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Assessment of Heterogeneous Traffic at Roundabout using VISSIM

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Abstract — *Traffic congestion is managed conventionally by signalisation, widening the roads, interchanges and intersections. Multi- modal traffic augments the congestion at this intersection. The problem of traffic congestion resolved by the methods on assumptions like Poisson –Distribution method, fixed critical gaps, Move –up times and constant traffic volume that appeared to be unrealistic for heterogeneous traffic is alleviated by simulation using VISSIM.*

The study works for three main parameters: Capacity of Rotary Intersection, Heterogeneous traffic flow simulation using VISSIM and suitable measures to be taken for reducing Traffic congestion and reconfigure the intersection. The framework will comprise of collection of accident data to learn about the black spot, measurements of geometric elements and its comparison with the standards of IRC: 65-1976 guidelines, also the public survey to have the idea of prevailing conditions. Further setting forth possible alternatives and come up with best gratifying solution followed by evaluation of traffic volume count and simulating it using VISSIM which will analyse and optimise the traffic flow.

Keywords- *Intersection, Evaluation, traffic congestion, VISSIM Simulation, Redesign*

I. INTRODUCTION

Intersection are the junction (at same level) of two or more roads either meeting or crossing. The various types of intersections viz; T-intersection, cross intersection, skewed intersection, rotary intersection. Intersections are categorized based on the grade and division of movements (at-grade, grade-separated without ramps, and interchanges). Grade separated intersections may be as simple as bridges and tunnels that separate through traffic stream or as complex as interchanges that incorporate separate dedicated roadways for turning traffic. At-grade Intersection are the junction (at same level) of two or more roads either meeting or crossing viz: 3-way (T,Y) Intersection,4-way (Rotary, Regular, skewed)intersection, 5-way (Roundabouts ,uncommon) Intersection, 6-way (having various streets joining more than 5 or 6) intersection.

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. The vehicles entering the rotary are gently forced to move in a clockwise direction in orderly fashion and weave out of the rotary to the desired direction.

This study deals with Rotary Intersection (Roundabouts) connecting National Highway-147 (Himmatnagar-Ahmedabad) and Gandhinagar - Dahegam road.

II. DATA COLLECTION

The traffic study needs a huge amount of data. The basic data required for any type of roundabout are all geometric elements and traffic volume count.

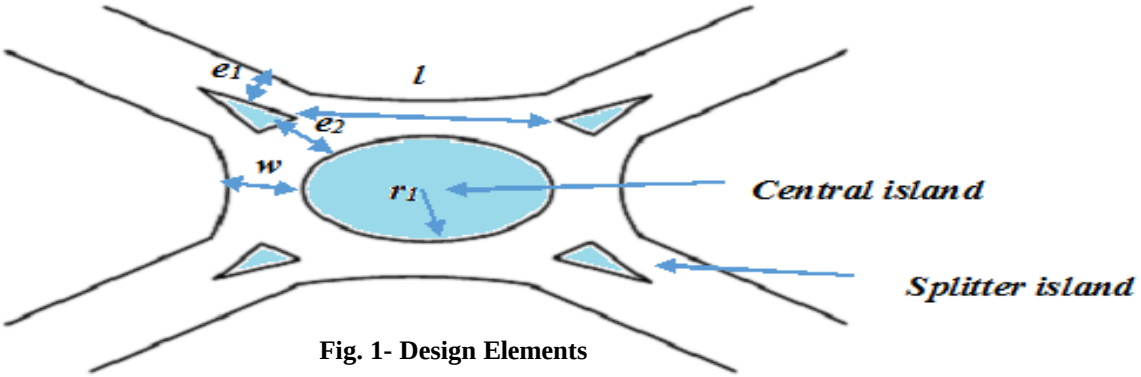

Fig. 1- Design Elements

Fig. 2- Traffic Congestion

Willingness survey is the primary need for any design and redesign of traffic control device. The willingness survey sheets were made and distributed among the various residents, shopkeepers, auto-rickshaw driver, vendors etc.
Road inventory data are must to ponder upon the causes of road accidents so were collected.

Geometric design elements i.e. weaving width, weaving length, radius of central island, exit and entry width etc were measured using 50 meters tape.

Also accident data of five years were collected. Use of ArcGIS in accident analysis was done.

Traffic volume count gives the practical capacity of Rotary Intersection., which was then analyzed referring IRC:65 guidelines.

III. RESULT AND DISCUSSION

VISSIM is a microscopic simulation software that takes various inputs such as lane length and width, vehicle inputs, base data etc for which optimum data are required. The collected data manifested the below discussed results.

Willingness survey showed that the problems of less road width, difficulty in crossing, manoevring of HCVs, inadequate sight distance, poor night vision etc were daily faced by the commuters, pedestrians, drivers, vendors etc. So, they recommended to increase the road width, provision of signals and ligthings, circle redesign etc.

Also the inadequate sight distance, less lane width, no provision of bumps at approaching legs were found by measuring design elements.

Accident points were plotted on the Chiloda circle map to analyse the blackspot area. Hotspot zone analysis, directional flow of accident, accident location and accident types were accomplished by using ArcGIS. This showed that accidents are more on Gandhinagar and Himmatnagar approach and the flow is deliberately increasing on the same from year 2011 to 2015.

Fatal accident is more on the circle which is dangerous for the upcoming years as Chiloda is semi-urban region and due to development population is sure to increase and thus the traffic giving rise to accidents due to less road width.

Next was the road inventory data; Potholes, Rutting. Raveling, Bleeding, Shoving were observed though at small extent but it can still worsen the condition if not taken care of.

Traffic volume count was done by videography for seven days. It was found that traffic circle of Chiloda being a junction of National highways has no specific peak hours. Traffic runs through this circle all day long. Heavy commercial vehicles are key reason of blocking due to less road width.

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

The calculated Practical Capacity (Q_w) exceeded the limit mentioned in IRC: 65 guidelines as a result of less road width.

Traffic volume was more from Ahmedabad to Gandhinagar and Himmatnagar than other three approaches.

VISSIM creates realistic and accurate situation to test different traffic scenarios.

Roadway geometry is coded in VISSIM. The key tools that enable roundabout in a realistic manner in VISSIM are Link & Connectors, Routing Decisions, Priority Rules and Reduced speed Zones.

The below figure shows the simulated model of Chiloda circle data:

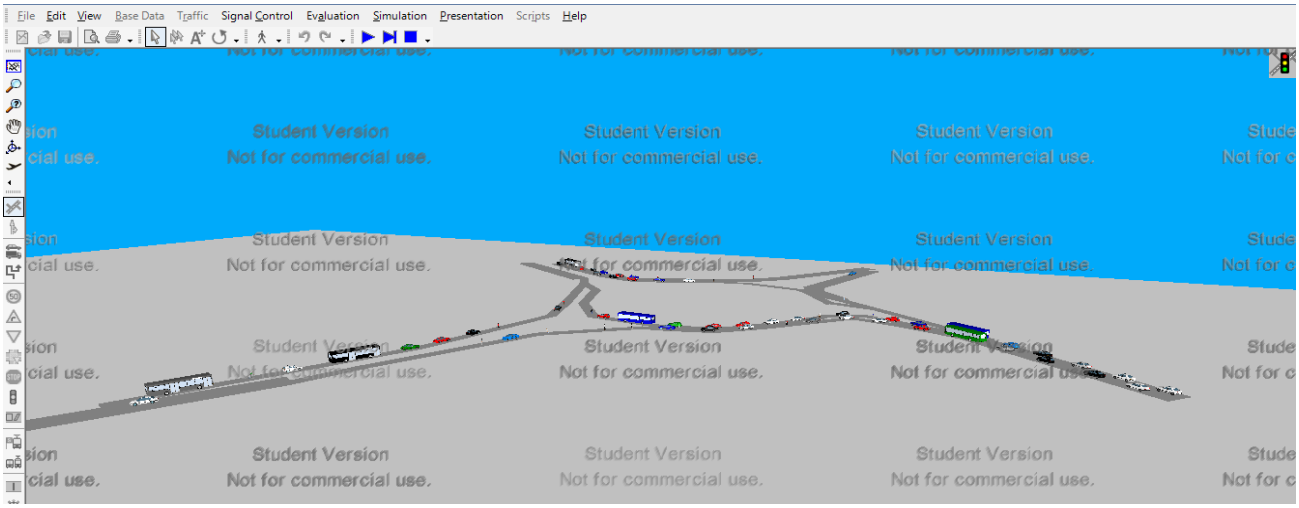

Fig. 3- Simulated Model

IV. CONCLUSION

This study is concluded with following points:

- VISSIM is efficient tool for estimating traffic, traffic planning, Designing and testing different alternatives.
- Proposing Dedicated lanes for HCVs.
- Provision of Signals and optimum Lighting.
- Redesign the Roundabout as per IRC: 65 guidelines.

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