



Traffic Flow Analysis and Highway Capacity of NH-16 from Gajuwaka to Hanumanthawaka

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ABSTRACT

Capacity evaluation of the Road (A case study on capacity evaluation of the Gajuwaka to Hanumanthawaka junction dual carriage way). The capacity of any location is define on the basis of transverse of the vehicles at that point which is select for the research. The capacity of a road is impact by the number of lanes, width of lane, width gradient, the total population of that area and also depend on the type of area that means if it is industrial area then automatically the capacity is more because of commercial vehicles as well as personal vehicles. With the help of Passenger Car Unit (PCU) the capacity is expressed. In India due to heterogeneous traffic and the movement of vehicles is not in discipline lane it is not easy to study and analyze the traffic flow and capacity.

I will analysis the traffic flow and highway capacity on NH-16. In this I basically I am studying about traffic at Gajuwaka to Hanumanthawaka junction and design a new type of carriageway that will to flow the traffic smoothly and as well as safely. I will suggest some important requirement which is very important to reduce the travel time and provide smooth and safe movement for traffic flow and for evaluating the capacity of the road I choose the manual survey method and surveyed the road for one week and find the total volume of the traffic in the 7 days of week with peak and non-peak hour. With the help of this design traffic will flow without stoppage. It will help to save time as well as fuel cost. I will explain to you how much fuel waste at traffic signals in my research.

After analyzing the traffic flow and the capacity of NH-16 from Gajuwaka to Hanumanthawaka junction some of the important improvement are required which will suggested in my research which will help to control the traffic volume and the capacity of NH-16. In this I will also estimate the fuel cost which are waste due to traffic signals. I will also calculate the estimation cost of construction of my new model.

Keywords: Traffic Flow, Speed Limit, Capacity, Volume, Prevention.

1. INTRODUCTION

The concept of traffic flow is a relationship between vehicles, drivers and type of infrastructure like highways, expressways, signals and devices which is install to control the traffic flow. The main purpose of understanding the traffic network is to help to reduce the traffic congestion. Due to increasing of population and transportation day by day the traffic and volume will increase. To reduce this traffic we need to use some new technology which are discuss in this research. Traffic volume is the most important part while we are studying the traffic flow and capacity. According to traffic volume the design and planning of the road system has to plan.

1.1 Model of Heterogenous Traffic Flow:

- In developing countries composition of traffic is mixed with different type of vehicles like fast moving and slow moving in same direction or using same right of way.
- The fast moving vehicles like taxi, buses, truck, bikes, auto rickshaws etc. and slow moving vehicles like bicycles, cycle rickshaws etc, this heterogeneous traffic flow increase the traffic.
- Huge study has been done to develop traffic flow models for the roadways and expressways, mostly for fast moving vehicles.
- And also heterogeneous traffic is representing in industrial countries like India.
- In India this is the factor which affect the whole traffic jam because all vehicles are moving without any specified lane.

1.1.1 BROKEN DIVIDERS:

- Traffic is also increase due to the conditions of road.

- A road should ideally have a minimum carriage way on both sides. If not taken proper care, there will be a huge problem to the motorists.
- Due to this they should care about the dividers by arranging at the junctions properly with sufficient railings so that most of the vehicles can follow in a lane and prevent the accidents.
- Due to heavy rain water gathering on the road, whole road get damage. Due to this damage traffic jam is increase and also increase the number of accidents.
- Due to low or poorly maintenance of road accident causes. Half of the fatal auto accident will happen due to low maintenance. It is happened at the national highways and expressways because of high speed.

1.2 UNEVENNESS OF TRAFFIC:

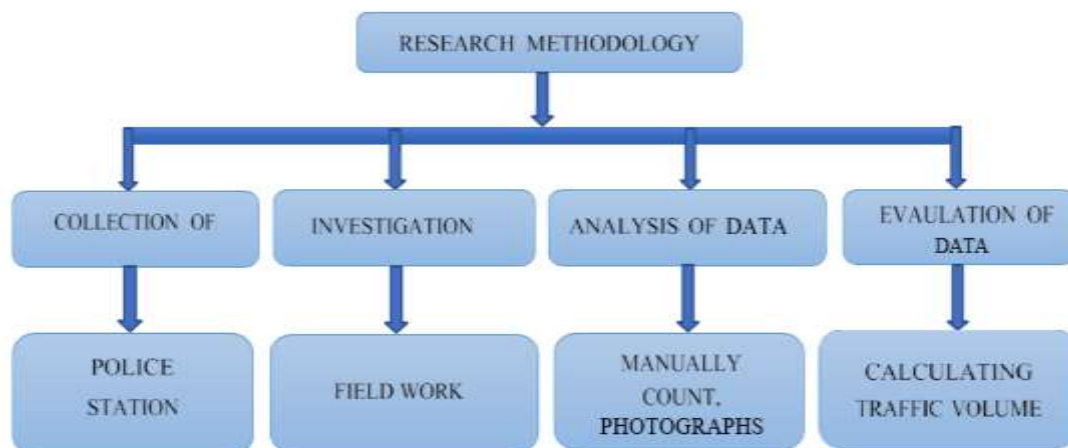
- Traffic may flow unevenly in peak hours and also in Non-peak hours. The traffic signs and signals must provide at the junctions where people passes and have to instructed by the Traffic inspector.
- Traffic inspectors must guide the pedestrians as well as the vehicles to pass by which is to avoid accidents in National Highways.
- Due to unawareness in the people the accidents were causing.

1.3 Objectives of Study:

- 1) To collect the accident data which was occur between Gajuwaka to Hanumanthawaka junction from nearby police station.
- 2) To analyze the traffic volume at Gajuwaka to Hanumanthawaka junction and to evaluate the total PCU (Passenger Car Unit) at both site.
- 3) After analyze the traffic volume we are able to evaluate the factor that affect the congestion.
- 4) Level crossings, manned and unmanned at all types of roads.
- 5) After the all suitable calculation I would like to suggest a design of my own to minimize the existing factor affecting economical and environmental too.

1.4 SCOPE OF TRAFFIC FLOW ANALYSIS:

- With the help of this the traffic at Gajuwaka to Hanumanthawaka junction will decrease and will it also increase the traffic volume.
- Services of that type of road area should always be clear due to security purpose.
- It will also help to save the human at the time of serious injury and an ambulance way is clear and it will pass from the traffic.
- At that type of huge traffic volume there must be restricted lane for such type of vehicles like: Ambulance, Fire brigade, Army (at the time of war), Police (for emergence case) etc. We will design this road for the future demand.



2.1 COLLECTION OF DATA:

Collection of accident data due to heavy traffic volume from the police station and count the traffic volume according to:

- Time and date of the accident
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- Location of accident
- Accident type
- The cause of accident
- Counting the traffic volume through the video recording.

Accident data helps to evaluate the number of accident, factors affecting like:

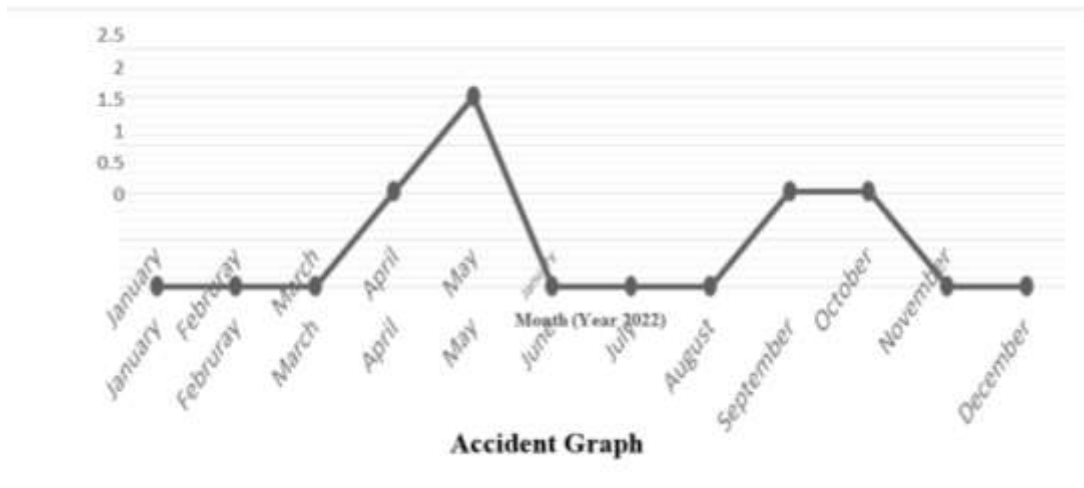
(a)Rate of accidents

(b)Conflict point

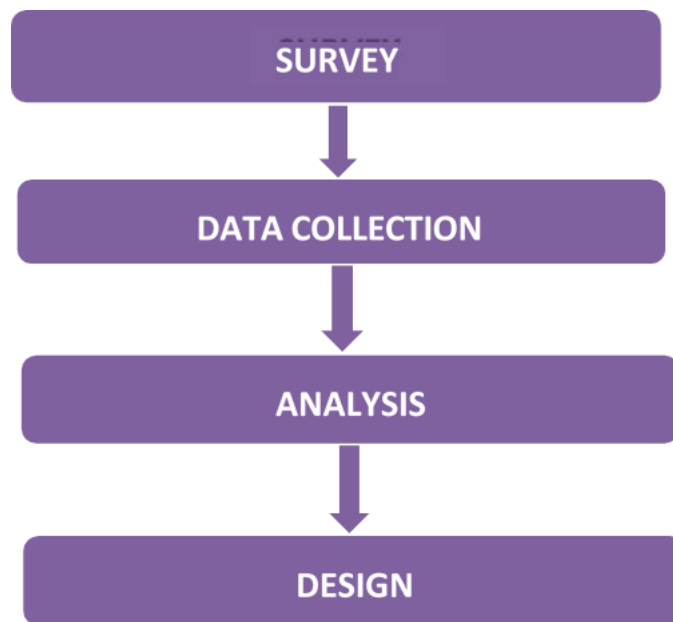
(c)Black-spot point

Table : Accident Data 2022

FIR Detail	Date	Road Type	No. of Fatalities	M	F	Children (0-18)	No. of Injured	M	F	Children (0-18)	Accused Party	Victim Party
u/s 279, 304 A IPC	03/02/2022	NH	1	1	0	0	0	0	0	0	Truck	M/C
u/s 279, 337, 338 IPC	15/03/2022	NH	0	0	0	0	1	0	1	0	Car	M/C
u/s 279, 304 A IPC	09/04/2022	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 337, 338, 304 A IPC	29/05/2022	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 337, 338, 427, 304 A IPC	18/06/2022	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 304 A IPC	11/07/2022	NH	1	0	1	0	0	0	0	0	Truck	M/C



Flow chart



2.2 : Standard PCU Values (Passenger Car unit):

Values of PCU	
Car	1.0
Motorcycle	0.5
Non-motorised Vehicles	0.2
LCV	2.2
HMV	3.5
3-Wheeler	0.8

2.2.1 : Evaluating the Traffic Data:

PCU for 2W = Total no. 2W*PCU value

= 891*0.

= 445.5 PCU/hr.

PCU for 3W = Total no.3W*PCU value

= 585*0.8

= **468 PCU/hr.**

PCU for Car = Total no. of car*PCU value

= 2338*1

= **2338 PCU/hr.**

PCU for HMV = Total no. of HMV*PCU value

= 464*3.5

= **1624 PCU/hr.**

PCU for LCV = Total no. of LCV*PCU value

= 128*2.2

= **281.6 PCU/hr.**

PCU for Non-motorised = Total no. of non-motorised vehicle*PCU value

= 66*0.2

= **13.2 PCU/hr.**

Total PCU/hr = Total PCU of all Vehicles

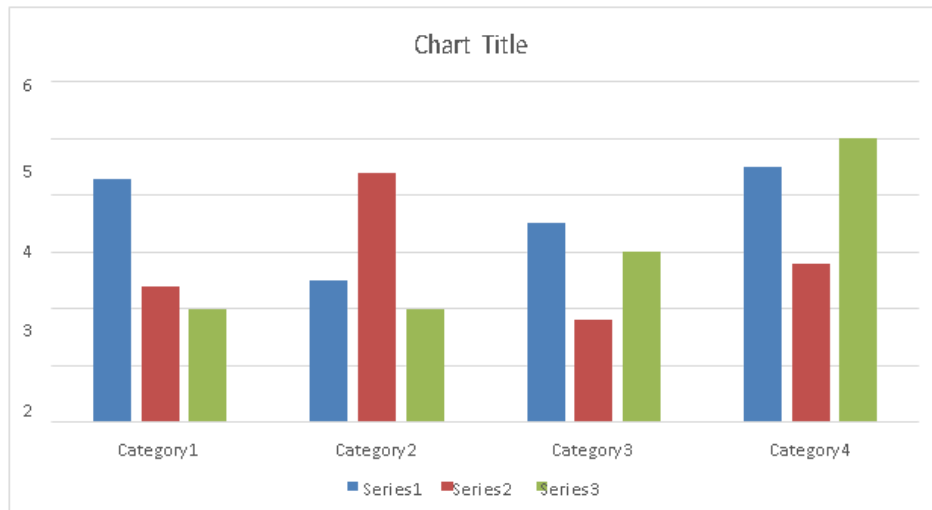
= **5184 PCU / hr.**

Table : (Traffic Data of Tuesday (28/05/2022))

Time	Motor Cycles & Bicycles	Autos	Cars	Heavy Vehicles	Light commercial Vehicle	Total Traffic (PCU)
07:00-08:00	768	54	1998	114	28	2886
08:00-09:00	785	51	1384	137	29	2596
09:00-10:00	841	58	1596	146	32	2644
10:00-11:00	864	49	1467	118	35	2428
11:00-12:00	744	37	1365	128	48	2320
12:00-01:00	649	42	1278	119	37	2134
03:00-04:00	758	58	1367	128	31	2309
04:00-05:00	769	61	1612	126	24	2539
05:00-06:00	837	77	1801	117	37	2772
06:00-07:00	889	72	1979	121	32	2975
Total						25603

After the analysing the traffic data at Gajuwaka to hanumanthawaka jn. maximum PCU/hour = 2886 According to a survey of PCU for a rotary it should not be exceed = 3000.

3000 > 2886



3.1: RESULT AND DISCUSSION:

After the analysing and evaluation of all data we are able to calculate the total traffic volume as well as total PCU/hour (Passenger Car Unit). With the help of **PCRA** we are able to calculate the total wastage of fuel due to signals.

3.1.1: CALCULATION FOR PCU/HOUR (PASSENGER CAR UNIT):

PCU for 2W = Total no. 2W*PCU value

$$= 891 * 0.5$$

$$= \mathbf{445.5/hour}$$

PCU for 3W = Total no.3W*PCU value

$$= 585 * 0.8$$

$$= \mathbf{468/hour}$$

PCU for Car = Total no. of car*PCU value

$$= 2338 * 1$$

$$= \mathbf{2338/hour}$$

PCU for HMV = Total no. of HMV*PCU value

$$= 464 * 3.5$$

$$= \mathbf{1624/hour}$$

PCU for LCV = Total no. of LCV*PCU value

$$= 128 * 2.2$$

$$= \mathbf{281.6/hour}$$

PCU for Non-motorised = Total no. of non-motorised vehicle*PCU value

$$= 66 * 0.2$$

$$= \mathbf{13.2/hour}$$

Total PCU/hr = Total PCU of all Vehicles

$$= \mathbf{5184/hour}$$

3.1.2 : DELAY IN PASSENGER HOUR PER DAY:

Delay in Passenger hour per day = Vehicle Occupancy * Delay time in vehicle hour

= 64*4879.36

= 1780966.4 hours per day

After all these calculations I would like to propose a new design from Gajuwaka to Hanumanthawaka jn. which will help to minimize the fuel consumption and save the travel time.

Conclusions:

With the help of my research I would like to suggest these improvements:

- 1) It will save fuel consumption and travel in delay time.
- 2) Traffic will flow without any interruption and After the calculation the construction cost of my design is very economical in terms of benefit cost ratio.
- 3) By providing road signs at the junctions especially (school,colleges and hospital areas).
- 4) By providing speed breakers we can prevent accidents and by providing speed breakers we can prevent accidents.
- 5) Majorly to construct the Flyovers at the main junctions to eradicate the traffic flow and time delay.

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