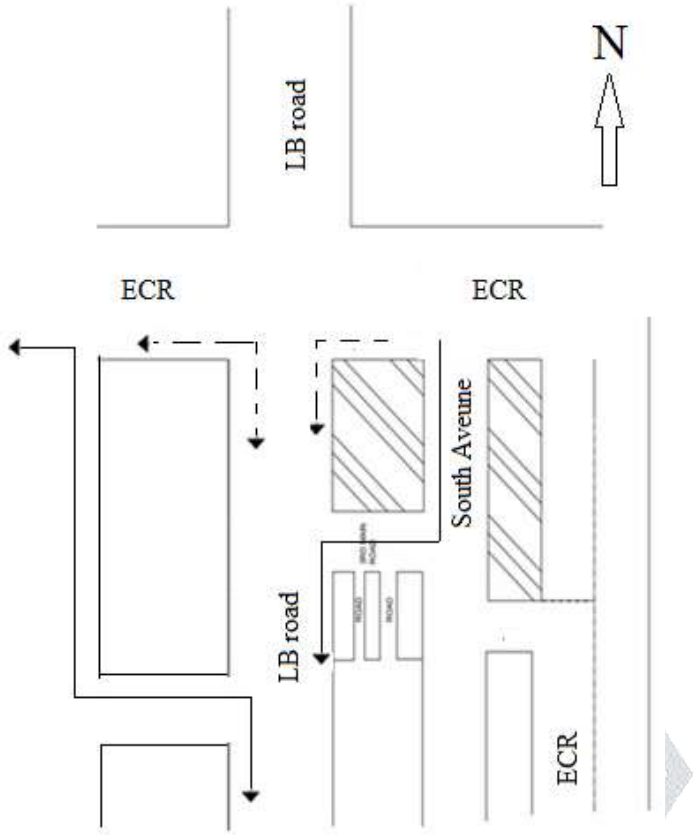

Fig 8. Proposed traffic flow Improvement at LB road South at Thiruvanmiyur intersection

Table 2 Volume to Capacity ratio at Thiruvanmiyur intersection after TSM proposals

Sl.No	Arms of Thiruvanmiyur Intersection	Volume (V) in PCE	Capacity (C) in PCE	V/C
1	LB road North	1088	2800	0.39
2	LB road South	1388	2800	0.50
3	ECR East	1543	2800	0.55
4	ECR West	791	2800	0.28

VI CONCLUSION

- Traffic congestion is characterized by slower speeds, longer trip times and increased vehicular queuing. The road intersection is not sustainable if its capacity exceeds the volume but the focus of this study is to suggest TSM to reduce the severity of the study intersection.
- The study intersection at Thiruvanmiyur which is the talk of Chennai City connects LB road in North and South, ECR the East and West. During the peak hour the speed of vehicle along LB road is just 4 kmph.
- Road geometric survey and traffic volume study are conducted at the study intersection. 1800 pedestrians per hour also using the road with vehicles.
- Thiruvanmiyur intersection has four roads of two way and road widths are 21.70m in North, 21.30m in South, 25.30m in East and 20.10m in the West.
- The volume count survey has been done between 7.00 and 21.00 hours. The volume between 7.00 and 21.00 hrs is 95009 PCE. The peak hour lies between 18.00 and 19.00hrs. The peak traffic is 11983 PCEs and it is 12.50% of 13 hours.
- ADT at this junction is found to be 138150 vehicles in numbers and 123140 in PCEs.
- In modal split the volume of two wheelers are dominating up to 59% followed by the car and auto with 33%.
- Vehicles towards LB road in North is 23% and towards LB road in South is of 38%. 61% of traffic is plying along LB road in North and South.
- The practical capacity of all purpose road is 2800 PCEs. V/C of four roads at thiruvanmiyur is ranges between 1 and 1.63.
- As a short-term management measure G turn under TSM is proposed to manage the flow. From LB road North under TSM measure 1643 PCEs are dragged and the peak volume will come down to 1088 PCEs. Same way in LB road South under TSM measure the volume will dragged to 1388 PCEs.
- After the proposed G turn technique under TSM the V/C of four roads will ranges between 0.28 and 0.50. The intersection volume will also come down to 7151 PCEs which can be managed easily for the coming years.

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