

A LITERATURE REVIEW ON TRAFFIC VOLUME CAPACITY AT ROTARY INTERSECTION

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Abstract: A rotary intersection is a specialized form of intersection-at-grade in which the traffic moves in one direction round a central island. Rotaries are appropriate for many intersections including locations experiencing high number of crashes, long traffic delays, and approaches with relatively balanced traffic flows. In order to avoid the conflict between entry vehicles and circulating vehicles, there are a mass of confluence operations at rotary weaving sections. The performance parameters are difficult to be determined due to the great complexity of traffic performances at rotary weaving areas. For the safe movement of the vehicles, it is essential to understand the operational performance of the roundabout. Capacity is one such parameter which explains the operational performance, traffic scenario, and level of service.

In contrast to traffic flow condition in developed countries, Indian traffic condition is totally different. Traffic Flow is a major problem in the urban cities. Due to rapid increase in population along with urbanization, industrialization and improving living conditions, the vehicular population is piling up. A busy road stretch in a city is dotted with traffic signals. These traffic signals regulate the traffic flow at intersections and are also determinant factors for journey and travel time. If coupled with environment, these factors also contribute to vehicular and noise pollution.

It has been observed that the entry capacity of vehicles become comparatively lower at intersection than that of the straight portion of the road due to reduction in speed. Rotary intersection became inefficient in peak hour traffic. In this paper traffic volume is studied in different approaches by manual method in PCU per hour and width. As per IRC 65-1976 a rotary can handle a maximum traffic volume of 3000 PCU/hour as IRC. Rotaries do not need practically any control.

Key words: Capacity, PCU, Traffic volume, Rotary intersection, Traffic congestion, Round about.

I. INTRODUCTION

Continuously growing population is biggest challenge for transportation engineers. Traffic volume of vehicle increasing day by day. As Traffic or transportation engineer, we have to provide the transportation users all possible safety measures and convenience. Round about is type of intersection or a junction which mostly has four legs or more in which the road intersection's traffic slowed and moves continuously in one direction around a circular island. Roundabouts convert major conflicts point into minor conflicts point. This type of intersection generally used in urban area, where mostly the traffic volume does not approaching saturation value. Thus studies which have been made on capacity of roundabouts in our country India, mostly based on the (IRC 65-1976) recommended method which is recommended by the T.R.B laboratory (United Kingdom).

Capacity analysis for rotary or round about intersections are generally based on empirical approaches typically based on observed real time field data of roundabouts intersections/junctions capacity findings and theories of gap acceptability generally based on models of drivers behavior characteristics and vehicular characteristics at intersections. The critical gap and follow up time are important inputs in the evaluation of the entry capacity of

round about intersections and is the minimum gap that a vehicles driver wants to merge with the moving conflicting flow or circulating traffic. The critical headway and follow up headway values are mostly closer to the values mention in H.C.F 2000. The critical headway depends upon accepted and roundabouts entry.

As per IRC 65-1976 some guidelines are used which are rotaries and are suitable when the traffic entering from all the approaches are relatively equal. A total volume of about 3000 vehicles per hour can be considered as the upper limit case and the volume of 500 vehicles per hour is the lower limit. A rotary is very beneficial when the proportion of the right turn traffic is very high, typically if it is more than 30%. Rotaries are suitable when there are more than 4 approaches or if there is no separate lanes available for right turn traffic. As Rotary are ideally suitable if the intersection geometry is complex.

LITERATURE REVIEW

The work by Sitesh Kumar Singh, Karan Prabhakar (2017) “STATISTICAL ANALYSIS OF TRAFFIC ROTARY INTERSECTION.” Traffic congestion is a major problem at an intersection in urban area. Due to the day by day increase in the growth of vehicular traffic the load on the existing intersection are increasing and causing the jam condition for movement of vehicle. In this paper, Rotary junction at Dogra Chowk, Jammu has been selected as a case study area. The research work on roundabout 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. Critical headway at roundabouts represents the minimum time interval in circulating flow when an entering vehicle can safely enter the roundabout. Roundabouts have fewer conflict points than traditional intersections. Also require lower operating speeds for both the driver entering the roundabout and the driver driving in the roundabout.

The work on “DESIGN AND ANALYSIS OF INTERSECTIONS FOR IMPROVED TRAFFIC FLOW AT BHOPAL-CASE STUDIES OF JYOTI SQUARE AND VALLABH BHAWAN ROUNDABOUT.” by Veentika Gomasta, Mohit Malviya, Abhishek Singh, Salim Akhtar (2015) gives an idea that signalised intersection are critical element of an urban road transportation system and maintaining this control system at their optimal performance for different demand condition has been primary concern of the traffic engineer. Round about is a five legged intersection situated near DB city mall, MP Nagar, Bhopal. In which study traffic volume is done by manual method. In there work they have gathered the data by calculating the traffic volume at four phases of intersection. Survey is done throughout the day at 2 hour interval -10 am to 12 pm, 1pm to 3pm, and 5pm to 7pm. Thus survey is carried out in a consecutive day in a week. Classified traffic volume data are collected for 12 min duration. The classified traffic volume is converted to a common unit called passenger car unit.

The work by Sandeep B. Rajurkar, Mithil S. Soni, Mohan M. Dusane, Kunal A. Mahale, Amar S. Gorule on “STUDY AND DESIGN OF ROUNDABOUT AT CHARKOP MARKET, KANDIVALI (WEST).” gives an idea about traffic congestion which is a major problem at an intersection in urban areas. The location of survey area is at charkop market square kandivali west. In this study traffic survey is done by manual method. Three observer were appointed at each leg. One observer to count overall vehicles, volume while other two were appointed to count left and right turning traffic. They carried out six surveys at peak hour on working three days at morning and evening. They got maximum traffic volume at morning peak hour and selected that volume for a design of rotary. After that they calculated weaving length, entry, exit radius. They decided to construct rotary in Charkop market, since the result will full fill the IRC 65 requirement.

The work done by Sharukh Marfani, Dhrum Kumar Shihore, Chirag kanthariya, Harshal Kansara (2018) on “TRAFFIC IMPROVEMENT FOR URBAN ROAD INTERSECTION”. has evaluated with hike in road traffic due to globalization, it has become a necessity to develop a transportation network which could handle the present as well as the future traffic efficiently. To do so, proper designing and analysis of various infrastructure

is to be done. Surat has been selected as the study area located on the bank of Tapi River. Simadanaka is situated on western side of Surat. It consist of 5 leg intersection. In this paper manual counting video graphic method is used for data collection. At simadanaka junction traffic volume data are collected for the week day on morning and evening peak times. A rotary intersection or Traffic rotary is an enlarged road intersection where all converging vehicles are forced to move around a large central island in one direction. 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. Design speed is kept 30 to 40 km/hr for urban and rural areas. The radius at the entry depends on various factors like Design speed, super-elevation, and coefficient of friction.

The work on “EFFICIENCY OF ROTARY INTERSECTION AT AUTHORITY CHOWK GREATER NOIDA.” By Ms. SonalikaMaurya, Mr. AjeetSingh(2018) analyzed present data of authority rotary Intersection. Then by calculating traffic volume and converting into PCU, they calculate practical capacity of rotary .Analysis was done by using Direct manual methods, as per IRC-65 1976 Guidelines. Data is collected in evening peak hours from 5pm to 6pm. After studying traffic volume at authority rotary intersection they found that, minimum capacity of rotary is 3306pcu/hr. And the total traffic entering the intersection is 5230 PCU/hour. Hence they suggested that, signalized Rotary can be provided.

The paper on “CASE STUDY ON PERFORMANCE ANALYSIS OF ROTARY INTERSECTION” by Debasish Das, Prof.Mokaddesh Ali Ahmed, Saikat Deb(2014) gives an idea about increasing trends of traffic in urban area which is a major concern in all cities in India. The heterogeneous traffic are more diverge in nature due to lane changing and lack of lane discipline characteristics of drivers in India. The situation becomes more intense during the peak hour when increase of traffic volume by 50% than normal traffic. The traffic flow characteristics at rotary intersection were studied to observe the performance of intersection. In this study Silchar city has been selected as a case study area. Ambikapatti is considered for evaluation of performance. Ambikapatti is one of the major uncontrolled intersections in Silchar city. The performance of this intersection is investigated based on critical gap acceptance criteria. The data were recorded for each 15 min/ hr of our survey duration i.e. from 9:30 hours to 19:30 hours on a typical week day. They recorded the number of arrival and departure of different type of class of vehicles. for both off-peak and peak hour the cumulative arrival rate and cumulative departure rate has been recorded.

The work on “DESIGN OF ROTARY FOR AN UNCONTROLLED MULTI-LEG INTERSECTION” by S Vasantha Kumar, Himanshu Gulati, ShivamArrora (2017) gives an idea about The capacity study on the rotary are done from all direction and was calculated based on established norms of Indian road congress (IRC 65, 1976 & 2017). The video graphic data collection was carried out to obtain the current traffic volumes, which is main input in design of a rotary. The hourly traffic volumes from 7:30 am to 11:30 am and 2:30 pm to 6:30 pm was calculated. It was found that, from 9 am to 10 am, the traffic volume was 4500 PCUs, which is maximum when compared to the other morning hour. This values clearly show the heavy amount of traffic which enter the rotary leading to long traffic jams.

Paper on “TRAFFIC CONGESTION OVERCOME BY ROTARY DESIGN AT VALSAD” by Krutika M. Gamit, Aney K. Patel & Ankit S. Vasava (April 2019) where they determined the capacity of rotary of each weaving section. Transportation road research lab (TRL) proposed the empirical formula to find the capacity of the weaving section. The width of weaving section should be higher than the width at entry and exit. Normally this will be one lane more than the average entry and exit width. IRC suggest the entry radius of about 20m and 25m is ideal for urban and rural design respectively. It was found that, traffic volume at kalyanbaug intersection is 3789, there design 4986.89 PCU/hr which is more than the required so there design acceptable.

This paper on “A STUDY ON ROTARY INTERSECTION AT MANGLURV” the authors Ishanya P, Shrirammarathe & Y. R. Sureshin 2017 from International Journal of Current Engineering & Scientific Research. They classified traffic volume count was performed at Nanthur intersection in the peak hours (7:30 – 10:00 AM, 12:30 – 2:30 PM & 4:30 – 8:00 PM). The survey was done by video photography method which gives permanent record of volume count. The same empirical formula is used to calculate traffic volume at weaving section which is proposed by Transportation Road Research Lab (TRL). On the basis of their study they concluded that, the rotary intersection at Nanthur junction is not functioning adequately due to a reduced capacity and abrupt growth of traffic in scenario. The attempt made to design signal was failed therefore it is essential to redesign the rotary intersection.

Paper on “AN EVALUATION OF ROTARY INTERSECTION” by Rakesh Kumar Chhalotre & Dr. Y. P. Joshi (2016) According to this paper, it is observed that there is increasing trends of traffic in urban area is a major concern in all cities in India. The Traffic in Bhopal City which is increasing day by day and the condition is now reached to upgrade the intersection. An attempt is made to solve the problem of traffic congestion and unusual delay to the traffic movement at Prabhat Square Raisan Road Bhopal by suggesting the design of Fix time signal in places of the rotary intersection. In this paper, the data is collected by manual method by counting the number of different types of vehicle approaching to the intersection from all direction.

Paper on “COMPARATIVE EVALUATION OF ROUNDABOUT CAPACITIES UNDER HETEROGENEOUS TRAFFIC CONDITIONS” by Ramu Arroju, Hari Krishna Gaddam, Lakshmi Devi Vanumu & K. Ramachandra Rao. in 3 July 2015. Roundabout are selected for this study, which are located in Chanakyapuri area of New Delhi. It is Satya Marg-Vinay Marg roundabout. The roundabout legs north bound (NB), east bound (EB), south bound (SB), and west bound (WB) are numbered as legs 1, 2, 3, and 4 in clockwise direction and similar nomenclature is used throughout the paper. Manual method of vehicle count is adopted as the turning movements of all vehicles are difficult to extract from a video. In total, 13 trained enumerators were used for this purpose of which 4 persons are assigned to count entry flows at 4 legs, 4 persons for exit flows at 4 legs, and 4 more persons are asked to count the left turning vehicles. In addition, one more person counted the vehicles in the weaving section between legs 1 and 2. As per the Indian Roads Congress Method (IRC 65-1976). Has concluded traffic increasing and growth are the huge concern in all urban cities of India.

The paper on “TRAFFIC VOLUME AND CONGESTION ANALYSIS AT GOLF COURSE ROTARY INTERSECTION” by Akshat Upadhyay, Bharat Tyagi & Vaishnavivansal. Golf course rotary intersection is taken up for capacity analysis. The capacity studies on the rotary are done from all four directions and which is calculated based on the established norms of Indian Road Congress (IRC:65, 1976). The performance analysis of rotaries are based on various parameters such as total entry & exit traffic volume, weaving lengths & width. The resulting performance leads to a new modal development and its validation based on calculated traffic volume density by collected data of traffic volume at the particular location. There are two methods of traffic volume measurement - 1. Manual method 2. Automatic method. Considering the cost factor and available facilities they used manual method for calculating traffic volume count. Readings were taken at entry and exit points to the roads going in all four directions using tally method of counting for which a measuring tape was used to measure dimensions like radius of rotary, entry and exit width, weaving width, weaving length etc. Capacity of rotary is determined by the capacity of each weaving section. The various components are thus calculated.

II. CONCLUSION

In the present study the performance of uncontrolled intersection will be studied. Primary criteria set for performance analysis for an uncontrolled intersection is the entry capacity of vehicle. The individual vehicle entry capacity and the overall mixed entry capacity for a particular maneuver are evaluated the capacity gives us the fair idea about performance of intersection. There are two methods for calculation of capacity of traffic volume at rotary intersection which are theoretical (Gap Acceptances) and empirical method (IRC 65-1976). The recommended value as per IRC range from 500pcu/hr to 3000pcu/hr for both minimum and maximum value of proportioning.

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