TRAFFIC ANALYSIS AND DESIGN OF FLYOVER AT PERUMBAVOOR SIGNAL

FINU JOHN[1] ALEENA NASAR[2] ELDHO PAUL C[3] FAHMITHA HAMEED[4] SULTHANA P S[5]

[1]Assistant Professor, Department of Civil Engineering, Viswajyothi college of Engineering and Technology, Vazhakulam Kerala, India
[2,3,4,5]UG Scholar, Department of Civil Engineering, Viswajyothi college of Engineering and Technology, Vazhakulam Kerala, India

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Abstract *–Urban traffic congestion has been identified has a big problem in the country, having a considerable impact on the economy, travel behaviour, land use and causing pain to millions of motorists. In India, due to rapid increase in population along with urbanization and improved living condition, the vehicular population have increased massively. Traffic congestion has become a major problem at intersections. The project main goal is to analyse traffic problems at the Perumbavoor crossroad and provide a different solution. In this study, we have taken signalized intersection at Perumbavoor. After analysis and structures. According to IRC: SP: 90-2010, manual for grade separators and elevated structures the maximum volume a rotary can handle is specified as 5000 pcu/hr Therefore, a simple grade separator, that is, a flyover is provided at the intersection over the road having greater traffic volume count. A large amount of traffic volume may be shifted to the bridges as a result of the flyover bridge at the intersection, and time delays could be minimised over the same time frame.*

Key Words: *Urbanization, Traffic congestion, Alternative solution.*

1. INTRODUCTION

In this paper, traffic congestions are evaluated at selected intersections and data regarding the traffic volume are collected manually. Following the analysis of the acquired data, several remedial procedures concentrating on junction improvement and alternative plans are presented. Despite of huge investment to be laid, congestion could be reduced to a certain extent by providing signalized traffic junctions, providing roundabouts, flyovers and interchanges, etc

1.1 GENERAL

The projects' main goal is to analyse the traffic problems at the Perumbavoor crossroads and provide a solution that includes grade separator and elevated. Collected data various remedial measures are proposed focusing on junction alternative and improvement operation plan. Despite of the huge investment to be laid, congestions could be reduced to a certain extent by providing signalized traffic junctions, providing roundabouts, flyovers, interchanges, etc

1.2 OBJECTIVES

- To determine the capacity of approach roads of intersections.
- To estimate the delay and capacity of intersection.
- To evaluate the performance of signalized intersection at Perumbavoor.
- To suggest some methods for improving the performance of intersection.
- To plan and develop current and new traffic operation facilities on the road.

1.3 SCOPE

- To achieve efficient and rapid flow of traffic at intersection.
- To increase traffic capacity of roads.
- To reduce the delays in road journeys and improve speed of the vehicle.

2. RESEARCH FRAMEWORK

The methodology consists of 6 steps, from selecting the intersection to providing layout of the alternative solution. After choosing the right approach road at intersection based on the analysis on the tabulated data, field measurements are taken for the same intersection. Then an alternative solution is suggested for reducing the traffic congestion.

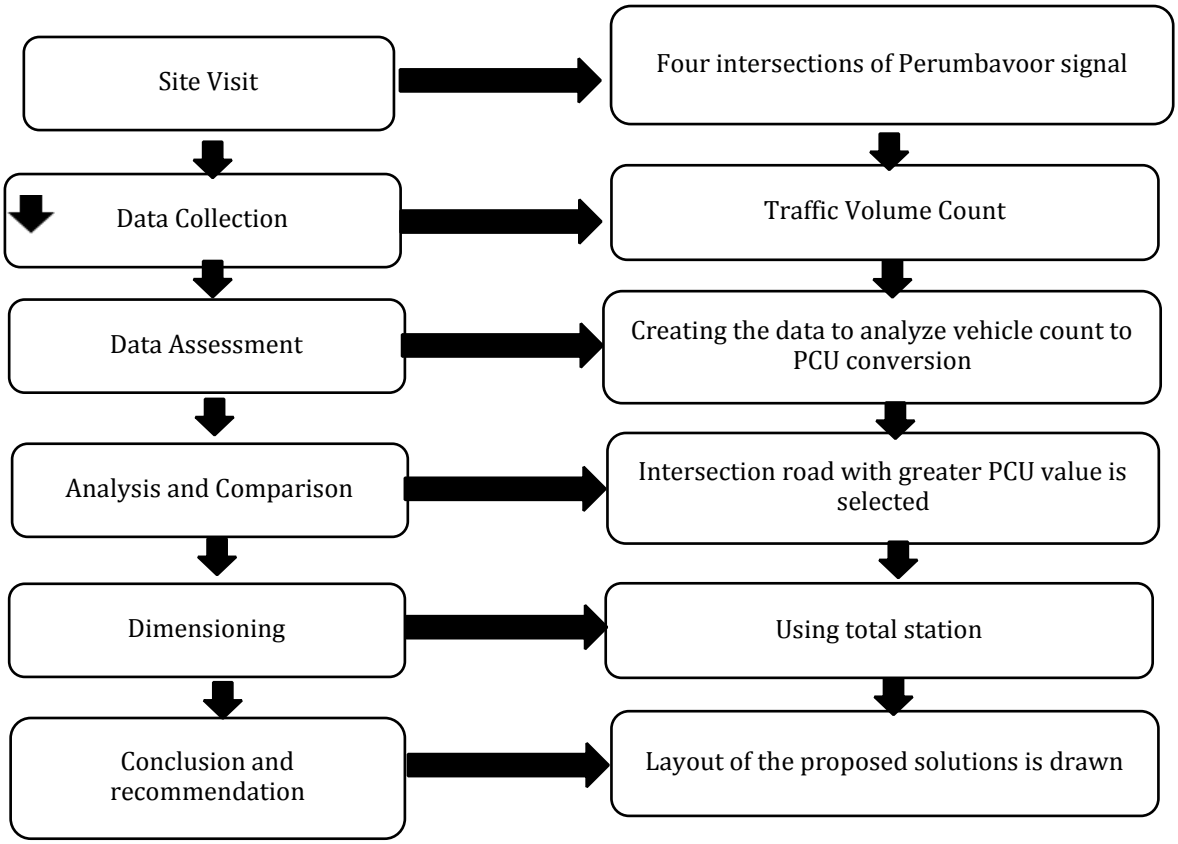

Chart 1 Flow Chart

3. STUDY AREA

The selection of the research area is the initial step in research process. The study's location determines the research activities that must be carried out in light of current traffic behaviour and transportation frame work. In this study, an existing road junction is studied and analysed by using volume count survey. Some implementation will result from data analysis inorder to improve the road's condition. It will have a good effect on the inhabitants in the area as well as other road users. This research will aid in minimising traffic flow issues, hence lowering the rate of accidents and lowering pollution levels. During peak hours, data for this study was obtained from perumbavoor's signalized intersection. The traffic is extremely diverse, with little adherence to lane discipline. Figure shows the aerial view of the signalised intersection selected for the study. It is the intersection of Aluva-Munnar road (SH 16) and MC road (SH1).

Chart 2 Aerial map of intersection at Perumbavoor

4. DATACOLLECTION & ANALYSIS

4.1 Data collection method

There are mainly 2 categories in traffic counting, they are manual counts and automatic counts. The manual counting method is used in this investigation, and is done with tally marks. Following that the raw data from the inventories is organised for analysis. The traffic on each arm is counted and recorded separately for each movement. Automatic counting is an alternate method that employs a number of equipment each with its own set of the most widely used instruments include pneumatic tubes, inductive loops, weigh in motion sensors, micro-millimetres, and video cameras. Here the method adopted is manual counting of different category of vehicles, since it is a direct and easy method involving no expensive equipment.

4.2 Estimation of PCU

The Passenger Car Unit (PCU) is a relative weightage factor used to the traffic volume of individual vehicle categories to account for variability in a mixed traffic environment. To far, a large number of studies have been undertaken to estimate PCU for various vehicle classifications. The nature of traffic flow is often heterogeneous. The degree of heterogeneity, on the other hand, varies depending on the situation. It is usually more for developing countries, for example. Because of this diversity, traffic studies are frequently required. The Passenger Car Unit (PCU) is a widely used method for converting diverse traffic volumes into homogenous traffic volumes. The measure of relative interaction between a vehicle and a traffic stream in contrast to a normal passenger automobile under a set of roadway circumstances, according to the PCU.

4.3 Traffic Volume count

Table 1 Total vehicular count in PCU Unit

FROM	TO	DAY 1 TOTAL IN PCU 9:30 – 10:30 AM	DAY 1 TOTAL IN PCU 4:30 – 5:30 PM	DAY 2 TOTAL IN PCU 9:30 – 10:30 AM	DAY 2 TOTAL IN PCU 4:30 – 5:30 PM
Muvattu-puzha	Aluva	610	750	634	772
	Angamaly	883	1095	876	1111
	Kotha- mangalam	539	778	550	741
Angamaly	Muvattu- puzha	964	1127	932	1173
	Aluva	630	870	649	934
	Kotha- mangalam	623	741	635	731
Aluva	Muvattupuzha	682	681	697	832
	Angamaly	817	913	834	887
	Kotha- mangalam	665	718	689	744
Kotha-mangalam	Muvattu- puzha	596	866	608	870
	Angamaly	760	861	773	790
	Aluva	504	807	510	813
TOTAL		**8273**	**10215**	**8387**	**10398**

5. TOPOGRAPHY OF INTERSECTION

Field measurements of Perumbavoor intersection was taken using total station. On 2nd April 2022 we had surveyed nearby junction of Perumbavoor signal that is Oushadhi junction and on 5th April 2022 we had surveyed Perumbavoor intersection.

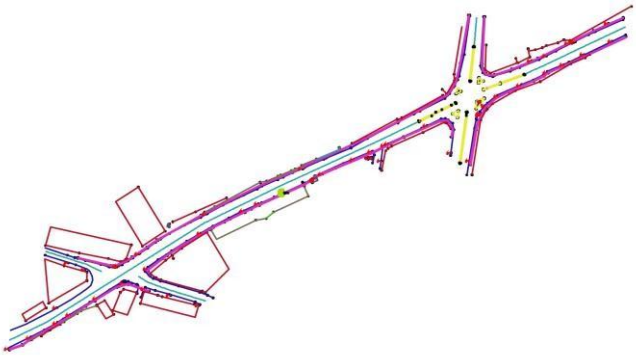

Chart 3 Joined lined diagram of existing road produced from AutoCAD

6. PROPOSED SOLUTION-FLYOVER

After analysing the Perumbavoor intersection it is clear that Muvattupuzha- Angamali road has peak values that is around 1000 PCU/Hr. From the capacity calculations made from field data it is evident that this intersection would fail to cater to the future traffic demands. The traffic volume that a roundabout can handle efficiently is 3000 PCU/hr, according to IRC: 65-2017, Guidelines for planning and design of roundabouts. The maximum volume a rotary can handle is set as 5000 PCU/hr in IRC: SP: 90-2010, Manual for grade separators and elevated structures, and an elevated structure could be provided beyond this limit. A simple grade separator, such as a flyover, would be the most practical option to separate the huge volume of traffic at this crossroads. While traffic on the road grows every day and there is no more space in both dimensions, the only alternative left is to proceed to the third dimension, which is accomplished entirely by flyover construction.

6.1 2D LAYOUT

2D layout of the flyover is plotted in AutoCAD considering the existing measurements. The median of existing and the proposed layout are kept the same and lanes are off set from the median to both the sides.

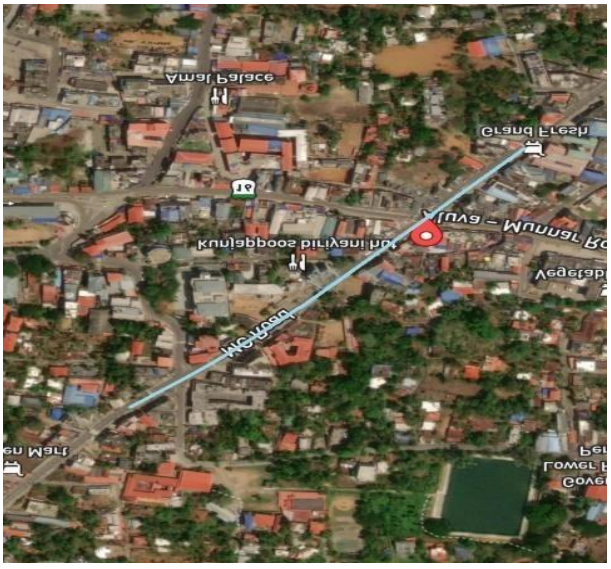

Chart 4 2D Layout

6.1 Detailed View

Data obtained from survey using total station is used to design a flyover. As the detailed file is imported from AutoCAD to Revit software. In general length of the flyover is 580.5m. Standard estimations of path width (3.5m), shoulder width (0.6m to 1m), middle (2m) are given in IRC: SP: 73-2015, Manual for determinations and norms for two coating of thruways. As indicated by IRC:3-1983, Dimensions and Weights of street plan vehicles, no vehicle other than multilevel buses will have a level surpassing 3.8m for ordinary application and multilevel buses might have a level not surpassing 4.75m.Therefore, according to Indian Standards, the height of flyover should be 5.5m. Total width of the flyover is 7.6m. Slope of the ramp is 15°. Pillars are provided at an interval of 7m throughout the length. Pillar diameter is 75cm and 83 number of pillars are provided.

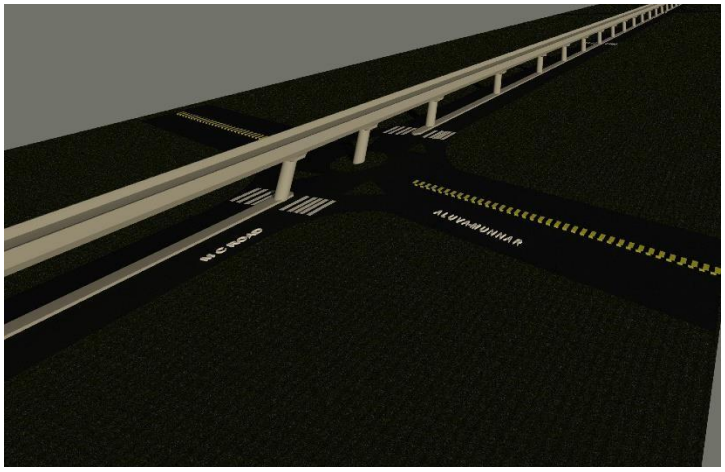

Chart 5 3D layout of flyover at intersection

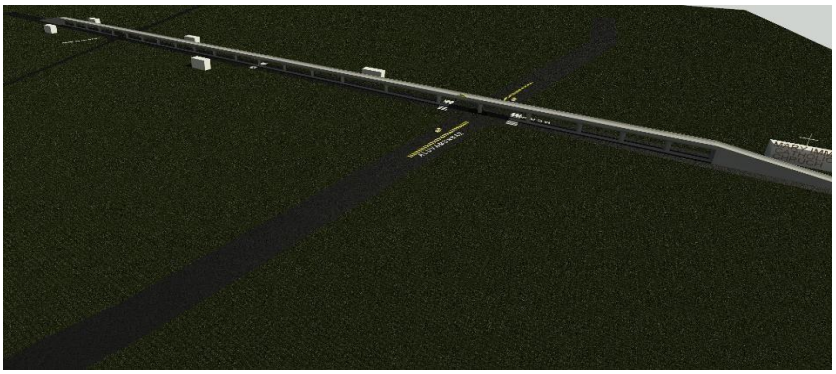

Chart 6 Starting and landing portion of flyover

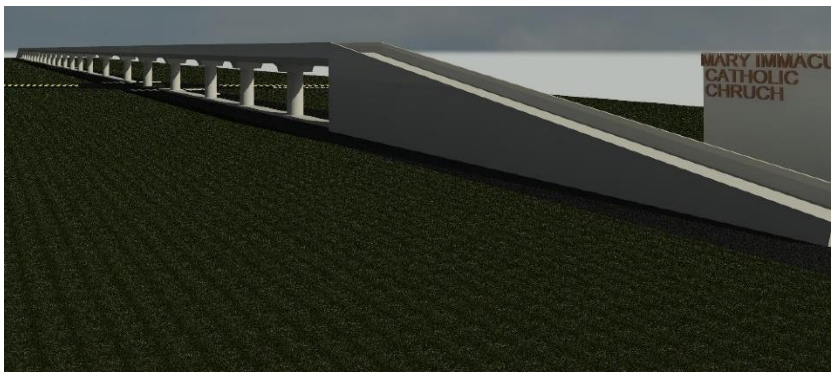

Chart 7 Landing portion of flyover

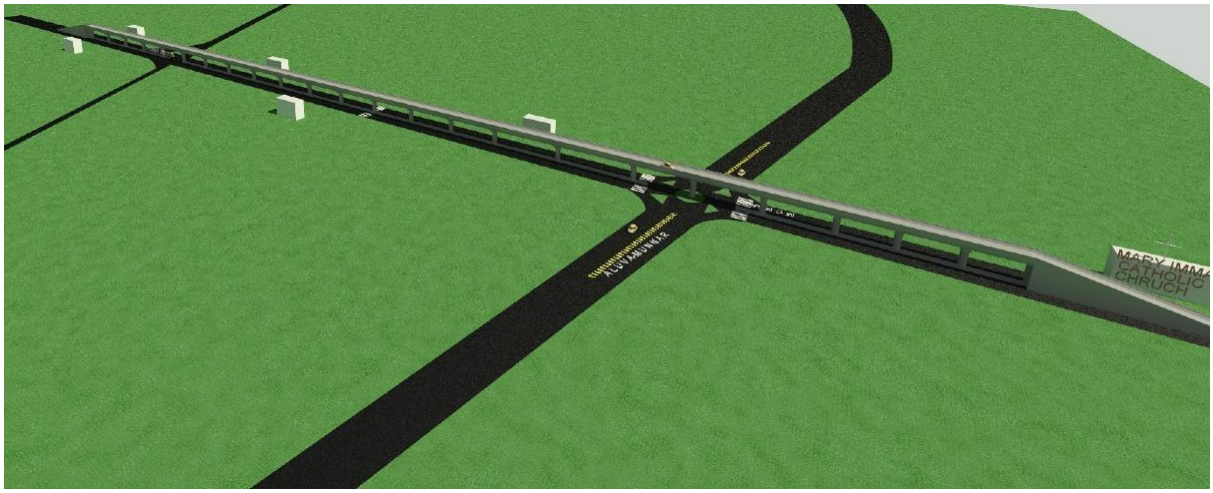

Chart 8 3D Layout of flyover

7. ADVANTAGES AND LIMITATIONS

Flyovers contain a few benefits, yet limits emerge simply because of a few mix-ups committed at some stage in their development or, in all likelihood due to ill-advised arranging, etc. Flyovers are not, when in doubt, proper for created regions as they need a colossal region and furthermore it is costly. Absence of legitimate overseeing inside flyover development could create bunches of issues. Different designing studies were completed for appropriate preparation and planning of grade separator at proposed intersection. The significant expectation is to get better current situation immeasurably and make relationship of traffic helpful to conceivable expand, albeit a totally contrast free circumstance can't be perceived. The essential plan norms executed for foundational layouts are according to necessities set down in latest versions of Indian Roads Congress codes of practices and customary details of Ministry of Road Transport as well as Highways. Land acquisition is also required for its construction. This project deals with traffic analysis and proposing a design layout for a flyover, hence it is not detailing about the structural aspect.

8. CONCLUSION

Expanded in populace and fast urbanization of India have brought about expanded utilization of vehicles and transportation offices, which thus brings about gridlock and related issues. The project study is based on 4 main intersection and the traffic data is collected through manual counting on peak hours and converted to PCU/Hr. After comparing the values of 4 roads Muvattupuza – Angamaly has the highest peak value. The total vehicular count is around 10000PCU/Hr. Field measurements are done using total station. The maximum value a rotary can handle is 5000PCU/Hr and elevated highways can carry beyond this limit. So, an alternate solution suggested is the design of a flyover. Data obtained from survey using total station is used to design a flyover. As the detailed file is imported from AutoCAD to Revit software. Overall length of the flyover is 580.5m. Standard measurements of lane width (3.5m), shoulder width (0.6m to 1m), median (2m) are provided in IRC: SP: 73-2015, Manual for determinations and norms for two covering of highways. Although governments may never be able to eliminate road congestion, with the flyover construction it could be reduced to a certain extent and crisis can be mitigated well. Despite of huge investment to be laid, it would provide an easy, safe and fast transportation. If the project is implemented the present and future demands of traffic may be satisfied.

9. REFERENCES

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