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ABSTRACT

The growth of traffic in the road network of large cities in developing countries like India is a serious concern for traffic managers and transportation officials. Our junctions are not suitable for accommodating the increasing traffic. Thus improvements of roads and junctions are very important for the development of the nation as a whole.

For the present study, Ayathil junction was taken. It is a five-legged intersection connecting Kallumthazham road, Mevaram road, Kollam road, Kannanalloor road and Pallimukku road. It is an important junction connecting NH 66 Kollam bypass and Kollam-Kulathupuzha SH 59 facing frequent traffic congestions.

We put forward two proposals for the junction improvement. Our first proposal is the redesign of traffic signals. By the redesign, it was concluded that a signal alone cannot solve the congestion at the junction. Installation of the signal will cause great delay to the traffic flow. So we put forward our second proposal. Our second proposal is to construct a flyover across the Kallumthazham- Mevaram road spanning for 380m across the junction. Various elements of the flyover were designed appropriately. Installation of the flyover seem to be a practical solution for eliminating the congestion at the junction.

KEYWORDS: Junction improvement, Traffic signal redesign, Flyover design

1. INTRODUCTION

Ayathil - The Healthcare hub of Kollam city is an important intersection connecting NH 66 Kollam bypass and Kollam- Kulathupuzha SH. It is a five legged intersection. Volume of traffic is high and the junction is facing frequent traffic congestion. The junction is occupied by schools, colleges, multi-specialty hospitals and commercial centers. Urban traffic congestion has become a serious concern of transportation professionals and traffic managers. The Ayathil junction becomes severely congested especially during daytime. Several efforts were made to mitigate the problems. A traffic signal was installed at the junction. But this system is unsatisfactory as the delay time is very high.

As a solution we propose redesigning of the existing traffic signal and also finding out alternative ways for the junction improvement which include the construction of a flyover. The fly over is desired to be designed over the Kallumthazham-Mevaramroad. The opening of the Kollam bypass is creating a huge traffic on this road. The traffic under the flyover will be managed by appropriate means.

2. MATERIALS AND METHODS

Methodology includes Preliminary Survey, Data collection, Analysis of data, Remedial measures (Signal design and Design of fly over) and Documentation. Preliminary survey was conducted in the form of a questionnaire and accident data was collected for the past four years and analyzed. It was found out that the junction is facing frequent traffic congestions and junction improvement is appropriate. The remedies suggested are traffic signal design and flyover design. Both the designs were done by treating the five-legged intersection as four-legged intersection. The Pallimukku road which has the least traffic volume was neglected for both the designs.

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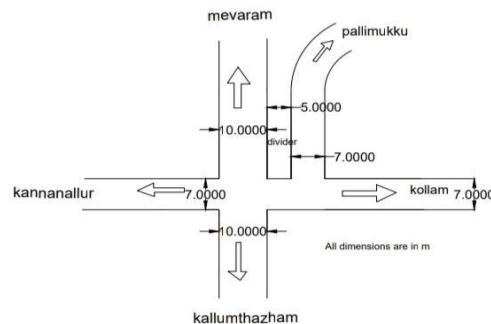
Traffic Signal Design

For the traffic signal design, the methodologies adopted were Geometric survey, Traffic volume count, Speed survey, Calculation of PCU, Analysis of data and signal designing. Geometric survey was done using Total Station survey. Traffic volume count was done manually for morning peak hours from 8.00 to 11.00am and for evening peak hours from 3.00 to 6.00pm. Speed survey was done using the Direct Timing procedure and found out the design speed. By manual calculation, the PCU (Passenger Car Unit) value was determined and finally after analysis of data signal design was done using Webster's method. From the design it was concluded that a signal alone cannot solve the congestion at the junction. The red time was very high and green time was very low. Installation of the signal will cause great delay to the traffic flow. So we put forward our second proposal – Design of Flyover.

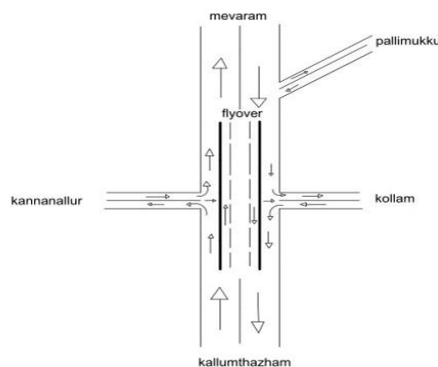
Design of Flyover

For the design of flyover, the methodology adopted was Geometric survey, Data collection, Design of structural elements of the fly over, Analysis of fly over and Prototype modeling. The geometric survey and data collection for flyover design is same as that done for signal design which includes Traffic volume count and Speed survey. From the analysis of data, flyover is proposed across the Kallumthazham- Mevaram road spanning for 380m across the junction. The flyover design was done using both manually as well as using software, STAAD. Various elements of the flyover such as girders, piers and foundation were designed appropriately adopting IRC class AA loading. Installation of the flyover seem to be a practical solution for eliminating the congestion at the junction. The traffic underneath the flyover is regulated by traffic signal design.

Figure:



Present condition of junction



Proposed flyover

3. RESULTS AND DISCUSSION

The signal design was done using Webster’s method. The obtained result is shown below. From the design, it is clear that Green time is very less as compared to Red time. So the delay time will be very high.

Figure:

4 Phase

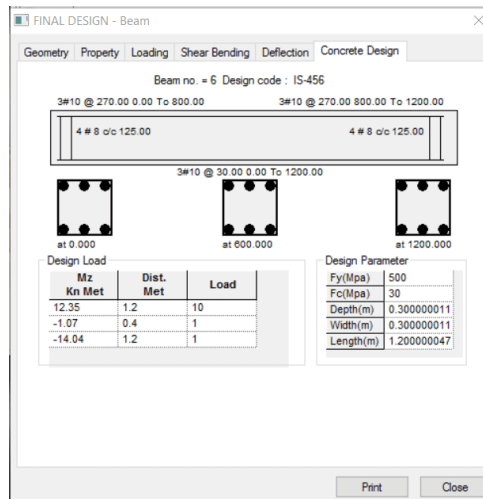


Red ■
 Green ■
 Amber ■

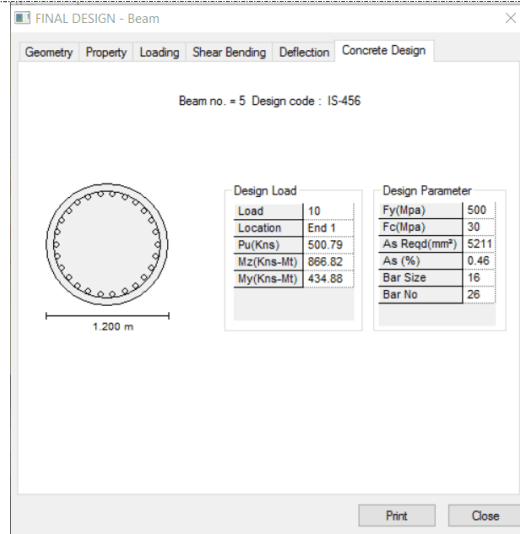
4 Phase signal design

The flyover design was done using STAAD.Pro/Beava and result obtained was verified by manual calculation.

Figure:



Girder design

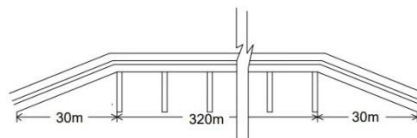


Pier design

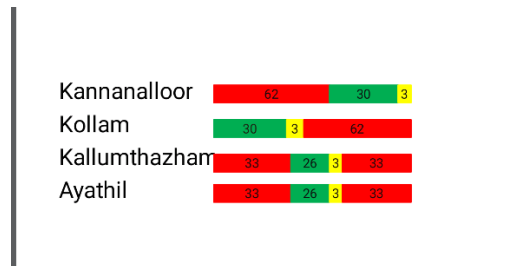
The general details of the flyover are given below:

- Length of the flyover = 380m
- Number of piers = 32
- Maximum height of the flyover = 4m
- Span between piers = 10m
- Horizontal length of approach road = 30m
- Grade percent for the ramp = 1.052%
- The up-ramp is proposed to be located 30m before the present Ayathil bus stop at Kallumthazham road.
- The down-ramp is proposed to be located at the end of Ayathil bus stop at Mevaram road.

Figure:



Layout of proposed flyover



3 Phase signal design for traffic regulation underneath flyover

4 CONCLUSION

The project was completed successfully. Traffic signal redesigning and flyover design was done as a part of junction improvement to solve the traffic congestion issue at Ayathil junction. Traffic signal is not a practical solution for solving the traffic congestion at the junction due to high delay time of signals. The design of flyover over the Kallumthzham-Mevaram road can be inferred as the solution to overcome the present condition of the junction as well as it adds to the aesthetic appearance of the junction. A 3 phase signal can solve the traffic congestion below the flyover.

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