Research Paper Engineering

Intersection Design for Pedestrians and Cyclist

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ABSTRACT

The urban traffic congestion has become a global phenomenon. Rapid urbanization and industrialization have caused drastically growth of vehicles all over the world. The problems like congestion, delay, energy consumption, environmental pollution etc. are observed due to growth of motorized vehicles. It is necessary to promote the non-motorized transport mode in the urban and rural area in order to reduce the congestion and environmental pollution. The environment surrounding our community provides many opportunities for outdoor activities. Commuter and recreational bicycling are among these opportunities and along with many other non-motorized forms of transportation have become increasingly popular over the years. To accommodate the increased use of alternative forms of transportation and to enhance the quality of life in our community needs to create a comprehensive, interconnected, well-maintained system of non-motorized transportation facilities. The aim of encouraging non-motorized transport mode is to provide a safe, efficient, easy to use, high quality network of non-motorized transportation routes, bicycle lanes and multi-use pathways throughout the community. This research paper covers the research work carried out by eminent personalities in the field of non-motorized transport.

This paper deals with SH-41 Road which links Ahmedabad – palanpur highway road. In mehsana city two major intersections namely Radhanpur cross road and modhera cross road.It lies between the parallels of latitude 23.2' and 24.6' and the meridians of longitude 71.56' and 72.52'.Also it is situated along SH-41 which is major junction and also established as market hub. So particularly this location is selected for the design and planning of rotary to overcome traffic congestion which was observed.

Keywords : Transportation Planning, Pedestrian Safety, Cyclist,Pedestrian, Non-Motorized Vehicle

1.Introduction:-

Most conflicts between roadway users occur at intersections, where one group of travelers crosses the path of others. Good intersection design indicates to those approaching the intersection what path they must follow and who has the right-of-way, including pedestrians and bicyclists, whose movements are complicated by their lesser speed and visibility.

2.Problem definition:

This paper deals with SH-41 Road which links Ahmedabad – palanpur highway road. In mehsana city two major intersections namely Radhanpur cross road and modhera cross road. It lies between the parallels of latitude 23.2' and 24.6' and the meridians of longitude 71.56' and 72.52'.Also it is situated along SH-41 which is major junction and also established as market hub. So particularly this location is selected for the redesign and planning of rotary to overcome traffic congestion which was observed.

3.STUDY AREA:

3.1Radhanpur Cross Road is heavily congested area and Pedestrian and Cyclists movements are very high because of various areas like residential, commercial buildings, schools, terminal, recreational centers, G.S.R.T.C. stands, private vehicle stands, offices, etc.

3.2Modhera Cross Road GSRTC Bus terminal is located at Modhera circle and due to which pedestrian movements are high. People approach bus terminals from near-by locations. And also many schools, G.I.D.C and commercial buildings are located. Hence it needs proper Non-Motorized Transport planning facility at intersection

4.METHODOLOGY:-

The field data sheets have been modified to suit the particular requirements of the modhera and radhanpur cross road intersection. Traffic enumerators need to be posted on each arm of the intersection. At a four arm intersection, the count at each arm of the traffic entering the intersection can be broken down into three categories, *uiz.,* left turning, right turning and

straight ahead traffic. The field data sheets have been modified to suit the requirement.

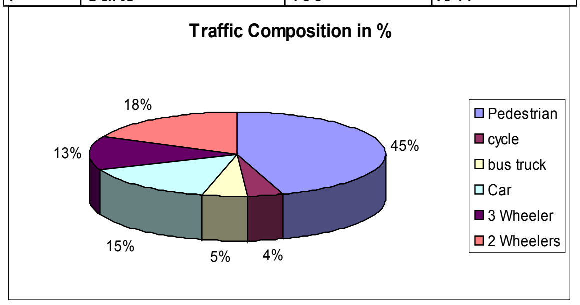
For all-day counts, work in three shifts of 8 hours each could be organized. Keeping above guidelines in view, the well-trained post graduate scholars from the discipline of Transportation Engineering and Urban Planning were engaged as enumerators. On each leg of the intersection 5 enumerators were given the duty of traffic count, two each for slow moving and two for fast moving traffic and one for specified turning and straight ahead movement of traffic. One co-coordinator and one reliever for each approach of the intersection have been deployed extra for smooth conduct of survey. The Details of the enumerators deployed for Traffic Volume Survey are given below.

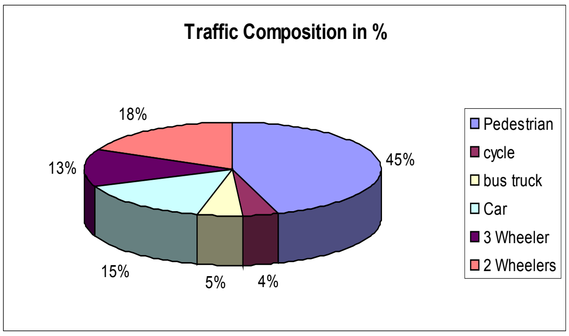
5.Data collection

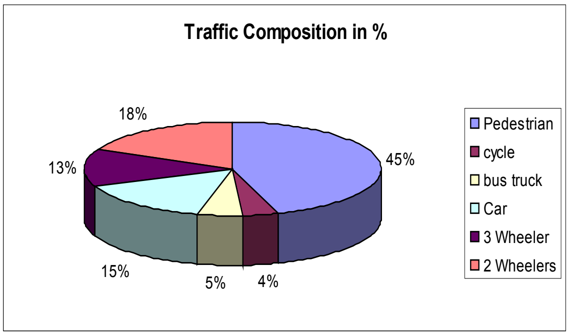
5.1Data of Traffic:-

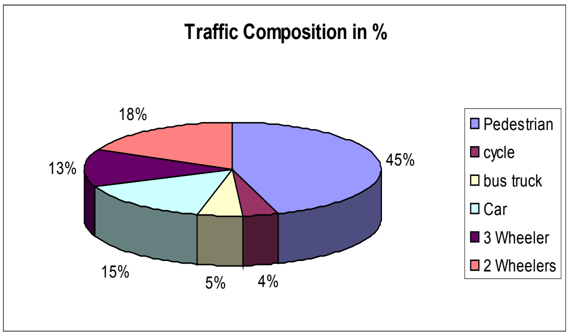
5.1.1 Modhera cross road :- Traffic volume count survey conducted at morning 9:30-12:00 and evening 4:30-6:30 PM,total 4:30 hours survey carried out by supporter .below table following different components of traffic.

Sr. no	Types of vehicles	No. of vehicles	Percentage of vehicles
1	2 wheelers	12959	18.43
2	3 wheelers	8789	12.50
3	Cars	10206	14.51
4	Bus/ trucks	3610	5.13
5	Cycles	3023	4.29
6	Pedestrians	31620	44.97
7	Carts	100	.017



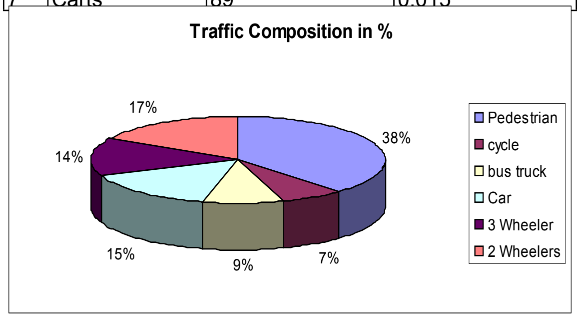






5.1.2 Radhanpur cross road: Traffic volume count survey conducted at morning 9:30-12:00 and evening 4:30-6:30 PM,total 4:30 hours survey carried out by supporter .below table following different components of traffic.

Sr. no	Types of vehicles	No. of vehicles	Percentage of vehicles
1	2 wheelers	9990	17.34
2	3 wheelers	8096	14.06
3	4 wheelers	8964	15.56
4	Bus/ trucks	4671	8.11
5	Cycles	3905	6.78
6	Pedetrians	21865	37.97
7	Carts	89	0.015



6.Intersection Design:

It Includes the design of Non-motorized Transport Facility such as footpath, subway ,foot over bridge, guard rails, separate cycle track for cycle users as per IRC:103-1988 for pedestrian and IRC: 11-1962 for cycle track design

Basic Principles :

1. Signals should be timed so they do not impede bicycle or pedestrian traffic with excessively long waits or insufficient crossing times.

2. Simple right angle intersections are usually the simplest to treat for bicycle and pedestrian movement. The problems are more complex at skewed and multiple intersections.

3. Good design creates a path for bicyclists that is direct, logical and close to the path of motor vehicle traffic; only in rare cases should they proceed through intersections as pedestrians.

4. Bicyclists should be visible and their movements should be predictable.

5 Bike lanes should be striped to a marked crosswalk or a point where turning vehicles would normally cross them. The lanes should resume at the other side of the intersection.

6.1Skewed & Multiple Intersections:

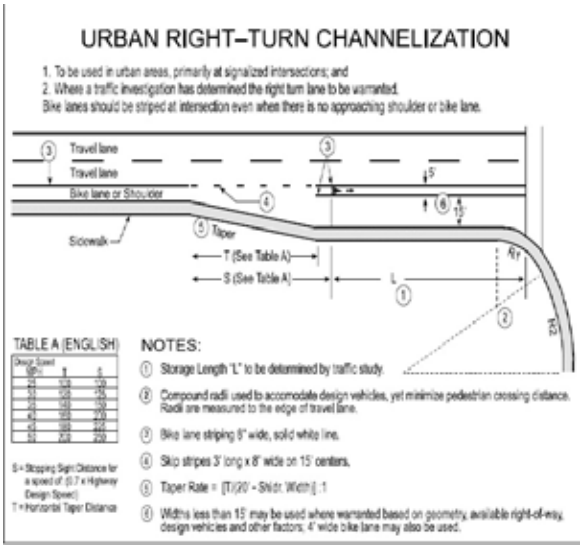
Skewed intersections are generally undesirable for all roadway users and introduce complications for bicyclists. Every reasonable effort should be made to design the intersection so that only two roads cross at a given point and they do it at a right angle.

6.2 Right-Turn Lanes :
Right-turn lanes should be used only where warranted by a traffic study, as they present these problems for cyclists:

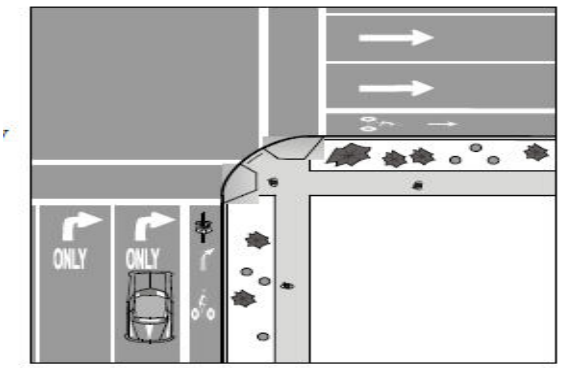
1. Right-turning cars and through bicyclists must cross paths.
2. The additional lane width adds to the crossing distance of the intersection.
3. Right-turn moves are made easier for motorists, which may cause inattentive drivers not to notice pedestrians on the right.

6.2.1Good designs make through bicyclists and right-turning motor vehicles cross prior to the intersection, with these advantages:
1. This conflict occurs away from the intersection and other conflicts.
2. The difference in travel speeds enables a motor vehicle driver to pass a bicyclist rather than ride side-by-side.
3. Bicyclists are encouraged to follow the rules of the road: through vehicles (including bicyclists) proceed to the left of right-turning vehicles.

Where it is not possible to add a full-right turn lane, the bike lane should still be placed to the left of right-turning motor-vehicles**.**

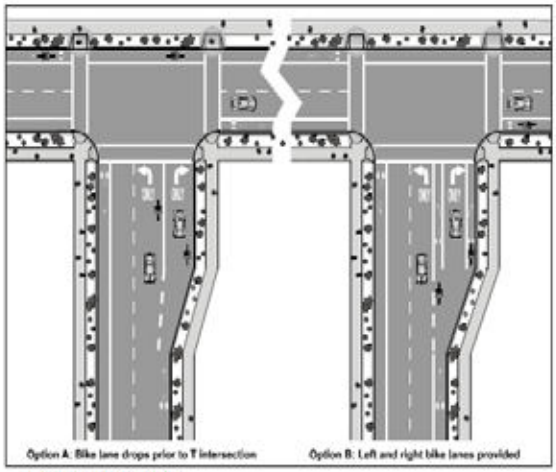


6.2.2Heavy Right Turns:
If the major traffic movement at an intersection is to the right, and straight through leads to a minor side street, then the bike lane may be placed on the right and wrapped around the curve, assuming that the majority of cyclists will desire to turn right



Bike lane follows major traffic flow to the right

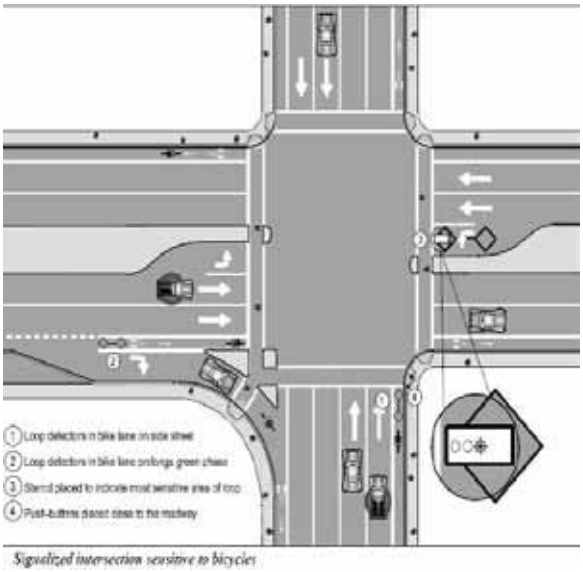
6.2.3Tee Intersections :
At a Tee intersection, where the traffic split is approximately 50% turning right and 50% turning left, the bike lane should be dropped prior to the lane split. This encourages cyclists to position themselves in the correct lane instead of making a left turn from the right side of the road. Where traffic volumes are very high, a left- and right-turn bike lane should be considered



Bike lanes at T intersections

6.2.4Signals :
On signals that function "on-call" (with loop detectors), there are several improvements that can be made to benefit cyclists:

1. Placing loop detectors in bike lanes on side street to trip the signal.
2. Placing loop detectors in bike lanes to prolong green phase when a bicyclist is passing through (the upcoming yellow phase may not allow enough time for a cyclist to cross a wide intersection)
3. Increasing the sensitivity of existing loop detectors in bike lanes and painting stencils to indicate to cyclists the most sensitive area of the loop.
4. Placing push-buttons close to the roadway where a bicyclist can reach them without dismounting



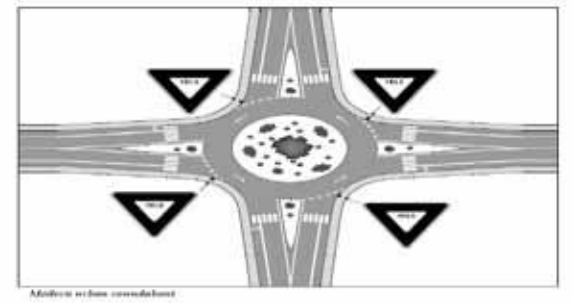
Signalized intersection sensitive to bicycles

6.2.5 Right-turn Lane without Room for a Bike Lane:
Where there is insufficient room to mark a minimum 4 ft bike lane to the left of the right-turn lane, a right-turn lane may be marked and signed as a shared-use lane, to encourage throughcyclists to occupy the left portion of the turn lane.

6.2.6 Modern Roundabouts :

A roundabout is a method of handling traffic at intersections commonly used in Europe, Australia and Japan. Roundabouts are now gaining acceptance in this country. Early attempts at roundabouts were often not successful for several reasons, mainly:

1. The radius was too small (creating difficulties for trucks).
2. The radius was too large (encouraging high speeds).
3. The right of way was not clearly defined (causing confusion and collisions).
4. Pedestrians were allowed access to the middle of the roundabout.



Modern roundabout design has several distinctive features:

1. A radius large enough to allow movement by trucks, but small enough to slow traffic speeds.

2. A visual obstruction, through landscaping, that obscures the driver's view of the road ahead, to discourage users from entering the roundabout and proceeding at high speeds.

3. The right-of-way clearly established: drivers entering the roundabout yield to drivers already in the roundabout.

4. There is no bicycle or pedestrian access to the center of the roundabout, which should not contain attractions such as fountains or statues.

One of the major advantages of roundabouts is the reduced need for travel lanes, as traffic is constantly moving (signals create stop-and-go conditions for motor vehicles - extra travel lanes are needed to handle capacity at intersections).

Other advantages include:

1. Reduced crash rates.
2. Reduced severity of injuries (due to slower speeds).
3. Reduced costs (compared to traffic signals, which require electrical power).
4. Reduced liability by transportation agencies (there are no signals to fail).

Most of the advantages and disadvantages of roundabouts affect motor vehicle flow, but there are advantages and disadvantages for bicyclists and pedestrians:

Advantages for Pedestrians and Bicyclists

1. The reduced cost frees funds for other purposes, including bicycle and pedestrian facilities.
2. The reduced need for travel lanes frees right-of-way for other purposes, including bicycle and pedestrian facilities.
3. Traffic flows at a more even pace, making it easier for bicyclists and pedestrians to judge crossing movements.
4. Pedestrians have to cross only one or two lanes of travel at a time, in clearly marked crosswalks.
5 Bicyclists negotiate intersections at speeds closer to that of motor vehicles.
6 Mid-block crossing opportunities may be improved if the number of travel lanes can be reduced.

Disadvantages for Pedestrians and Bicyclists

1. Traffic flowing more evenly may reduce pedestrian crossing opportunities as fewer gaps are created.

2. Pedestrians are responsible for judging their crossing opportunities; there is no signal protection provided, though pedestrian signals can be added at special sites.

3. Bicyclists must share the road and occupy a travel lane; by riding too far to the right, they risk being cut off by vehicles leaving the roundabout in front of them.

7. Conclusion:-

From the conducted study we can easily know from Volume counts of traffic, therefore, need to improve the transport facilities.so improve the intersection design and Reduced crash rates.,Reduced severity of injuries (due to slower speeds), Reduced costs (compared to traffic signals, which require electrical power),Reduced liability by transportation agencies (there are no signals to fail),increase the velocity of Traffic at intersection,save fual and save environment.

REFERENCES

[1]IRC: 11-1962 for cycle track design [2] IRC:-103-1988 for pedestrians [3]Traffic Engineering and Transport Planning by Dr L.R.Kadiyali [4]Mehsana Nagar Palika,Mehsana