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TRAFFIC MANAGEMENT OF MADHAVGANJ INTERSECTION IN VIDISHA CITY

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Abstract— Integrated Traffic administration is the main criteria for the effective planning in any city. Most of the traffic problems are caused by various deficiencies in scheduling, engineering and some sorts of management issues. In Vidisha, a city in Madhya Pradesh, faces rigorous traffic congestion due to quick and hysterical development by an undesirable level of inconsistency in transportation demand and supply circumstances resulting in environmental humiliation as well. To assess the severity of the existing traffic system engulfed by tremendous traffic congestion in Vidisha city a study was conducted by our team. In the study, traffic volume count, survey of road geometry and calculation of flow capacity was performed. Relevant secondary data was also collected. Compared to the run controlled junction, Signalized Intersection can reduce speed as well as the point of divergence and the overall delay is less as compared to the normal intersection. Hence it is necessary to evaluate the feasibility of the intersection.

Traffic congestion mainly occurred by a range of vehicles like rickshaw, bullock cart etc, which was followed by tempo, car, bus, truck etc due to which proper traffic flow cannot be maintained. An encroachment along the roadside also causes the problem in maintaining the traffic flow . In this study an attempt is made to solve the problem of traffic congestion and unusual delay to the traffic movement due to the very large traffic volume at Intersection in Vidisha city. A square named madhavganj is selected and study regarding the traffic volume count, road geometry was conducted. After which peak hours are selected and the traffic signal is design as per the above data.

Such a detailed scenario of the traffic paradigm of madhavganj square in vidisha city is depicted in this paper.

Keywords— traffic congestion, environmental degradation, signalized intersection, feasibility, traffic paradigm

I. INTRODUCTION

Traffic and transportation problems in Vidisha City have not been commensurate with the increasing demands for its usage. The city expanded dynamically without any planning and control due to the rapid socioeconomic changes. Vidisha City is the nucleus of the greater vidisha regions and all of the divisional head office of corporate offices, the higher educational facilities (one public universities, one public medical college, one public engineering college, two more colleges, many private hospitals and clinics, government colleges and schools), so many business shopping complexes, and seven temples are located in or around the Vidisha city. Thus, the city plays a big role in controlling the economic development of vidisha region. Due to lack of proper planning and control over land use activities, people from various districts rush to vidisha and made it a horde of residential, commercial and business centers.

Therefore, high migrations rate especially a population growth rate of 4 percent per annum is observed in vidisha city in comparison to the annual average growth rate of 2.01 percent. Such high migration rate increases the population of vidisha city dramatically.

The study was carried out to know the existing condition and performance of intersection. The traffic flow characteristic of intersection were Studied by experiencing the traffic problem over there. The study is based on the Weaving Traffic and entry volume. In the study of this area we focused on the traffic handling capacity of the rotary and made an attempt to solve the problem experienced by travelling vehicles during the crossing of rotary.

Significant study has been done to evaluate the capacity of rotary and the feasible solution is given as suggestion to solve the existing problem.

II. OBJECTIVES

1. To Design two- Phase traffic signal by IRC and Webster method and compare both method.
2. To find out the traffic handling capacity of intersection.
3. To find the total traffic approaching to the intersection.
4. To find the problem in handing of traffic.
5. Improve roadway capacity and reduce traffic congestion in the intersection area and side streets.
6. Improve safety and access for pedestrians who pass through the intersection

III. METHODOLOGY

Stage-1:- In this study, madhavganj square near vidisha railway station are considered as study area because most of the time in a day this area faces heavy traffic jam and traffic congestion problem..

Stage-2:- Zoning of study area: - selected area for study in located near vidisha railway station and also commented with 3 temples and several shops.

Stage-3:- peaks hours for 7 days (21/10/2017 -27/10/2017) data were collected.:-

the following steps took for data collection:-

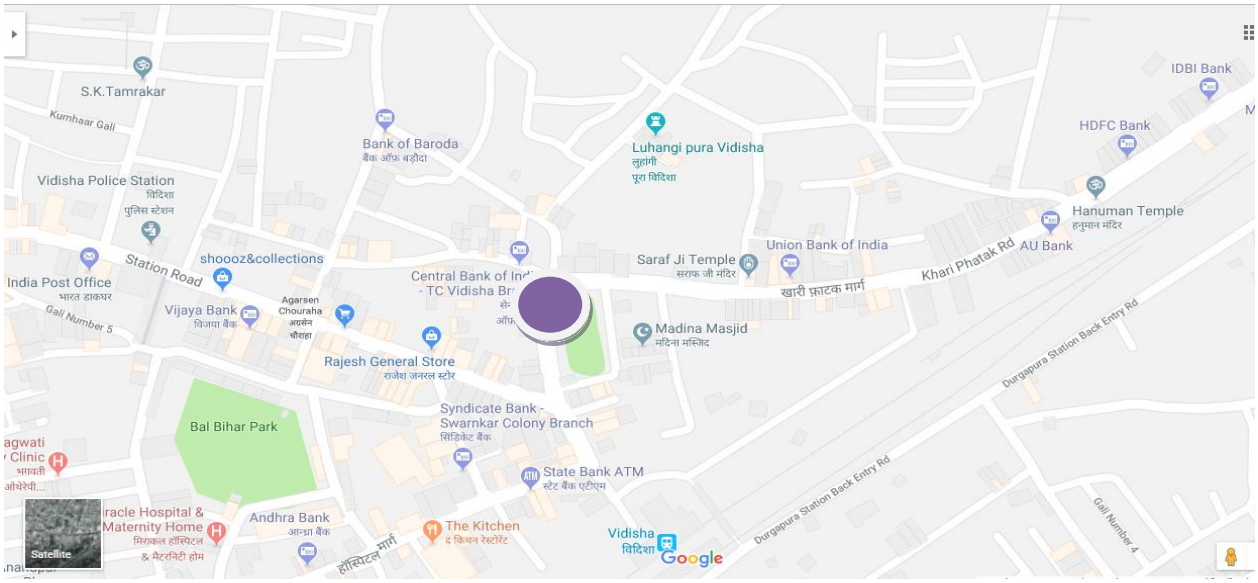
- Volume count
- Intersection volume count
- Pedestrian count
- Width intersection dimension
- Data from different source

Stage-4:- Data analysis and presentation: - analyze the collection data according to IRC: 93-1985 and Webster method then compare these two methods.

Stage-5:- Conclusion and recommendation: - After analysis and presentation conclude the best method.

IV. SELECTION OF STUDY AREA

Vidisha City, is situated at the northeast portion of the state with latitude of 23.53◦N and longitude of 77.820E. The study area selected for this study comprises 26.50 sq. km of central urban portion of Vidisha City.For the analysis of regional transportation activities, the study area is divided into two regions which is designated as origin & destination points. Fig. indicating road networks in Vidisha City showing important intersections.

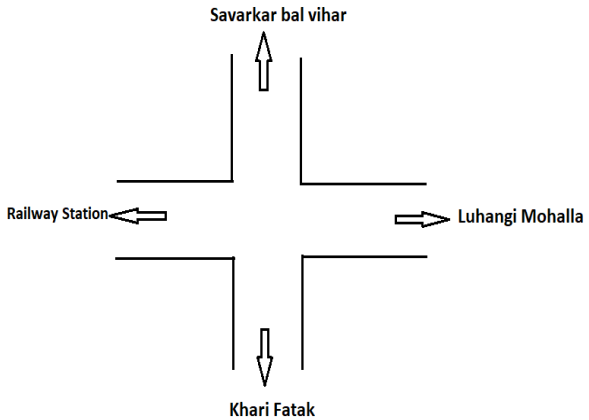


V. TRAFFIC VOLUME COUNT

A traffic count is a count of traffic along a particular road either done electronically or by people counting by the side of the road. Traffic counts can be used by the local council to identify which routes are used most and to either improve that road or provide an alternative if there is an excessive amount of traffic. The most important data are generated through the modern survey techniques like traffic volume count at different links and intersections. The extent of variation of traffic flow was ascertained by carrying at peak hour counts at intersection. By analyzing the Peak hour traffic volumes, the period of peak flows are assessed. Traffic volume counts were performed at one major intersection and 4 important links only in the period of peak flows as assessed by peak hour traffic volume count. The traffic volume is expressed as passenger car unit per hour (PCU/h).

DATA COLLECTION

We have collected data using manual count method for the week days in summer season and counted the traffic volume approaching from the four approaches and their respective movement in different directions. The traffic movement of different class of vehicle is noted down in the table prepared for it. Eight observers were stand on the four approaches of two Roads and counted manually the approaching vehicles from each direction and noted the number of different class of vehicles passing the intersection in the pre prepared table. The traffic is counted for at an interval of 15 min at peak time period of morning and evening and for the off peak period the 15 min traffic counted and converted into hourly traffic by multiplying the value by 4.The traffic data collected is later converted into a common factor called Passenger Car Unit (PCU). The maximum values of PCU from seven days traffic volume is considered for the calculation of total traffic and the capacity of rotary. These PCU values then plotted on a graph between the time interval and PCU's value and the peak period is known by the maximum ordinate of PCU values.



Number of Vehicle Approaching at Intersection from Different Direction (in PCU)

Approach	Left Turning	Straight	Right Turning	Total
Savarkar Bal Vihar (N)	450	512	369	**1330**
Luhangi Mohalla(E)	689	591	292	**1572**
Khari fatak (S)	510	489	722	**1721**
Station (W)	441	784	511	**1736**
Total	2090	2376	1894	**6360**

From the data collected it was observed that the total traffic volume approaching from all the legs of the intersection is 6360 PCU which can be clearly seen as an extremely high volume.

According to irc-65-1976-recommended-practice total volume of about 3500 vehicles per hour can be considered as the upper limiting case and a volume of 500 vehicles per hour is the lower limit.So in this case signalized intersection can be provided which is suggested in this study.

VI. DESIGN OF TRAFFIC SIGNAL

6.1- General: - In this chapter by using IRC 93-1985 designing traffic signal at Square at vidisha by collecting the raw data required i.e. by 7 days 24 hours traffic volume count and designing the traffic signal .

6.2- Design of signal as per code IRC 93-1985.

6.3- Data required for design of signal are:-

Road Width, PCU / hours in each direction

Design IRC Method:-

Step-i :- Given data :- Road width , street 1=24m and street 2=16m

Pcu / hour , street 1=1211 and street 2=1295

IS code method

Critical lane volume of street 1= higher of two approach

=1211/2=606 PCU/hour

Critical lane volume of street 2= higher of two approach

=1295/2=648 PCU/hour

Step-ii :- pedestrian crossing time ,

Pedestrian clearance time for street1 =24/1.2= 20 sec

Pedestrian green time for crossing street 1=20+7=27 sec

Pedestrian clearance time for street 2 =16/1.2= 14 sec

Pedestrian green time for crossing road 2 =14+7=21sec

Step-iii :- Minimum green time for traffic ,

Minimum green time for vehicle on street 2 = 27 sec

Minimum green time for vehicle on street 1 = 606/648*27= 26sec

Step-iv :- Revised green time for traffic signals, Adding initial amber and clearance of 2seconds each for minor as well as major street approaches.

The minimum cycle length works out to = (2+27+2)+ (2+26+2) = 61sec.

Signal cycle time may be conveniently set in multiples of five seconds and so cycle time = 65 seconds

Extra time (61-65= 4 sec per cycle) are provided adding 2 seconds to each road 1 & road 2.

Therefore Adopt, G1 = 27+2= 29 sec

G2 =26+6=28 sec

G1 = 28 sec, G2= 29 sec

Step-v :- Check for clearing the vehicles arrived during the green phase,

Check for design of signal cycle timing on the basis of vehicular volume

Check for street 1

Number of vehicle per hour per lane = 606

Number of vehicle per lane per cycle of 60 sec = 606/60= 10.1 =10.1 PCU

Therefore

Green time required for street 1=6+(10.1-1)*2=24.5sec

Since 28sec green time is provided, it is safe.

Check for street 2

Number of vehicle per hour per lane = 648

Number of vehicle per lane per cycle of 65 sec =648/65= 9.9=10 PCU Therefore

Green time required for street 2 =6+ (10-1)*2=24 sec

Since 29sec green time is provided, it is safe.

Webster method

Optimization of signal timings

The optimum signal cycle is given by:

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

L = Total lost time per cycle (sec)

Y =Volume/Saturation flow for critical approach in each phase.

Y =y1+y2+……yn

L = total amber time + reaction time of both phase

= 2n+R

= 8 + 2*4

=16 sec

Saturation flow for critical approach in phase 1 = 525*7.5=3978 PCU/hour Saturation flow for critical approach in phase 2 = 525*7.5=3978 PCU/hour

y1=1211/3978=0.30

y2=1295/3978=0.33

Y=0.30+0.33=0.63

Co = 79sec Say 80 sec

$$G1 = \frac{y1\ (Co - L)}{Y}$$

$$G2 = \frac{y2\ (Co - L)}{Y}$$

G1=31 sec

G2=34 sec

VII. RESULT & DISCUSSION

The analysis of traffic volume shows that the rotary is experiencing the problem of high traffic volume that can cause various problems to the movement of vehicles and safety of vehicles and can cause conflict and fatalities of vehicle. The rotary is receiving an extremely high volume of 6276PCU/hour which is more than double of its practical capacity of 3083PCU/hour.

The study shows the following results

i. The entire traffic problem is occurring due to the high traffic volume of vehicles.

ii. The rotary parameters cannot be increased as it is located in constructed area.

iii. The traffic volume can be divided by means of traffic signals.

iv. Two phase signal can be designed to allow the movement of one street in both directions by stopping the other street movement.

v. The pedestrian movement is allowed by pedestrian signal with the movement of one straight moving traffic. The suggested cycle time is shown in table5.1 and phase diagram.

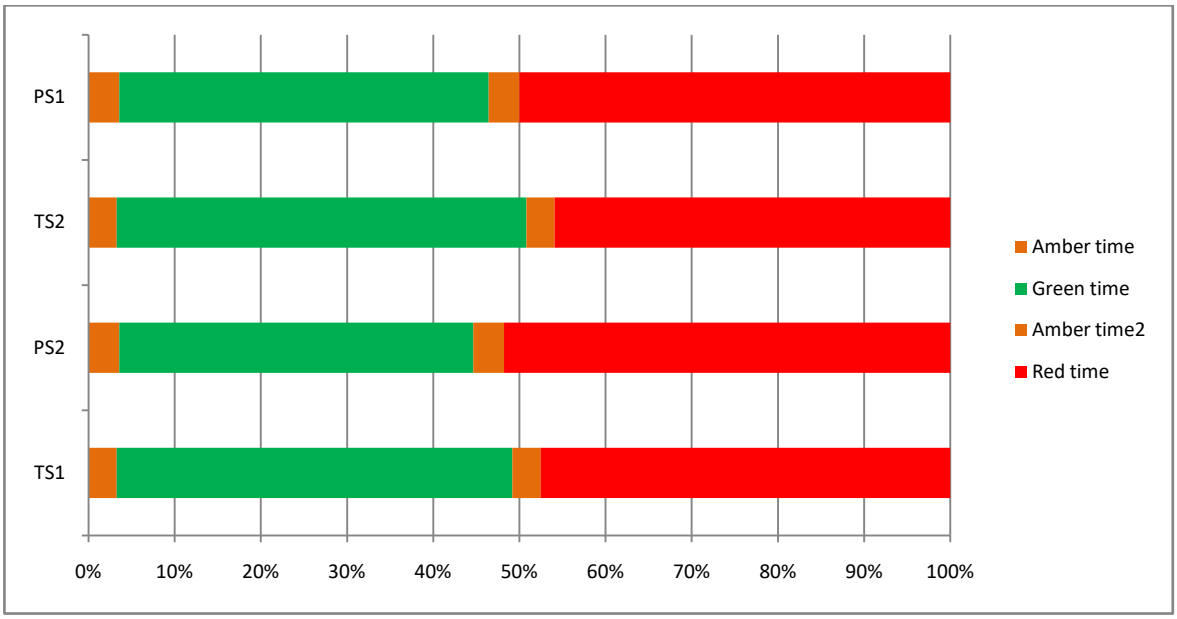
vi. Webster works on traffic volume count no pedestrian timing was included in this method.

vii. IRC method is more efficient because it uses the main parts of both Webster and Approximate method & pedestrian timings are also considered in this method.

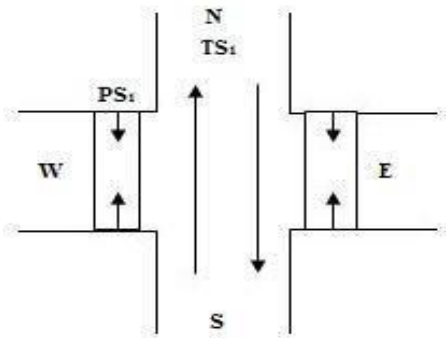
viii. By using IRC method we can check our signal timing whether it is correct or not.

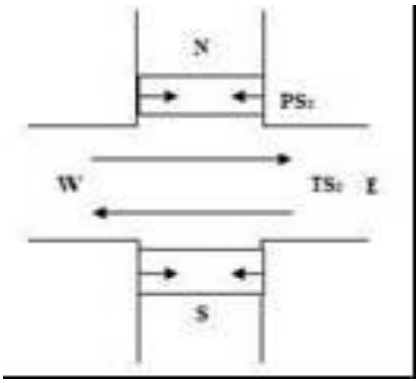
Street	**Initial Amber**	**Green**	**Clearance Amber**	**Red**	**Cycle**
Street 1	2	28	2	29	61
Street 2	2	29	2	28	61

Traffic signal Phase timing



Phase diagram of traffic signal





Major Conclusion:-

Utility:-

- This signal helps in reducing the traffic congestion of the intersection.
- It increases the traffic capacity of the area.
- This study helps in maintaining efficient traffic flow.
- The traffic signal will reduce the conflicts between the intersection.
- As the conflicts are reduce, So the chances of accidents also gets minimum

VIII. CONCLUSION AND RECOMMENDATION

- The major conclusions from the study are as follows:-

  To study traffic operation at intersection and to verify and improve the existing characteristics where possible. One of the two important aspects investigated was the existing condition of intersection and its capacity and the second was the traffic load on the intersection.

  We have found that our proposed solution is most efficient solution for this type of problem in intersection

  Conclusions:-

  i. The intersection is receiving high traffic which cannot be handled by the existing system. Hence it is needed to increase its capacity. But the intersection is already at the level of the maximum capacity it can handle.
  ii. It is also not possible to increase the parameter of intersection as the location does not allow this.
  iii. Then the solution is that we have to reduce the traffic by applying any means.
  iv. The noble way to reduce the traffic is to divide the traffic entering in the Intersection area.
  v. Traffic can be divided by means of traffic signals. So it is suggested to install signal.
  vi. The signal time of a two phase signal is calculated in the study

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