International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 04 | Apr-2018 www.irjet.net p-ISSN: 2395-0072

TRAFFIC SURVEY AND SIGNAL DESIGN AT KALWA-COURT NAKA CROSS ROAD

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Abstract: *Traffic rules and regulations are devised to assure the smooth flowing of motor vehicles on the road. The increase in traffic at intersection has arises problems like road accidents, conflicts and conjunctions. This problem can be solved by providing and efficient traffic signal control at intersection. The necessary data should be collected by means of traffic engineering studies. Signal timing is the technique which traffic engineers use to determine who has the right-of-way at an intersection, it involves deciding how much green time the traffic lights shall provide at an intersection approach. Due to increase of population and the attraction of human activities into urban region which is turn leads to growth of vehicle ownership and use, there is demand for traffic signal which has led to number of public transport operation. Traffic signal should be installed at Court Naka Cross Road to avoid heavy conjunction of traffic in peak hours.*

Key words: Traffic volume study, Signal design, Webster's method

1. Introduction

At intersections where there are a large number of crossing and right-turn traffic, there is possibility of several accidents as there cannot be orderly movements. The earlier practice has been to control the traffic by means of traffic police by showing stop signs alternately at the cross roads so that one of the traffic stream may be allowed to move while the cross traffic is stopped. Thus the crossing streams of traffic flow are separated by time, segregation. Traffic signals are control devices which could alternately direct the traffic to stop and proceed at intersections using red and green traffic light signals automatically.

1. 1 Advantages of traffic signal

Properly designed traffic signals have following uses:

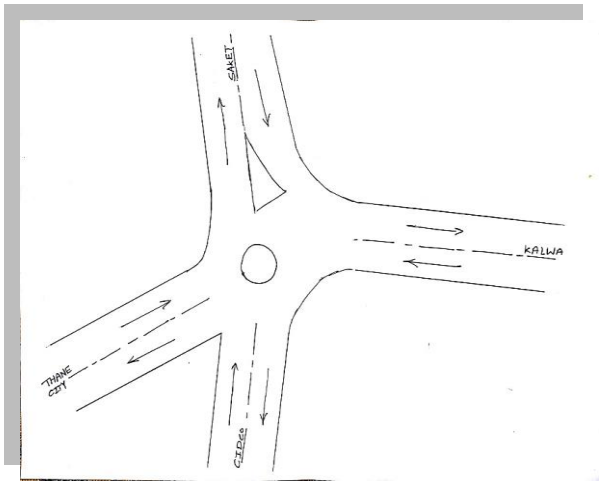
i. They provide orderly movement of traffic and increase the traffic handling capacity if most of the intersections at grade.

ii. The signal allows crossing of heavy traffic flow with safety.

iii. When the signal system is properly co-ordinated, there is a reasonable speed along the major road traffic.

1.2 Study area

Court Naka Intersection is surrounded by four roads leading to four different places. North direction goes to Saket, South goes to CIDCO, East goes to District Court and the West leads to Kalwa. As this is the main and important national road that connects to major cities like Nashik, Thane and Pune the road is always running with vehicles of both private and transport. As this intersection don't have any traffic signal system, conjunction of vehicles happens in peak hours of day.



2. Literature Review

In the design of a signalized traffic intersection, the objectives should be to provide sufficient capacity for the volume of traffic approaching the intersection. The design should aim at minimizing total delay, building short queues, and providing a high probability of passing through the intersection on the first given period for most users. Signal timing should be in accordance with traffic flow on intersection.

3. Methodology

Webster's Method

In this method, the optimum signal cycle C_0 corresponding to least total delay to the vehicles at the signalized intersection has been worked out. This is a rational approach. The field work consists of finding (i) the saturation flow S per unit time on each approach of the water section and (ii) the normal flow q on each approach during the design hour. The saturation flow is to be obtained from careful field studies by

noting the number of vehicles in the stream of compact flow during the green phases, and the corresponding time intervals precisely. The normal flow of the traffic is also determined on the approach roads from the field studies for the design period (during the peak or off-peak hours as the case may be).

The optimum signal cycle is given by:

$$C_0 = \frac{1.5\,L + 5}{1 - Y}$$

Where,

C_0 = optimum cycle length

L = total lost time per cycle, sec = 2n + R (n is the number of phase and R is the all red time

Y = $y_1 + y_2$, where $y_1 = \frac{q_1}{S}$, $y_2 = \frac{q_2}{S}$

Where S is saturation flow

Then, $G_1 = \frac{y_1}{Y}(C_0 - L)$ and $G_2 = \frac{y_2}{Y}(C_0 - L)$

Effective Green Time $G_1 = \frac{y_1}{y_1 + y_2 + y_3 + \cdots + y_n}$

4. Result

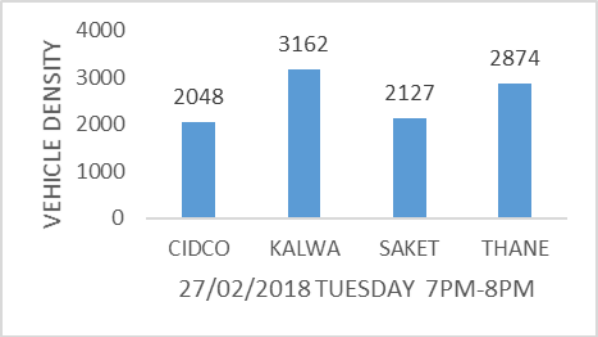
Design traffic volume one leg1: 2048

Design traffic volume one leg2: 3162

Design traffic volume one leg3: 2127

Design traffic volume one leg4: 2874

Each approach has 2 lanes each



APPROCH	CIDCO	KALWA	SAKET	THANE
LEG	Leg 1	Leg 2	Leg 3	Leg 4
WIDTH (m)	16.56	16.8	17.2	17.4

Approach volume per lane on leg 1: 1024(q_1)

Approach volume per lane on leg 2: 1581(q_2)

Approach volume per lane on leg 3: 1064(q_3)

Approach volume per lane on leg 4: 1437(q_4)

Saturation flow on leg 1: 525*8.3 = 4348(S_1)

Saturation flow on leg 2: 525*8.4 = 4410(S_2)

Saturation flow on leg 3: 525*8.6 = 4515(S_3)

Saturation flow on leg 4: 525*8.7 = 4568(S_4)

$y_1 = q_1/(S_1)$ = 1024/4348 = 0.23

$y_2 = q_2/(S_2)$ = 1581/4410 = 0.35

$y_3 = q_3/(S_3)$ = 1064/4515 = 0.23

$y_4 = q_4/(S_4)$ = 1437/4568 = 0.31

$Y = y_1 + y_2 + y_3 + y_4$ = 1.12

L = 2n+R = (4*3) + 12= 24

Therefore,

$$C_0 = \frac{(1.5 * 24) + 5}{1 - 1.12}$$

Total cycle time = 342 seconds

$G_1 = \frac{y_1}{Y}(C_0 - L)$

$G_1 = \frac{0.23}{1.12}(342 - 24)$ = 66 seconds

$G_2 = \frac{0.35}{1.12}(342 - 24)$ = 99 seconds

$G_3 = \frac{0.0.23}{1.12}(342 - 24)$ = 66 seconds

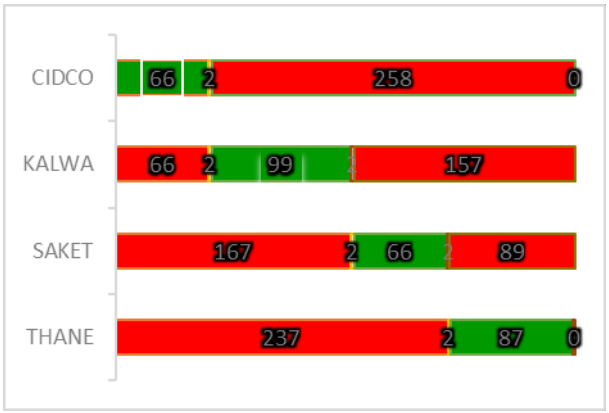
$G_4 = \frac{0.31}{1.12}(342 - 24)$ = 87 seconds

All red time for pedestrian crossing= 16seconds.

Providing Amber times of 2 seconds, each for clearance.

(66+2) + (99+2) + (66+2) + (87+2) + 16

= 342 seconds

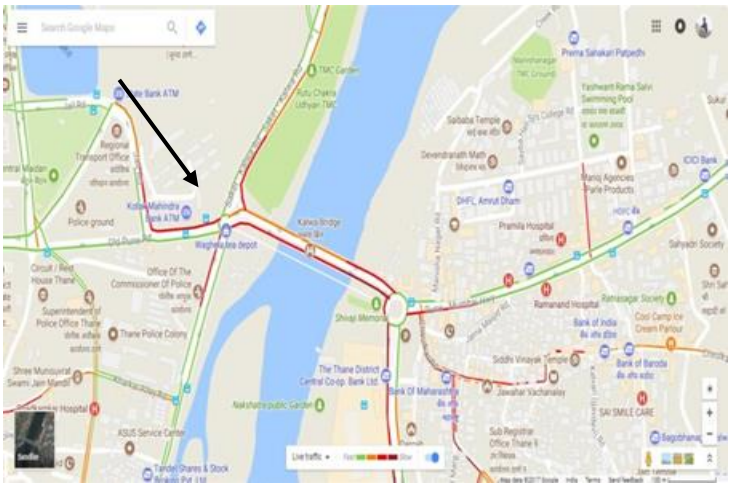


5. Conclusion

By doing traffic survey studies and measurements, we have calculated the total cycle time at the intersection and accordingly effective green time for each intersection.

The following information is concluded from our signal design.

- Total cycle time required in seconds= 342
- Actual green time for leg 1= 66.0
- Actual green time for leg 2= 99.0
- Actual green time for leg 2= 66.0
- Actual green time for leg 2= 87.0



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