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Rotary Intersection Design at Shahu Chowk in Miraj City

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Abstract - *Traffic congestion at intersections is a major problem in urban areas. The load on existing intersections is growing day by day as vehicular traffic grows, creating traffic jams. The intersection in Miraj city is becoming highly congested, and it is time to upgrade it. In this paper, the concept of a rotary intersection is proposed as a solution to the problem of traffic congestion and unusual delays at Shahu Chowk.*

Key Words: *Environment, Economy, Miraj, traffic congestion, Travel time, Rotary, Central Island*

1. INTRODUCTION

Increased vehicular traffic is becoming a major transportation problem. Because of the possession of personal information, this question has arisen. To effectively control this increasing traffic on the road, some traffic control measures are used on roads, such as traffic rotary, traffic signals, channelization of road etc. Manual counting is used to collect traffic movement data for the weekday at various time intervals, including the morning and evening peak times, at the Shahu Chowk. Shahu Chowk is one of the busiest intersections in Miraj, located on the two important cross roads; one is from Solapur to Kolhapur and another is going towards the railway station.

2. OBJECTIVES

The main objective of the study is to identify the actual cause behind the traffic congestion and to provide practical solutions at the intersection of Miraj city to reduce congestion.

3. STUDY AREA:

Shahu Chowk is the study place, which connects two major cities: Solapur and Kolhapur. It also links the R.T.O. Office, no bank branches, a number of colleges, the main Miraj market areas, MIDC, business offices, no schools, the Miraj rail junction and bus station, and other points of interest. A satellite picture of the street is shown. The study area is the most convenient way to get to the cities or peripheries major centres.

Fig- 1 Aerial Image of Study area

3. DATA COLLECTION

Manually counting the number of different types of vehicles approaching the intersection from all four directions and then converting the values into a common factor known as the Passenger Car Unit (PCU). On summer days, traffic data is collected at different time intervals from 7 days of the week, and traffic data is collected for estimating traffic rotary capacity from morning and evening peak hours. (Table 1)

Direction of flow	Average PCU (vehicle/hr)				
	Road 1 (Railway Station)	Road 2 (Bus Stand)	Road 3 (Police Station)	Road 4 (Mission Hospital)	Road 5 (Ambedkar Udyan)
Vehicle turning left	119	717	163	253	11
Vehicle moving straight	147	1190	330	807	307
Vehicle turning right	164	66	149	36	410

Table 1 Traffic Volume in PCU

4. DESIGN OF ROTARY INTERSECTION

4.1 Design procedure for rotary intersection

4.1.1 Road 1

Steps	Calculation	Reference
Step I	Radii of Curve at entry: Radius of curve at entry= 20m	IRC 65: 1976 (Clause No. 5.1, Table No. 1)
Step II	Radii of Curve at exit: Radius of curve at exit = 2 times of radius at entry Radius of curve at exit = 2 x 20 Radius of curve at exit = 40m	IRC 65: 1976 (Clause No. 5.2)
Step III	Radius of Central Island: Radius of Central Island should be equal to 1.33 times radius of entry curve. Radius of Central Island = 1.33 x 20 Radius of Central Island = 26.67m	IRC 65: 1976 (Clause No. 6)
Step IV	Weaving Length: For design speed 30kmph, Minimum weaving length = 30m So provide Weaving length = 40m	IRC 65: 1976 (Clause No. 7)
Step V	Width of Carriageway at entry and exit: For carriageway width = 7.5m Width of Carriageway at entry and exit = 7.00m	IRC 65: 1976 (Clause No. 8, Table No. 2)
Step VI	Width of non-weaving section: Width of non-weaving section of the rotary should be equal to width of single entry. Therefore, Width of non-weaving section = 7/2 = 3.5m	IRC 65: 1976 (Clause No. 9.1)
Step VII	Width of weaving section: $w = \frac{e_1 + e_2}{2} + 3.5$	IRC 65: 1976 (Clause No. 9.2)

	w =8.75m	
Step VIII	Entry and exit angle Angle at entry = 60° Angle at exit = 30°	IRC 65: 1976 (Clause No. 9.2)
Step IX	Check W = 8.75m (6-18m) e/w = 0.6 (0.6-1.00) w/l =0.29 (0.12-0.4)	IRC 65: 1976 (Clause No. 10)

4.1.2 Road 2

Steps	Calculation	Reference
Step I	Radii of Curve at entry: Radius of curve at entry= 20m	IRC 65: 1976 (Clause No. 5.1, Table No. 1)
Step II	Radii of Curve at exit: Radius of curve at exit = 2 times of radius at entry Radius of curve at exit = 2 x 20 Radius of curve at exit = 40m	IRC 65: 1976 (Clause No. 5.2)
Step III	Radius of Central Island: Radius of Central Island should be equal to 1.33 times radius of entry curve. Radius of Central Island = 1.33 x 20 Radius of Central Island = 26.67m	IRC 65: 1976 (Clause No. 6)
Step IV	Weaving Length: For design speed 30kmph, Minimum weaving length = 30m So provide Weaving length = 50m	IRC 65: 1976 (Clause No. 7)
Step V	Width of Carriageway at entry and exit: For carriageway width = 7.5m Width of Carriageway at entry and exit = 10.7m	IRC 65: 1976 (Clause No. 8, Table No. 2)
Step VI	Width of non-weaving section: Width of non-weaving section of the rotary should be equal to width of single entry. Therefore, Width of non-weaving section = 10.7/2 = 5.35m	IRC 65: 1976 (Clause No. 9.1)
Step VII	Width of weaving section: $w = \frac{e_1 + e_2}{2} + 3.5$ w =11.525m	IRC 65: 1976 (Clause No. 9.2)
Step VIII	Entry and exit angle Angle at entry = 60° Angle at exit = 30°	IRC 65: 1976 (Clause No. 9.2)
Step IX	Check W = 11.525m (6-18m) e/w = 0.696 (0.6-1.00) w/l =0.38 (0.12-0.4)	IRC 65: 1976 (Clause No. 10)

4.1.3 Road 3

Steps	Calculation	Reference
Step I	Radii of Curve at entry: Radius of curve at entry= 20m	IRC 65: 1976 (Clause No. 5.1, Table No. 1)
Step II	Radii of Curve at exit: Radius of curve at exit = 2 times of radius at entry Radius of curve at exit = 2 x 20 Radius of curve at exit = 40m	IRC 65: 1976 (Clause No. 5.2)
Step III	Radius of Central Island: Radius of Central Island should be equal to 1.33 times radius of entry curve. Radius of Central Island = 1.33 x 20 Radius of Central Island = 26.67m	IRC 65: 1976 (Clause No. 6)
Step IV	Weaving Length: For design speed 30kmph, Minimum weaving length = 30m So provide Weaving length = 50m	IRC 65: 1976 (Clause No. 7)
Step V	Width of Carriageway at entry and exit: For carriageway width = 7.5m Width of Carriageway at entry and exit = 7.5m	IRC 65: 1976 (Clause No. 8, Table No. 2)
Step VI	Width of non-weaving section: Width of non-weaving section of the rotary should be equal to width of single entry. Therefore, Width of non-weaving section = 7.5/2 = 3.5m	IRC 65: 1976 (Clause No. 9.1)
Step VII	Width of weaving section: $w = \frac{e_1 + e_2}{2} + 3.5$ w =9.125m	IRC 65: 1976 (Clause No. 9.2)
Step VIII	Entry and exit angle Angle at entry = 60° Angle at exit = 30°	IRC 65: 1976 (Clause No. 9.2)
Step IX	Check W = 9.125m (6-18m) e/w = 0.61 (0.6-1.00) w/l =0.3 (0.12-0.4)	IRC 65: 1976 (Clause No. 10)

4.1.4 Road 4

Steps	Calculation	Reference
Step I	Radii of Curve at entry: Radius of curve at entry= 20m	IRC 65: 1976 (Clause No. 5.1, Table No. 1)
Step II	Radii of Curve at exit: Radius of curve at exit = 2 times of radius at entry Radius of curve at exit = 2 x 20 Radius of curve at exit = 40m	IRC 65: 1976 (Clause No. 5.2)
Step III	Radius of Central Island:	IRC 65: 1976 (Clause No. 6)

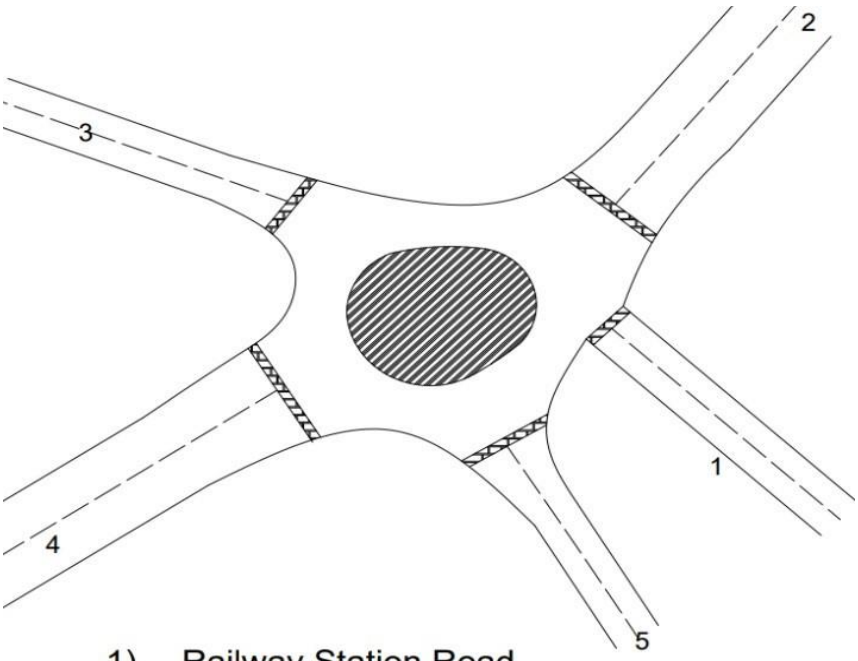
	Radius of Central Island should be equal to 1.33 times radius of entry curve. Radius of Central Island = 1.33 x 20 Radius of Central Island = 26.67m	
Step IV	Weaving Length: For design speed 30kmph, Minimum weaving length = 30m So provide Weaving length = 55m	IRC 65: 1976 (Clause No. 7)
Step V	Width of Carriageway at entry and exit: For carriageway width = 7.5m Width of Carriageway at entry and exit = 12.85m	IRC 65: 1976 (Clause No. 8, Table No. 2)
Step VI	Width of non-weaving section: Width of non-weaving section of the rotary should be equal to width of single entry. Therefore, Width of non-weaving section = 12.85/2 = 6.425m	IRC 65: 1976 (Clause No. 9.1)
Step VII	Width of weaving section: $w = \frac{e_1 + e_2}{2} + 3.5$ w =13.13m	IRC 65: 1976 (Clause No. 9.2)
Step VIII	Entry and exit angle Angle at entry = 60° Angle at exit = 30°	IRC 65: 1976 (Clause No. 9.2)
Step IX	Check W = 13.13m (6-18m) e/w = 0.73 (0.6-1.00) w/l =0.23 (0.12-0.4)	IRC 65: 1976 (Clause No. 10)

4.1.5 Road 5

Steps	Calculation	Reference
Step I	Radii of Curve at entry: Radius of curve at entry= 20m	IRC 65: 1976 (Clause No. 5.1, Table No. 1)
Step II	Radii of Curve at exit: Radius of curve at exit = 2 times of radius at entry Radius of curve at exit = 2 x 20 Radius of curve at exit = 40m	IRC 65: 1976 (Clause No. 5.2)
Step III	Radius of Central Island: Radius of Central Island should be equal to 1.33 times radius of entry curve. Radius of Central Island = 1.33 x 20 Radius of Central Island = 26.67m	IRC 65: 1976 (Clause No. 6)
Step IV	Weaving Length: For design speed 30kmph, Minimum weaving length = 30m So provide Weaving length = 40m	IRC 65: 1976 (Clause No. 7)
Step V	Width of Carriageway at entry and exit: For carriageway width = 7.5m	IRC 65: 1976 (Clause No. 8, Table No. 2)

	Width of Carriageway at entry and exit = 8.21m	
Step VI	Width of non-weaving section: Width of non-weaving section of the rotary should be equal to width of single entry. Therefore, Width of non-weaving section = 8.21/2 = 4.1m	IRC 65: 1976 (Clause No. 9.1)
Step VII	Width of weaving section: $w = \frac{e_1 + e_2}{2} + 3.5$ w =9.6m	IRC 65: 1976 (Clause No. 9.2)
Step VIII	Entry and exit angle Angle at entry = 60° Angle at exit = 30°	IRC 65: 1976 (Clause No. 9.2)
Step IX	Check w = 9.6m (6-18m) e/w = 0.64 (0.6-1.00) w/l =0.32 (0.12-0.4)	IRC 65: 1976 (Clause No. 10)

4.2 Central Island



1) Railway Station Road
2) Bus Stand (Kolhapur Road)
3) Towards City (Police Station Road)
4) Mission Hospital Chowk (Solapur Road)
5) Ambedkar Udyan Road

5. CONCLUSIONS

Traffic rotaries eliminate intersection traffic unpredictability by pushing intersection traffic into weaving activities. The rotational shape and size are determined by the amount of traffic and the number of turning developments available. The capability of a revolving drum is determined by looking at the place with the most weaving traffic. As a result of considering all options, we have a central island at the intersection, as well as parking areas and road widening.

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