

Traffic and Area Improvement of Baker Junction and Seematti Roundabout

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ABSTRACT: The increasing of traffic volume at our intersection has been arising problems like road accidents, conflicts, and congestions. These problems can solve by providing an efficient traffic signal control at the intersection for continuous and efficient movement of vehicles through the intersection. According to the traffic signal, signal timing is most important which is used to decide the green time of the traffic light shall be provided at an intersection and how long the pedestrian walk signal should be provided. Traffic volume studies are to determine the number, movement and classification of vehicles at the Baker Jn. and Seematti roundabout. These data is used identify the normal flow of the road; determine the influence of heavy vehicles or pedestrians on vehicular traffic volume. The collected data is converted into PCU units. Webster's method is used for manual signal design.

KEYWORDS: Signal design, phase design, traffic, transportation engineering,

I. INTRODUCTION

The Kottayam lies on the National Highway 183 (NH 183) connecting Kollam and Theni. The NH183 connects Kottayam to the state of Tamil Nadu and the tourist destinations of Thekkady and Kuttikanam, as well as the agricultural towns of Kanjirapally and Mundakayam and National Highway 208 (NH 208) connecting Kollam and Madurai State Highways SH1 or Main Central (MC) road, SH11, SH13, SH14, SH15 and SH32 pass through Kottayam. The current trends in Kottayam show that a large population in migrating into the town in search of a job. Due to the increasing economic growth and shopping power of Kottayam, people are attracted to do business and invest in this town. From statistics given by Kerala RTO Kottayam, the number of new vehicles registering per week is so alarming to the current road condition. The project stretch is from Baker Jn. to Seematti Roundabout which is situated in Main Central road and is connected to Kollam – Theni Highway. All vehicles to Kottayam Medical College, Pala, Kumily, Changanashery etc. has to pass this stretch. Hence the volume of traffic passing this stretch is also very large, that it is difficult to count manually. This causes the reduction in Level of Service at the Junction and the volume of traffic exceeds the Capacity of Road. Baker junction has a large volume of pedestrians, during morning and evening hours when school, office, and college depart. But pedestrian amenities in the junction are poor. There is no pedestrian signal at the junction.

II.SCOPE AND OBJECTIVE

The scope of the project is to improve the technical, aesthetic and economic aspects of an area through improvement proposals. Hence for, the detailed designs and drawings for various elements of the project such as road alignment, signals, footpath, intersection and other traffic regulating aids of the junctions are analyzed. The main objective of the study is to formulate traffic improvement operation plan for Baker junction and Seematti roundabout area through engineering, management and control measures by considering the quality and safety of traffic. The broad objectives of this study are

- To identify existing issues affecting smooth traffic flow.
- To conduct traffic volume studies.
- To estimate the queue length.
- To work out appropriate regulatory traffic signals, intersections and other engineering measures for improving the function of a traffic junction.

III. GENERAL BEHAVIOUR OF TRAFFIC

Traffic demand at both Baker Jn. and Seematti Roundabout is very heavy and has large queue lengths. This leads to acute congestion in the area. There are 15 directions of vehicular flow at these intersections. These intersections are controlled by three police including one in the Baker Jn. There is no coordination between these three policemen. This further deepens the cause of congestion. The vehicles from Shastri road going to Baker Jn. has to travel about half a Kilometre while the actual distance between these two points is about 100m. This is because no traffic is allowed to go around the Seematti roundabout towards Baker Jn. This practice increases the traffic in the Nattakam– Baker Jn.leg.

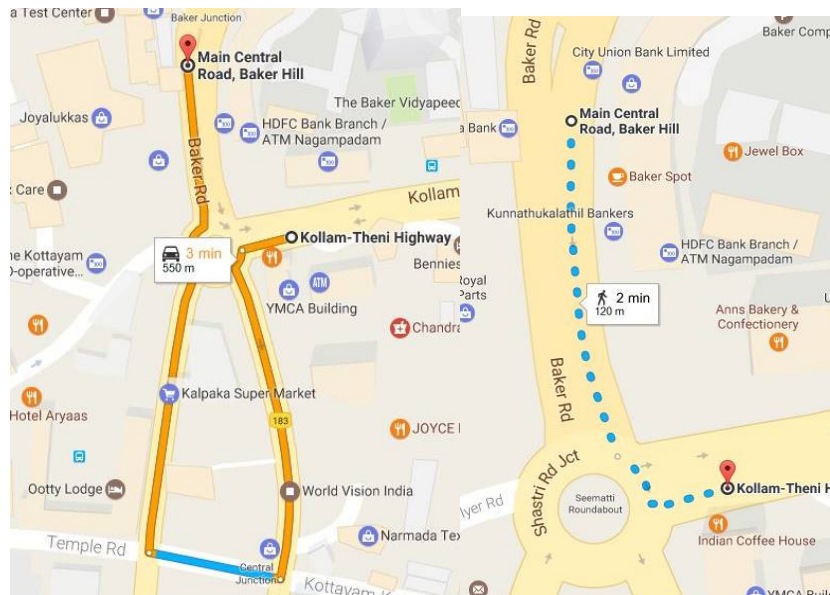


Fig.1 Traffic Movement: Shastri Road to Baker Jn.

The vehicles from SreenivasaIyer road (Old Bus stand) going to Shastri road has to travel about half a Kilometre while the actual distance between these two points is about 80m. This is because no traffic is allowed to go around the Seematti roundabout towards Shastri road. These vehicles have to take a U-turn at Baker Jn. This practice increases the traffic in the Baker Jn.

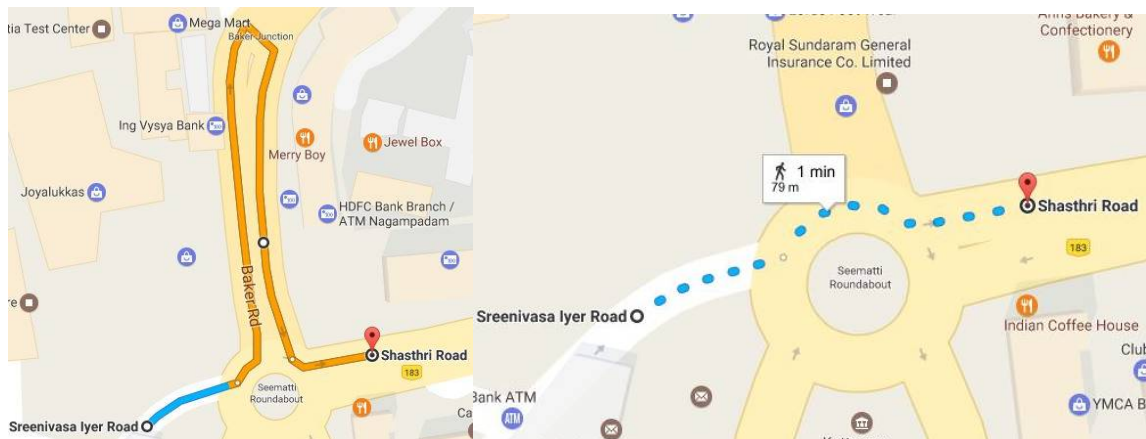


Fig.2 Traffic Movement: SreenivasaIyerShastri Road.

Presently there is no sufficient traffic sign like informative, warning etc. provided at the intersection. The road markings such as Zebra Crossing and lane marking etc. are just for namesake. There is no sufficient street light. All these further increases the traffic related problems.



Fig.3 Position of side service road

There is a side service road near the Seematti roundabout in logos junction - Seematti roundabout leg which connects Seematti roundabout to Market Road. The vehicles moving to and moving from this side service road creates congestion in the Shastri road and Main Central road.

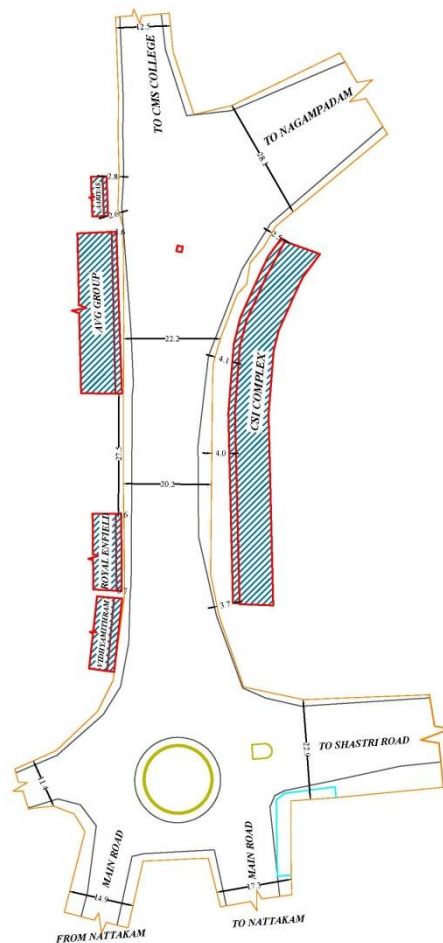


Fig.4 Base plan of project stretch

Fig.4 shows the geometrical condition of the project stretch. The distance between the two intersections is around 120m. The approach road from CMS College has a lesser width which may result in some amount of traffic congestion. Improper road marking and pedestrian facilities worsen the condition and serviceability of the intersection.

IV. DATA ANALYSIS

IV.ABus Headway

The time interval between the passage of successive vehicles moving in the same lane and measured from head to head as they pass a point on the road is known as the time headway. The time headway is used by us to find the arrival pattern of buses at a stop. This study helps us to find the requirement of bus bay at a point. The requirement of bus bay is observed when the Headway is minimum. The chart below shows headways at different points at baker junction.

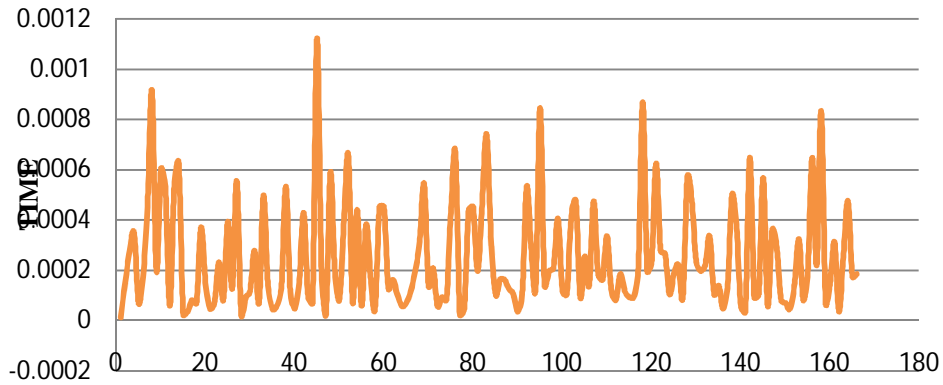


Fig.5 Headway of Buses to Nagampadam

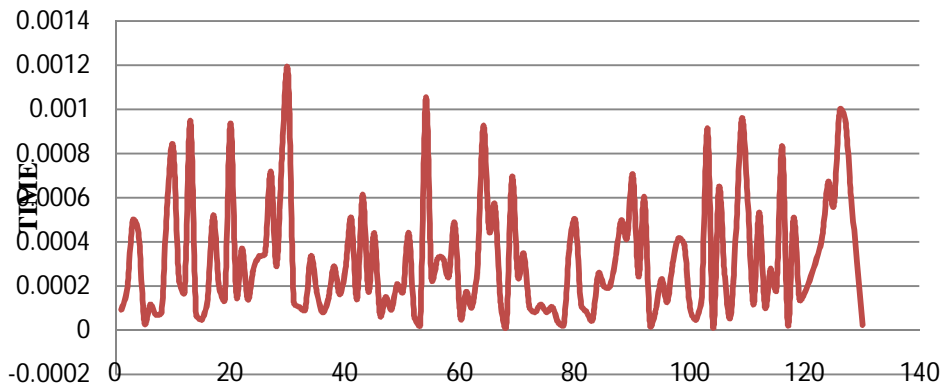


Fig.6 Headway of Buses to Nattakam

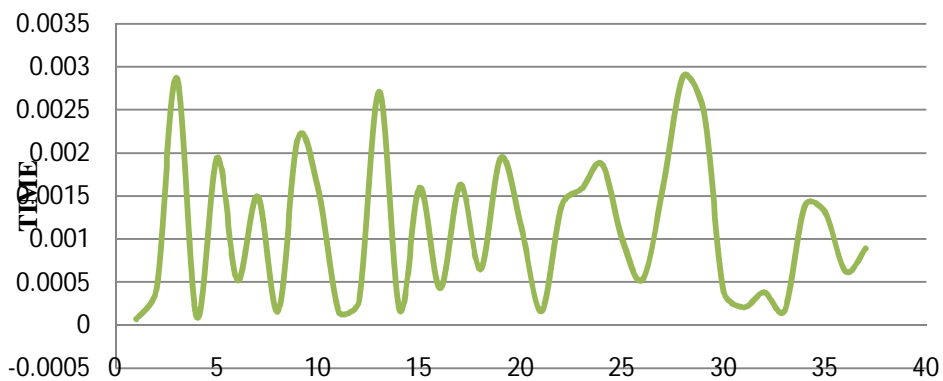


Fig.7 Headway of Buses to CMS College

From the fig.5, fig.6, and fig.7 the number of bus crossing to baker junction toward Nagampadam is very high. On average of 22 seconds a bus will arrive at the bus stop. The bus stop is located hardly 30m away from the Baker Junction and the 22 second time interval make the accumulation of buses (including the following vehicles). This queue enters into the intersection. Fig.7 show the traffic accumulation at baker junction caused by the bus stop towards Nagampadam.



Fig.8 Bus stop at Baker Jn. towards Nagampadam

IV.BQueue Length

Queuing is the study of traffic behaviour near a certain section where demand exceeds available capacity. The charts below show the queue length and time spend for different legs. From fig.8 it is clear that for a shorter delay time the queue formed is greater in Baker Jn. – Nattakam leg which means higher the value of PCU/hour through that leg.

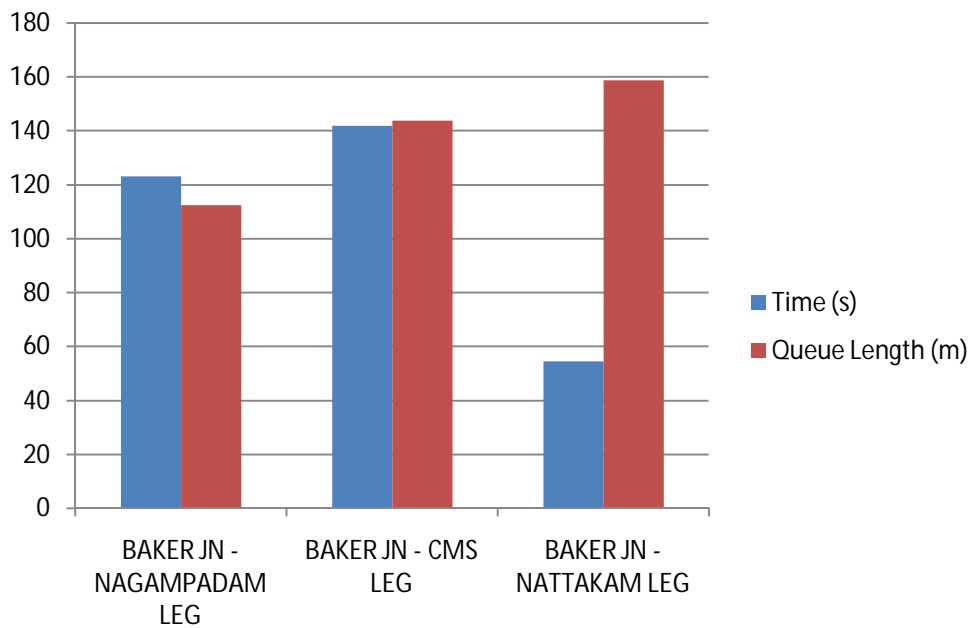


Fig.9 Queue Observed at BakerJn.

IV.CTime allowed by the policemen

The Baker junction and Seematti roundabout are controlled by a traffic police. He allows time proportionally based on demand. There is no coordination between the officers which is also causing traffic congestions. The time distribution by traffic police to major direction are shown below.

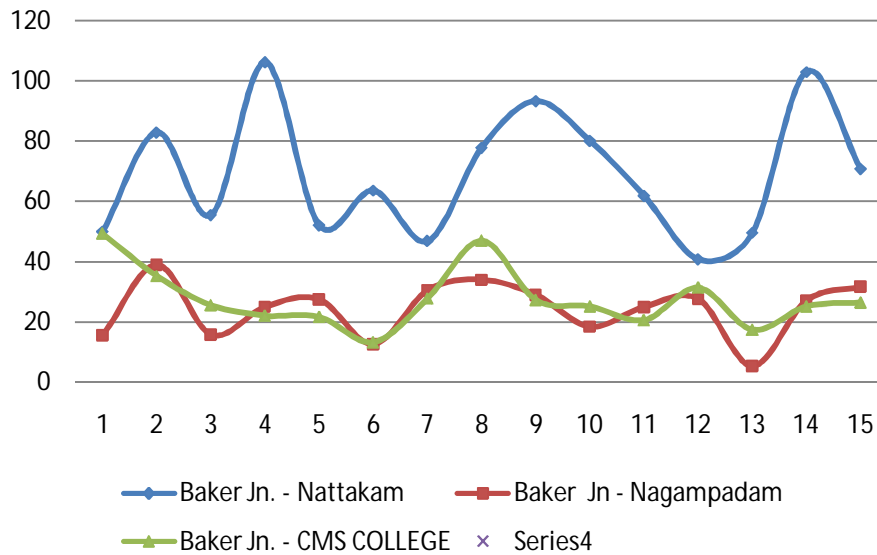


Fig.10 Time allowed by Traffic Police to different leg in seconds

The average time allotted to

1. Baker Jn. - Nattakam Leg: 68.95 seconds
2. Baker Jn. - Nagampadam Leg: 24.38 seconds
3. Baker Jn. - CMS College Leg: 27.77 seconds

IV.D Peak Turning Volume Count

Vehicles turn at the intersections to 15 different locations are analyzed and the results are presented in fig.11&fig.12. The bars in green colour represent the free left PCU and that in red represents the PCU taking the intersection, which is to be considered in the signal design. From the traffic volume analysis, it is found that 08:45 – 9:45 is the peak hour and max PCU is recorded. All the legs highly saturated.

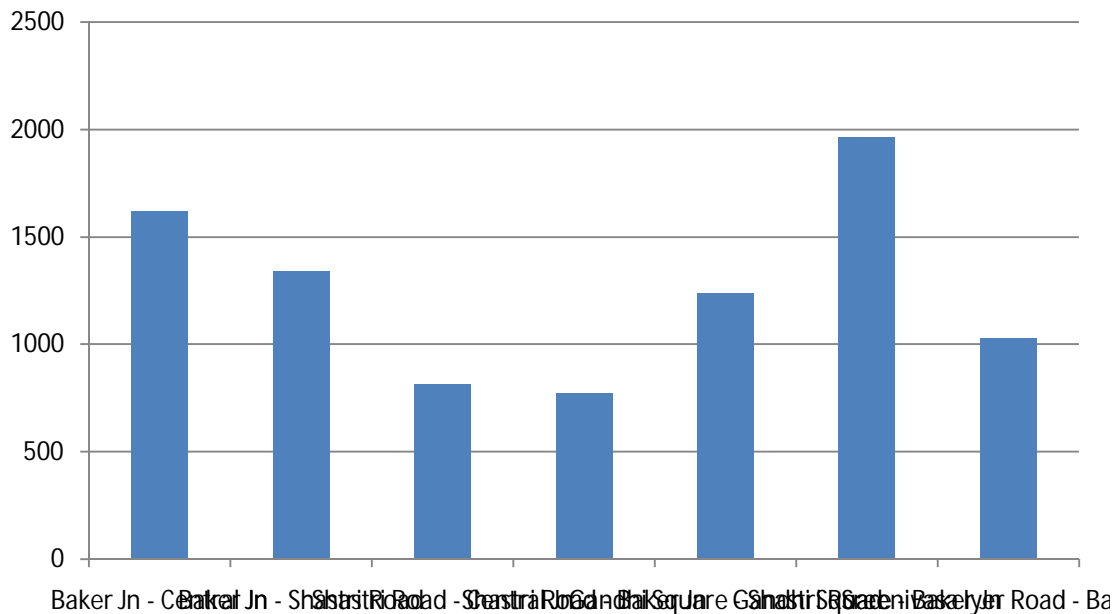


Fig.11 Peak Hour Turning Volume at Seematti Roundabout

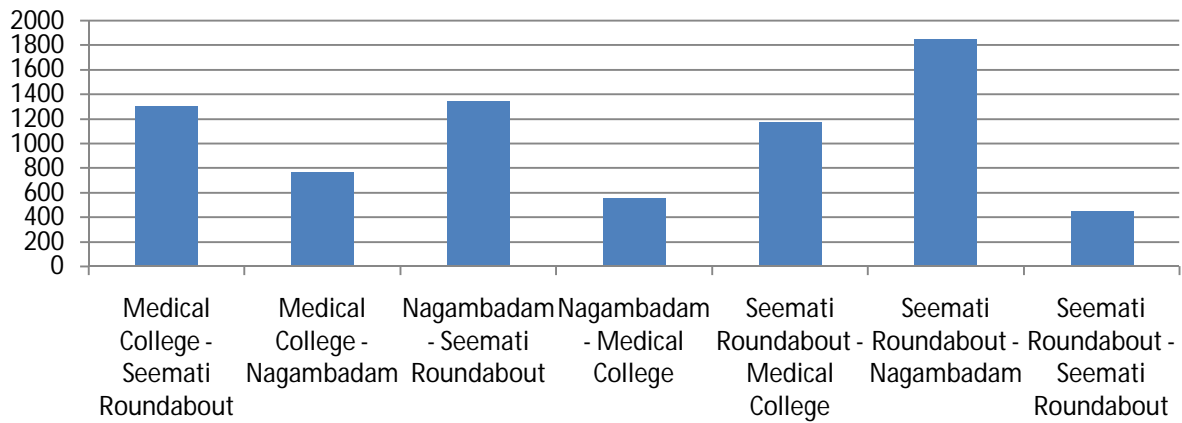


Fig.12 Peak Hour Turning Volume at Baker Jn.

V. IMPROVEMENT PROPOSALS AND SIGNAL DESIGN

V.A Signal Design

Both Baker Jn. and Seematti roundabout have a traffic volume which is almost equal to the saturation volume. The distance between these intersections is hardly 120m. From bus headway, queue length analysis and peak hour volume the Nattakam – Nagampadam leg has high traffic volume and great importance in signal designing. The signal timing at Baker Jn. should be such that the queue formation should not enter the Seematti roundabout. Since the traffic is highly saturated in this leg it can be taken in two phases. The traffic in road section between Baker Jn. and Seematti Roundabout should be cleared after each green signal in that leg (Phase 2 and 3), so signal coordination between Baker Jn. and Seematti Roundabout is very important but because of high traffic volume and less distance between these two intersections theoretical signal coordination is not possible. This coordination can be achieved by proper phase selection and understanding actual real life conditions.

The total number of vehicles passing through the intersection during the peak hour is 8789 and 7403. This is almost equal to the saturation capacity. The warrants for signal design mentioned that the volume of traffic should not exceed 800 PCU on major roads and the minor road should not cause interruption of traffic on major roads. This justifies the need of traffic signal design at the intersection. The traffic signal design is done by Webster method. Four phase signal was designed at the intersection. Also in this study signal is designed only for vehicles and not for the pedestrian.

Phase selection at Seematti Roundabout

Phase 1

Shastri Road - Baker Jn. **774** PCU

Phase 2

Nattakam - Baker Jn. **1965.5** PCU

Baker Jn. - Central Jn. **1622** PCU

Phase 3

Nattakam - Baker Jn. **1965.5** PCU

Nattakam - Shastri Road **1241** PCU

Phase 4

Nattakam - Shastri Road **1241** PCU

Phase selection at Baker Junction.

Phase 1

CMS - Seematti Roundabout **1299** PCU

Phase 2

Seematti Roundabout - Nagampadam **1849** PCU

Phase 3

Nagampadam - CMS **553** PCU

Phase 4

Seematti Roundabout - Nagampadam **1849** PCU

Table 1. Proposed signal characteristics

Junction	Phase	Cycle length(s)	Green Time(s)	Amber Time(s)	Red Time(s)
Baker Jn.	1	150	40	2	94
	2		36	2	98
	3		22	2	112
	4		36	2	90
Seematti Roundabout:	1	150	18	2	115
	2		38	2	95
	3		39	2	94
	4		38	2	95

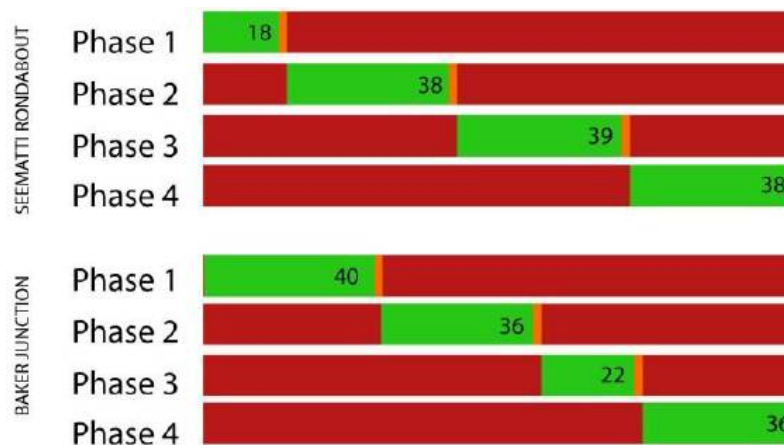


Fig. 13 Signal Phase Timing.

VI. CONCLUSION

The increase in population and rapid urbanization of India has resulted in increased usage of vehicles and transportation facilities, which in turn result in traffic congestion and related problems. Two intersections in Kottayam town is considered as the project stretch and relevant data like geometric data, traffic volume, accident data, queue length, the time allowed by the policemen, headway etc. were done. Proper data analysis and strategic planning help in designing the signal timing and improvement proposals.

Major traffic problems

- Heavy volume of traffic during peak hours
- Lack of lane traffic
- Improper location of pedestrian zebra crossing
- Insufficient traffic signs and lightings
- Poor pedestrian facilities
- Improper parking of vehicles
- Formation of long queues during peak hours

Improvement proposals

- Proper lane marking should be made
- Sky for the pedestrian Crossing
- Installation of Traffic sign board and Lightings
- Removals of obstruction for traffic from the road
- Provision of advanced traffic facilities

- Installation of four phase signal system
- Construction of fly over

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