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# Performance and Analysis of Gol Chakkar Kirti Stambh Rotary Intersection Greater Noida, India

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**Abstract –** *Rotary intersections or roundabouts are special form of channelized intersections at same grade laid out for the movement of traffic in one direction around a central traffic island. Basically all the major conflict at an intersection namely the collision between through and right-turn movements are converted into milder conflict namely merging and diverging. The rotary intersection of roads is also called as traffic rotary which is nothing but enlarged intersection of roads where vehicles cross roads or change their direction without stopping. All vehicles coming from different roads move in single direction around the central island and diverges into required exit. They weave out of the rotary to the desired direction. In one sense, Rotary intersections can be considered as a form of channelized intersection in which vehicles are guided onto a one-way roadway and required to move in a clockwise direction about a central island. At one time, the rotary intersection was considered to be the answer for all the problems associated with intersections.. Where roundabouts are properly used and designed, the efficient flow of traffic is promoted by the orderly movement of vehicles about the central island. There is only minor delay to traffic due to speed reductions and no delay, at all, due to stopping.*

***Key Words*: roundabouts, PCU, Traffic studies, grade intersection, Rotary Intersection, Traffic volume.**

## 1. INTRODUCTION

Traffic rotaries reduce the complexity of crossing traffic by forcing them into weaving operations. The shape and size of the rotary are determined by the traffic volume and share of turning movements. Capacity assessment of a rotary is done by analyzing the section having the greatest proportion of weaving traffic. Rotaries are suitable when the traffic entering from three or more approaches are relatively equal. A total volume of about 3000 vehicles per hour can be considered as the upper limiting case and a volume of 500 vehicles per hour is the lower limit. Rotaries are suitable when there are more approaches and no separate lanes are available for right-turn traffic thus making intersection geometry complex. The traffic operations at a rotary are three; diverging, merging and weaving.

Rotaries are appropriate for many intersections including locations experiencing high number of crashes, long traffic delays, and approaches with relatively balanced traffic flows. Rotary have the potential to resolve various traffic flow problems. Current research work on rotary models mostly concentrates on determining the capacity of an approach based on the entering and circulating flows. Approach capacity is calculated as a mathematical function of critical headway and follow-up headway. This method is not sensitive to rotary geometric parameters such as inscribed circle diameter, entry angle, etc.

### 1.1 OBJECTIVES

According to IRC 65 total volume of about 3000 vehicles per hour can be considered as the upper limiting a volume of 500 vehicles per hour is the lower limit.

Therefore our main objectives are

To find out the capacity of Rotary Intersection and check its efficiency,

Suggest effective modification of rotary intersection if required.

## 2. METHODOLOGY

The vehicles entering the rotary are then forced to move in a clockwise direction. They then weave out of the rotary to the desired direction. Good intersection design results from a minimization of the magnitude and characteristics of the conflicts and a simplification of driver route selection process

### 2.1 Design consideration

-Design speed

- Radius at entry and exit

- Radius of Central Island

- Weaving length and width

- Entry and exit with

- Friction coefficient

- Sight distance

### 2.2 Design element as per IRC

1) Design Speed:- 30 and 40 kmph for urban and rural areas respectively

2) Radius at Entry:- 15 and 20 meters is ideal for an urban and rural design respectively.

3) Radius at Exit:- The exit radius as 1.5 to 2 times the entry radius.

4) Radius of Central Island:- The radius of the central island is 1.3 times entry curve.

5) Weaving Length:- For the design speed of 40 kmph and 30 kmph are 45m and 30m respectively.

6) Width of rotary carriageway:- The width of weaving section (w) should be one traffic lane (3.5) wider than the mean entry width.

7) Entry and Exit Angles:- Entry angles should be larger than exit angle, it should be should be about 600.

### *2.3* dimension of Gol Chakkar Kirti Stambh Rotary intersection

**Table -1: design element**

| | |
|---|---|
| Design speed | 30kmph |
| Radius of central island | 30m |
| Weaving width | 11m |
| Weaving length | 44m |
| Entry radius | 20m |
| Exit radius | 26m |
| Friction factor | 0.43 |
| Minimum sight distance | 30-45m |
| Super-elevation | minimum |

### 2.4 Traffic volume count

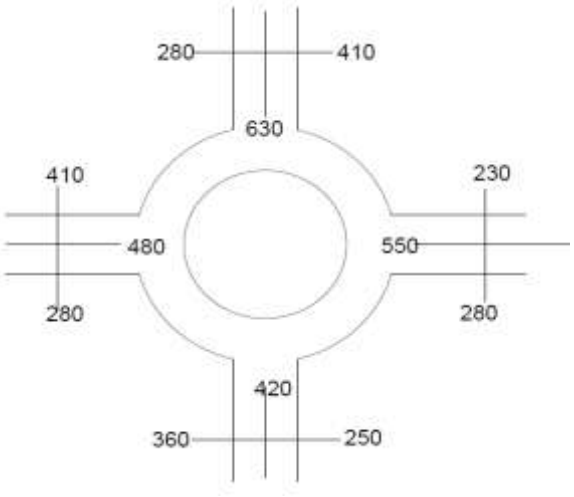


**Chart -1**: Per hour traffic data at a Gol Chakkar Kirti Stambh rotary intersection

### 2.4.1 Proportion of weaving ratio:

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

$\mathbf{P_{NE}} = \frac{630+280+480+250}{410+630+280+480+250+280}$

$= \mathbf{0.7038}$

$\mathbf{P_{ES}} = \frac{550+230+630+280}{280+550+230+630+280+280}$

$= \mathbf{0.7511}$

$\mathbf{P_{SW}} = \frac{420+250+280+550}{360+420+250+280+550+230}$

$= \mathbf{0.7177}$

$\mathbf{P_{WN}} = \frac{500+280+230+420}{410+500+280+230+420+250}$

$= \mathbf{0.6842}$


Fig 1: Aerial view of Gol Chakkar Kirti Stambh rotary intersection

### 2.4.2 Weaving Ratio:

The capacity of the rotary is dependent on the minimum capacity of the individual weaving section, then

Capacity is minimum when proportion of weaving ratio is maximum, so we take **P= 0.7511**

Width of weaving section:

$\mathbf{w} = \frac{e1+e2}{2} + 3.5$

$\mathbf{w} = \frac{7.5+7.5}{2} + 3.5 = 11\text{m}$

Length of weaving section:

L = 4W

L= 4×11 = 44 m

Capacity of the rotary;

$$\mathbf{Q_P} = \frac{280W\ (1+\frac{e}{w})(1-\frac{P}{3})}{(1+\frac{w}{l})}$$

$$\mathbf{Q_P} = \frac{280*11\ (1+\frac{7.5}{11})(1-\frac{0.7511}{3})}{(1+\frac{11}{44})}$$

***$Q_P$ =3104.64*** vehicle /hr in East South direction.

where,

Qp = practical capacity of the weaving section in PCU/ hr.

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

$\mathbf{w} = \frac{e1+e2}{2} + 3.5$

e = avg. width of entry e1 and width non weaving section e2

L = length of weaving section between the ends of channel island in meter

p = proportion of weaving traffic given by

P=( b+c) / (a+b+c+d)

a = left turning traffic moving along left extreme lane

d = right turning traffic moving along right extreme lane

b = crossing/weaving traffic turning toward right while entering the rotary

c = crossing/weaving traffic turning toward left while leaving the rotary.

## 3. CONCLUSIONS

According to IRC 65 traffic rotaries can handle traffic volume from 500 PCU/hour to 3000 PCU/hour. Here capacity of traffic rotary is 3104 PCU per hour in east south direction at Gol Chakkar Kirti Stambh Rotary Intersection as per present traffic condition which is almost under satisfied condition for urban rotary intersection. But current rate of traffic growth is very high in Greater Noida due to high rate of development in this area so we recommend installation of traffic signal at this rotary in future for efficient movement at intersection. As per our research we found that Gol chakkar kirti stambh Rotary intersection Greater Noida is found satisfactory intersection presently.

## REFERENCES

[1] Khanna, S.K., and Justo, C.E.G., (2011), "Highway Engineering", New Chand and Bros, 9th Edition, New Delhi.

[2] IRC 93-1985, Guidelines on design and installation of Road Traffic.

[3] IRC 65-1976 (December 1990), Recommended Practice for Traffic Rotaries.

[4] Dr. L.R. Kadiyali, "Traffic Engineering and transport planning", 8th edition, New delhi

[5] SachinJat, Mr. S.S. Goliya, SachinNagayach, RohitGurjar "Controlling Traffic by Designing Signal at Intersection of Vidisha" (published 2015)

[6] Surender Kadyan, V.K. Ahuja (2016) "A Study of Rotary Intersection at Panipat". International Journal of Enhanced Research in Science, Technology & Engineering.