Evaluation of Traffic Improvement Strategy At Balva To Mansa Highway

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Abstract- *Rapid growth of traffic in urban as well as in rural areas. It is managed conventionally by providing signals, widening of road, intersection, and rotary. Traffic congestion is improving day by day at balvachowkdi (SH 71) to connect mansa (y intersection) SH 138. Balva chowkdiis facing problem of right-turn movement with heavy vehicle like truck and buses about 3 axle or above. At the mansa (y intersection). There is high congestion of traffic due to heavy vehicle and also facing problem of merging and diverging. As a result problem like delay, high congestion, increasing accident rate, chance of miss behave, increase in environmental pollution. The purpose of this study is give suggestion to solve the above problems with safe, efficient &easy movement.*

Keywords- High Traffic Congestion, Traffic Volume Count Survey, Passenger Car Unit, Rotary design

I. INTRODUCTION

Road traffic problems are one of the most important problems prevailing in the urban cities and villages. The development of a city or town leads to the growth of traffic which is directly linked with increased number of accidents and fatalities and traffic congestion. Spending hours in traffic jam has become part and parcel of metropolitan lifestyle leading to health and environmental hazards. There could be two approaches to solve these problems, first and the most common solution is to come up with infrastructure involving wider roads, flyovers bypasses, expressways etc. The Inhabitants congregated in large urban areas lead to sometimes intolerable levels of traffic congestion on urban streets and thoroughfares. Modern traffic management depends highly on the efficiency of mechanisms, such as the controlled intersection and multi-lane roundabouts. Rotary intersections or roundabouts are special form of at-grade intersections laid out for the movement of traffic in one direction around a central traffic island. Research and development is needed to document the existence of the rotaries over the heavy loaded roads and highway networks to substantially reduce the fatal and injury crashes. For heterogeneous traffic on National Highway it is necessary to study efficiency of Rotary. Design of Rotary must satisfy the standards of IRC.

II. STUDY AREA

Balva is a village of Mansa taluka in Gandhinagar district of Gujarat, balva is having population of about 5900 (2011) and Mansa having 82,956(2011). Mansa city is largest as compared to other taluka of Gandhinagar. Mansa is well connected by state highways and bus station. The city transportation is mainly dependent on roadway system. Vehicle growth has been rapid. The network is expressing heavy traffic congestion, noise pollution and air pollution.

Fig.1 Study Area Location of Balva and Mansa Intersection

Balva and Mansa are connected by two lane road of about 7 km. Balva intersection connect the Gandhinagar to Mansa highway, NH 38, and Balva village. Balva and Mansa intersection are facing problem of high congestion during pick time. Due to high congestion delay in journey time, noise and air pollution problems are create. There is need of some strategy to apply for the solution of traffic congestion.

Fig.2 Right Turn Movement Issue at Balva Intersection

III. DATA COLLECTION

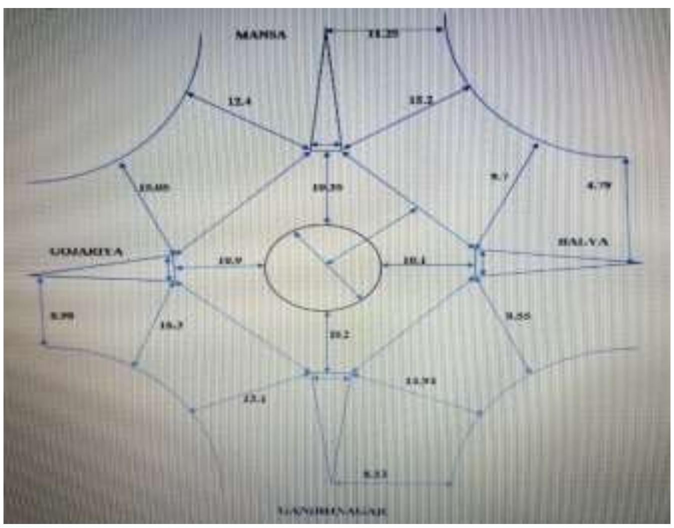

Fig.3 Rotary Measurement of Balva Intersection

Table 1: traffic from the four approaches

Approach	Left turn	Straight	Right turn
North	155	209	107
South	402	293	92
East	124	37	166
West	303	113	79

IV. ANALYSIS

1. Design elements

The design elements include design speed, radius at entry, exit and the central island, weaving length and width, entry and exit widths. In addition the capacity of the rotary can also be determined by using some empirical formula.

2. Design speed

All the vehicles are required to reduce their speed at a rotary. Therefore, the design speed of a rotary will be much lower than the roads leading to it. Although it is possible to design roundabout without much speed reduction, the geometry may lead to very large size incurring huge cost of construction. The normal practice is to keep the design speed as 30 and 40 km/h for urban and rural areas respectively.

3. Entry, exit and island radius

The radius at the entry depends on various factors like design speed, super-elevation, and coefficient of friction. The entry to the rotary is not straight, but a small curvature is introduced. This will force the driver to reduce the speed. The entry radius of about 20 and 25 m is ideal for an urban and rural design respectively. The exit radius should be higher than the entry radius and the radius of the rotary island so that the vehicles will discharge from the rotary at a higher rate. A general practice is to keep the exit radius as 1.5 to 2 times the entry radius.

4. Width of the rotary

The entry width and exit width of the rotary is governed by the traffic entering and leaving the intersection and the width of the approaching road. The width of the carriageway at entry and exit will be lower than the width of the carriageway at the approaches to enable reduction of speed. IRC 65-1976 suggests that a two lane road of 7 m width should be kept as 7 m for urban roads and 6.5 m for rural roads. Further, a three lane road of 10.5 m is to be reduced to 7 m and 7.5 m respectively for urban and rural roads.

$$\text{Weaving} = \frac{(e_1 + e_2)}{2} + 3.5$$

Where, e_1 is the width of the carriageway at the entry e_2 is the width of the carriageway at the exit

Table 2: weaving of traffic from four direction

w_N	17.300
w_E	12.625
w_S	17.525
w_W	19.175

This can be best achieved by making the ratio of weaving length to the weaving width very high. A ratio of 4 is the minimum value suggested by IRC 65-1976. Very large weaving length is also dangerous,as it may encourage over-speeding.

5. Capacity

The capacity of rotary is determined by the capacity of each weaving section. Transportation road research lab (TRL) proposed the following empirical formula to find the capacity of the weaving section.

$$Q_w = \frac{280w\left[1+\frac{e}{w}\right]\left[1-\frac{p}{3}\right]}{1+\frac{w}{l}}$$

Where, e is the average entry and exit width

w is the weaving width
l is the length of weaving
p is the proportion of weaving traffic to the
Non-weaving traffic

Therefore,

$$P = \frac{b+c}{a+b+c+c}$$

Table 3: values of weaving traffic to the non-weaving traffic

p_{NE}	0.5321
p_{ES}	0.7114
p_{SW}	0.5014
p_{WN}	0.8296

This capacity formula is valid only if the following conditions are satisfied

Table 4: capacity of rotary

Q_{w1}	4144
Q_{w2}	2854
Q_{w3}	4382
Q_{w4}	4143

The capacity of rotary is the minimum of the capacity of all the weaving section. From the above results maximum capacity of the rotary is 2854 PCU/hr. and the total traffic entering the intersection is 2080 PCU/hr.

1. Weaving width at the rotary is in between 6 and 18 meters. (As per IRC 65-1976)
2. The ratio of average width of the carriage way at entry and exit to the weaving width is in the range of 0.4 to 1m.
3. The ratio of weaving width to weaving length of the roundabout is in between 0.12 and 0.4m.
4. The proportion of weaving traffic to non-weaving traffic in the rotary is in the range of 0.4 and 1m.
5. The weaving length available at the intersection is in between 18 and 90 m

V. CONCLUSION

1. Road pavement without pot holes, cracks and other damage from roundabout to 100m of road.
2. Rotary design should be in the proper way of the standard code of IRC to detect the right turning movement.
3. The ratio of weaving width to weaving length of the roundabout is in between 0.12 and 0.4m. This condition is not satisfy this study that's why decrease weaving width or increase weaving length to full fill IRC recommendation.
4. Rotary design speed should be maintain as per requirement.

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