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"Traffic Rotary Design of Road Intersection at TI Mall Chowk Bhilai"

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ABSTRACT
Rotary Traffic is a special way of managing traffic at intersections by creating a circular roadway around a central island, which allows vehicles to move in a clockwise direction and merge or weave to their desired exits. This design is particularly useful in managing the increasing volume of traffic and reducing collisions at road crossings.In traditional intersections, vehicles often collide while making right or left turns, causing major conflicts and traffic congestion. By using rotary design, these conflicts are minimized, and vehicles are allowed to flow smoothly in a circular stream, which reduces the risk of accidents and traffic jams.This paper discusses the process of designing rotaries at intersections and presents a software package for road works. The focus of this project is to ensure that traffic flows efficiently and safely, especially at the TI MALL CHOWK intersections, which experiences high traffic volumes and mixed traffic conditions.Overall, the rotary design is a smart solution to reduce the number of conflict points in a signalized intersection and create a safe and efficient flow of traffic.

Key word:-Signalized Intersection, Safety, Conflict points, Rotary Design, Mixed Traffic Condition

I. INTRODUCTION

Rotaries, also known as roundabouts, are circular intersections where cars yield to other vehicles before entering and then move in acircular direction around a central island. They are useful when there is a lot of traffic in multiple directions, as they can help reduce congestion. To analyze the effectiveness of a rotary, two important factors are considered: the critical headway and the follow-up headway. The critical headway is the minimum amount of time between entering vehicles in the rotary, to ensure safe circulation.Rotaries can be a good choice for intersections that have a high number of accidents and where there are many lanes with no designated turning lanes, which can make the intersection complicated to navigate. In a rotary, there are three types of traffic activities: entering the rotary, circulating within the rotary, and exiting the rotary. Overall,rotaries are a useful traffic management tool that can help improve trafficflow.

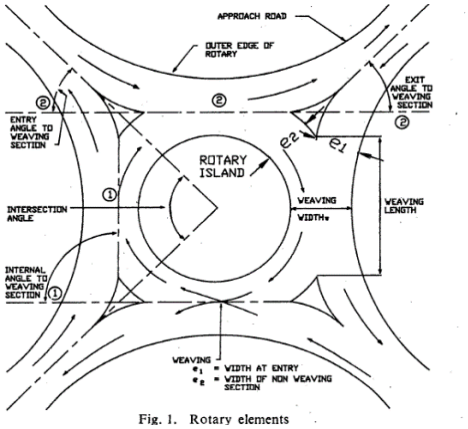

Fig. 1. Rotary elements

II. REVIEW OF LITERATURE

When designing a rotary intersection, the radius and shape of the kerb line should be based on the curve traced by the inner rear wheel of vehicles. The entrance curve's radius should match the recommended minimum radius of the central island, as vehicles entering the rotary will slow down to the design speed. For design speeds of 40 kmph, the suggested radius for entry curves is 20 to 35 meters, and for 30 kmph, it's 15 to 25 meters. Instead of complicated three-centered entry curves, simple circular curves should be used to avoid clustering of mixed traffic at the approaches. The normal pavement width at entrance and exit should be equivalent to two lanes to preventcongestion.

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Carriageway width of approach road	Radius at entry(m)	Width of carriageway at entry and exit(m)
7m(2 lanes) 10.5m (3 lanes) 14m(4 lanes) 21m (6 lanes)	25-35	6.5 7.0 8.0 13.0
7m (2 lanes) 10.5m (3 lanes) 14m (4 lanes) 21m (6 lanes)	15-25	7.0 7.5 10.0 15.0

Table no 1

To decide how wide the road should be at a rotary intersection, consider how much traffic is expected to go in and out during the design year. The width at the entrance and exit should be at least 5 meters, but can be wider if the approach road is wider and the entry radius is between 25-35 meters. For example, if the approach road is 7 meters wide, the entrance can be widened to 6.5 meters. If the approach road is 10.5 meters wide, the entrance can be widened to 7 meters, and if the approach road is 14 meters wide, the entrance can be widened to 8 meters. This helps to ensure that traffic flows smoothly through the intersection.

S.K. Mahajan, (2013)- A flyover between the two Rotaries is constructed very recently to ease out the traffic jam between the stretch of 330 m long road rotaries in location plan are therefore modified using Dr.S. K Mahajan equation . Concept of global man was invented by Dr.SK Mahajan in 2008 while finding an answer to a problem asked on internet stated below. The geomatic road engineering software is prepared to compute the following with less data observations in the field.

III. METHODOLOGY

1. The project topic is assessing and designing a rotary intersection at TI MALL chowk by conducting a traffic volume count.
2. A literature review was conducted to learn about rotary design, traffic volume counting methods, global trends, and software usage in rotary intersection design.
3. Different terms related to rotary design were studied, such as central island, weaving section, weaving length, entry and exit angle, and non-weaving section. 4. Various traffic volume counting methods were also studied.

4.A preliminary survey was conducted to collect information about the condition of the rotary, observe its usage, and find geometric features of the intersection and space required for extension.
5. Manual traffic volume counts were conducted during the peak hours of morning and evening.
During the traffic volume count, approach roads were taken into consideration, and a survey team recorded all the vehicles entering and exiting the rotary.
6. The net Passenger Car Units (PCU) values were determined for single maneuvers, and the total PCUs were calculated for each approach road during morning and evening sessions.
7. The PCU data was analyzed by tabulating it and plotting it in MS Excel to draw a graph of PCU versus days. Peak hour PCUs for each session were concluded from this data.

S. No	Time	Junwani side			Kohka Side			Nehru Nagar Side			Mall Side		
		Left	Right	straight	left	right	straight	left	right	straight	left	right	straight
1	9.00am-10.00am	203	430	1195	430	205	1230	1060	480	325	180	185	325
2	10.00am-11.00am	205	436	1230	421	185	1195	1021	437	295	185	184	287
3	11.00am-12.00am	197	407	1185	400	169	1175	987	386	203	112	119	183
4	12.00pm-1.00pm	82	245	789	221	98	572	107	101	103	49	27	39
5	12.00pm-1.00pm	87	235	821	287	103	646	112	389	105	27	18	36
6	2.00pm-3.00pm	95	286	987	323	119	695	144	387	123	31	20	44
7	3.00pm-4.00pm	107	303	1175	403	141	842	178	423	169	44	31	52
8	4.00pm-5.00pm	105	300	1260	435	150	870	135	420	165	45	40	65
9	5.00pm-6.00pm	112	325	1272	495	185	974	195	586	194	68	57	89
10	6.00pm-7.00pm	410	520	906	675	331	1012	302	1003	329	135	150	310
11	7.00pm-8.00pm	431	525	923	690	395	1090	301	1070	384	176	164	297
12	8.00pm-9.00pm	295	426	877	564	304	996	276	975	296	112	119	223

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CALCULATION-

3.2 Design of rotary Intersection-

Step 1 -Design speed of urban area=30 kmph

Step 2-Radius at Entry curve

A range for urban area is 15 to 25 m, so suitable for urban area radius at entry is 20m.

Step-3-Radius at exit =30m

Step-4-Radius at central island =26

Step-5- Width of weaving section: -

$$W = \frac{e1 + e2}{2} + 7$$

$$e1 = e2$$

$$e1 = 6.5, e2 = 6.5$$

$$W = \frac{6.5 + 6.5}{2} + 7 = 13.5m$$

Weaving length L: - $L = 4 \times W$

$$4 \times 13.5 = 54m$$

Step-6-Proportion of weaving traffic: -

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

$$PNE = \frac{1485+909}{690+1485+909+1070} = 0.576$$

$$PES = \frac{461+2160}{176+461+2160+395} = 0.821$$

$$PSW = \frac{1448+692}{431+1448+692+164} = 0.782$$

$$PWN = \frac{1454+1070}{310+1454+1070+1525} = 0.752$$

Pmax=0.821

SteP-7 - Practical capacity of rotary: -

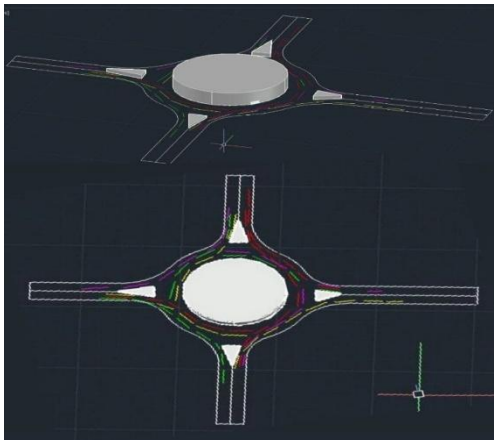
$$QP = \frac{280W(1+\frac{e}{W})(1-\frac{P}{3})}{(1+\frac{W}{L})}, \quad QP = \frac{28013.5(1+\frac{6.5}{13.5})(1-\frac{0.82}{3})}{(1+\frac{13.5}{54})}$$

Capacity of rotary = $QP = 3233.46$ PCU/hr

IV. RESULT

A study was conducted on the rotary intersection at Forest Complex in Karimnagar, focusing on traffic volume analysis. To understand the traffic improvement requirements, several parameters were monitored, evaluated and analysed. Traffic volumes were analysed from each leg of the rotary intersection, considering volume and capacity in terms of Passenger Car Unit (PCU) for uniformity in the analysis.

According to calculation we design the rotary model in AutoCad.



V. SUMMARY AND CONCLUSION

In the design process of a rotary intersection, it's important to collect traffic data during peak hours and site data such as horizontal and vertical alignment. Based on standards, the type of junction to be constructed is selected, and the layout can be adjusted according to operational, cost, and environmental considerations. A safe rotary design can effectively reduce accidents and better serve people compared to other types of junctions. In conclusion, thorough planning and attention to detail are crucial for the successful design and implementation of rotary intersections.

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