Impact Factor (SJIF): 5.301

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 5, Issue 3, March-2018

FEASIBILITY OF ROTARY ISLAND AT GANGOTRI COMPLEX CROSS ROAD, GOTRI-SAMTA ROAD, VADODARA CITY

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Abstract: - ***Traffic congestion at cross roads is one of the grass root problem due to which vehicular operations cost, travel time and accidents increase. Due to rapid urbanisation with economical growth, mixed traffic volume and poor performance of traffic, it results into a large volume of traffic during the peak hours at intersection. Keeping in mind all the problems faced by road users at the cross roads, this project is carried out for obtaining an effective solution to reduce traffic congestion at cross roads.***

***Keywords*: - Traffic, Cross road, Traffic Congestion, Traffic Rotary, Traffic Safety.**

I. INTRODUCTION

Due to economic development and incredible population growth, it has lead to dramatic increase in number of personalized vehicles, particularly motorized two wheelers and passenger cars. According to centre of science and environment (2009), they states that country reached first million of personalized vehicles in 1971, after that it has increased to 2 more million in 20 years. But in last decade, 16 million vehicles were added only in 4 years i.e 2001 to 2004. This leads to drastic growth of traffic which leads to congestion at road and that too mainly at intersection of two opposite roads. Due to Congestion at cross road many traffic problems arises. To reduce this problem normally, rotary or signals are provided at cross roads for easy traffic flow. We have observed at many cross roads, where there are many problems due to lack of rotary or signals. So we took a thought to check the feasibility of rotary at cross road.

II. MATERIAL/TOOLS REQUIRED:

Camera,
Tripod,
Notebook,
Memory card,
Pen drive, Etc.

III. PLAN OF WORK:

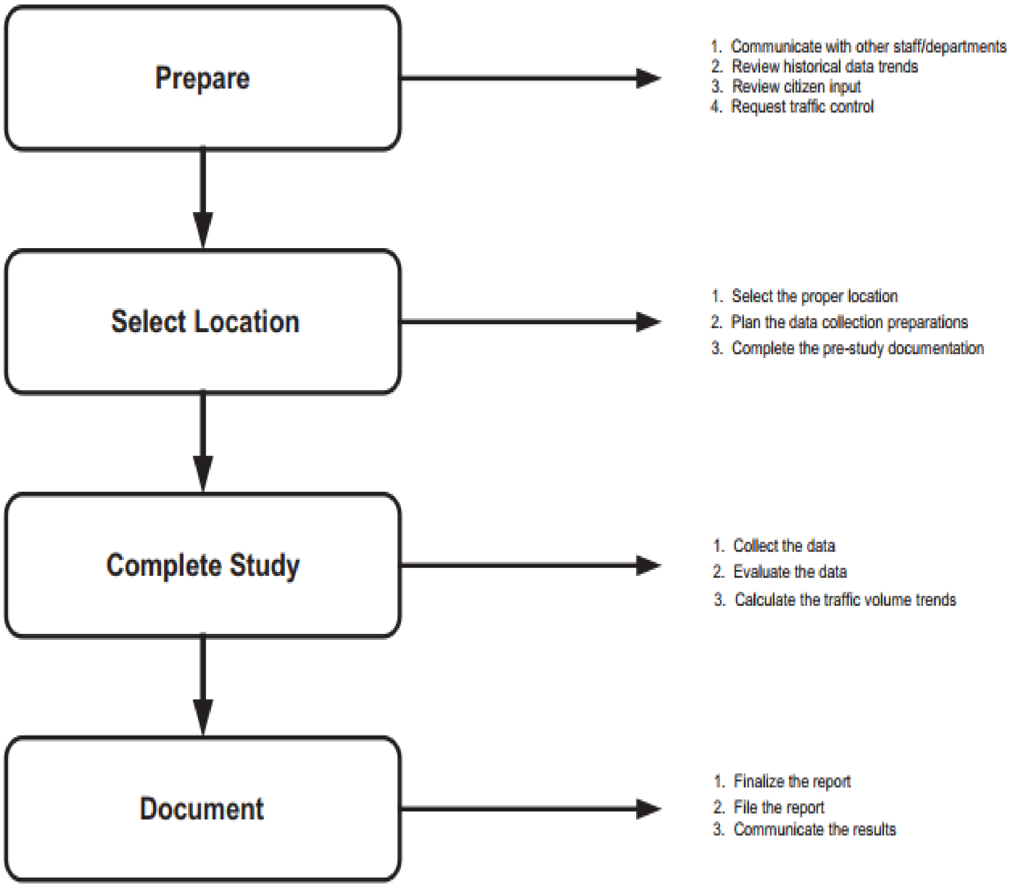


Fig.1: *Plan of work*

IV. DESIGN METHODOLOGY:

We have used videography method for calculation of traffic volume, under which we captured a video from GANGOTRI COMPLEX, at rush hours and by analysing result we obtained traffic flow at intersection. By this we will check the feasibility of rotary at cross road. We will design rotary as per IRC:65-1976.

DESIGN CHARCTERISTICS:

Design speed: 30 kmph

Shape of central island: Circular

Radius at entry: From IRC:65-1976, 15-25m for design speed of 30kmph.

Radius at exit: 1.5- two times the radius of entry curves.

Radius of central island: 1.33times the radius of entry curve.

Wearing length: By IRC 65-1976, for design speed 30kmph minimum wearing length is 30m.

Width of carriageway at entry and exit: minimum 5m.

Width of rotary carriageway: $w = \frac{e_1 + e_2}{2} + 3.5$

e1 =width at entry.

e2= width non weaving section.

entry and exit angles:

Chamber and superelevation: The inward slop of chamber serves as superelevation for the traffic going round the central island and the outer slope of the chamber helps the vehicles turning left towards the exit curve to the radiating road.

Capacity: The capacity of rotary is directly determine by the capacity of each weaving section.

$$Q_p = \frac{280\omega\left(1+\frac{e}{\omega}\right)\left(1-\frac{p}{3}\right)}{1+\frac{\omega}{l}}$$

Where,

Q_p = practical capacity of the weaving section (PCU/hour)

ω = width of weaving section (6 to 18 m)

e = average entry width (m)

$= \frac{e_1+e_2}{2}$

l = length of weaving section between ends of channelizing islands (m)

$$p = \frac{b+c}{a+b+c+d}$$

a=left turning traffic moving along left extreme lane
b=cross/weaving traffic turning towards right
c=cross/weaving traffic turning towards left
d=right turning traffic moving along right extreme lane

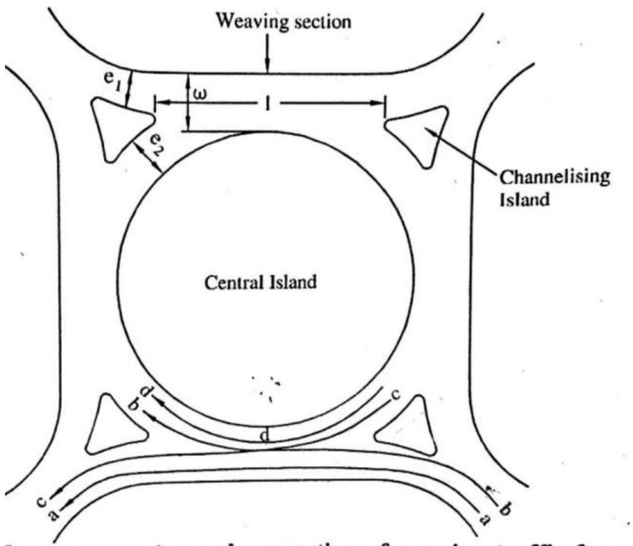
The above formula is valid under the following conditions:

$\frac{e}{w}$ should be limited to 0.4 to 1.0

$\frac{\omega}{l}$ should be limited to 0.12 to 0.40

p should be limited to 0.4 to 1.0

l should be limited 18 to 90 m



Weaving section and proportion of weaving traffic for use in capacity formula

fig 2:

V. PCU VALUES

VEHICLE TYPE	PCU
CARS AND LIGHT COMMERCIAL	1.0
PEDAL CYCLE	0.5
BUSES AND HEAVY VEHICLES	2.8
MOTORCYCLES AND SCOOTER	0.75
ARRIVAL DRAWN VEHICLES	4 TO 6

Fig 3: *PCU Values*

VI. TOTAL VOLUME COUNT

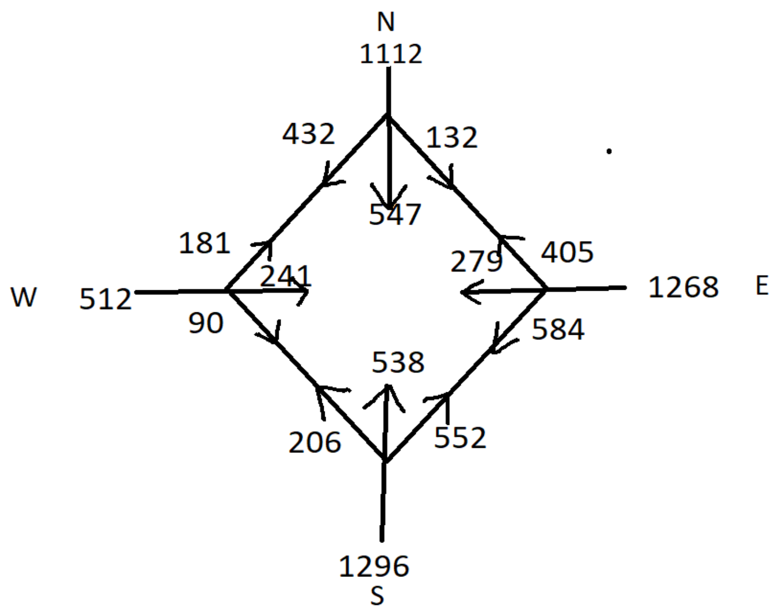


Fig 3: *Flow of total volume count*

VII. DESIGN:

For rotary in urban areas design speed = 30kmph
Since intersection legs carry nearly equal traffic, a circular central island will be adopted.
The entry and exit angles will be 45^0 each
Radius of 20m at entry, 40m at exit and 80m for Central Island will be adopted
The traffic in terms of PCU from each legs is calculated as under.

SOUTH:

Left turning = 4x0.5+44x1+9x2.8+149x0.75 = 183
Straight = 9x0.5+ 82x1+44x2.8+403x0.75= 512
Right =3x0.5+82x1+53x2.8+414x0.75= 542

Other calculation are shown in figure of maximum flow in PCU/hr

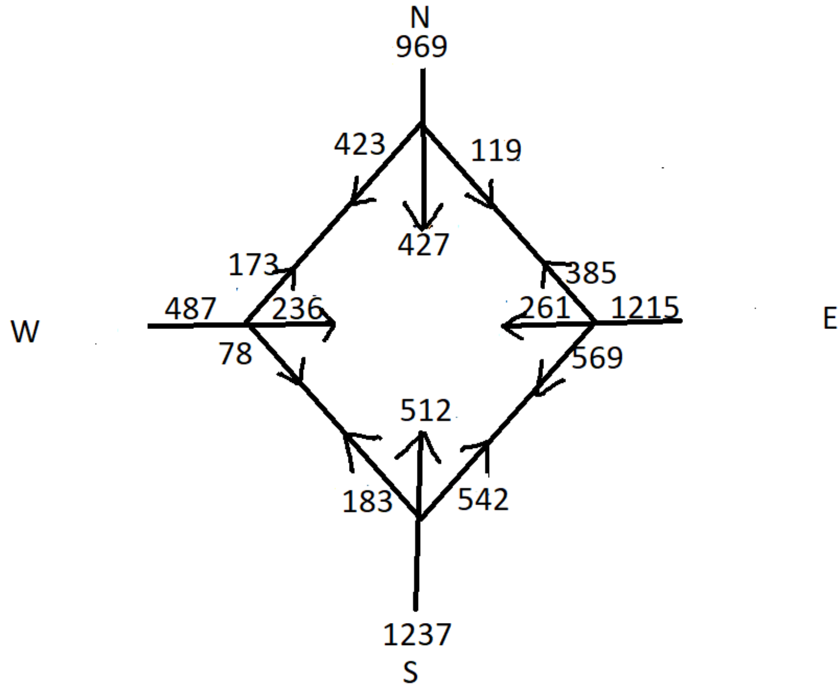


Fig.4: *calculated traffic PCU volume*

maximum flow in the intersection leg(south) is 2420 PCU/hour
the width of carriage way at entry and exit may be taken 7.5m
take e1 = 7.5m
e2 = 7.5m
therefore $W = \frac{e_1 + e_2}{2} + 3.5$ m
the maximum weaving occurs in E-S section
therefore $p = \frac{b+c}{a+b+c+d}$

a= 569
b= 261+385 =646
c= 427 + 78 = 505
d= 423

$$p = \frac{646+505}{569+646+505+423} = 0.54$$

$$Q_p = \frac{280\omega\left(1+\frac{e}{\omega}\right)\left(1-\frac{p}{3}\right)}{1+\frac{\omega}{l}}$$

$$\frac{(280)(11)\left(1+\frac{7.5}{11}\right)\left(1-\frac{0.54}{3}\right)}{1+\frac{11}{30}}$$

= 3108.0041 PCU/hr

This is very much higher than the traffic flow of 2143 PCU/hr and Hence design is acceptable

Reg.cap = $\frac{3108.0041 - 2143}{2143} * 100$ = 45.03%

i.e if traffic flow increases by 45% it will work

VIII. SOLUTION

ROTARY DESIGNED WITH DIMENSIONS:

Circular shape having 27 m radius
Radius at entry = 20 m
Radius at exit = 40 m
Angle at entry and exit = 45^0
Width of entry = 6.55 m
Width of non weaving section = 8.5 m
Width of weaving section = 11 m
It will give practical capacity Qp ≅3110PCU/hr, which is approximate 45% higher than capacity.

IX. LIMITATIONS

All the vehicles are forced to slow down and negotiate the intersection. Therefore, the cumulative delay will be much higher than channelized intersection.
Even when there is relatively low traffic, the vehicles are forced to reduce their speed.
Rotaries require large area of relatively flat land making them costly at urban areas. The vehicles do not usually stop at rotary.
They accelerate and exit the rotary at relatively high speed. Therefore, they are not suitable when there is high pedestrian movements.

X. ACKNOWLEDGMENT

We have taken efforts in this project, By the grateful help of our project guide and we were able to do our project work and was able to focus on it easily.
Firstly , we would like to thank our guide **Prof. RASESH KATWALA,** Faculty of Civil Engineering Department, ITM for providing invaluable guidance, suggestions and support, which have helped us to submit our thesis in time**.**
We would also like to thank our family members for supporting us throughout our life and our friends without whom it was really not possible for us to do this thesis. Finally Thank to all the faculties and staff members of civil Engineering Department, who have helped us for the completion of this project.

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