TRAFFIC FLOW ANANLYSIS AND HIGHWAY CAPACITY - A Case Study of BSF Chowk and PAP Chwok

Submitted in partial fulfilment of the requirements of the degree of

MASTER OF TECHNOLOGY

in

CIVIL ENGINEERING

by

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2017

DECLARATION

I, Sunil Kumar Chaurasiya (11210052), hereby declare that this thesis report entitled **"TRAFFIC FLOW ANANLYSIS AND HIGHWAY CAPACITY - A Case study at BSF Chowk and PAP Chowk"** submitted in the partial fulfilment of the requirements for the award of degree of Master of Civil Engineering, in the School of Civil Engineering, Lovely Professional University, Phagwara, is my own work. This matter embodied in this report has not been submitted in part or full to any other university or institute for the award of any degree. I have adhered to all the principles of academics honestly and integrity. No falsified or fabricated data have been presented in the thesis. I understand that any violation of the above will cause for disciplinary action by the Institute, including revoking the conferred degree, if conferred, and can also evoke penal action from the source which have not been properly cited or from whom proper permission has not been taken.

Date: **Sunil Kumar Chaurasiya**

Place:

CERTIFICATE

It is certified that this project report entitled **"TRAFFIC FLOW ANALYSIS AND HIGHWAY CAPACITY – A Case Study at BSF Chowk and PAP Chowk",** submitted individually by student **Sunil Kumar Chaurasiya**, **(11210052)** of School of Civil Engineering, Lovely Professional University, Phagwara, carried out the work under my supervision for the Award of Degree. This report has not been submitted to any other university or institution for the award of any degree.

Signature of Supervisor

Mr. Akash Verma

Assistant Professor

ACKNOWLEDGEMENT

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Finally, I would like to thank almighty god and my parents and friends who stood by me during the tenure of my project work.

Signature of Student

SUNIL KUMAR CHAURASIYA

ABSTRACT

Capacity evaluation of the Road (A case study on capacity evaluation of the PAP chowk Jalandhar NH-1 3-lane dual carriage way) which is start from Jalandhar and end at PAP chowk Jaladhar. 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 analyse the traffic flow and capacity.

Traffic flow principle always represents in mathematically. It is always described the interaction between vehicle and the driver. So in my thesis "TRAFFIC FLOW ANALYSIS AND HIGHWAY CAPACITY OF NH1 A CASE STUDY AT PAP CHOWK". I will analysis the traffic flow and highway capacity on NH-1. In this I basically I am studying about traffic at PAP chowk 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. In my thesis I want to remove all traffic signals from PAP chowk and design a new model traffic flow at PAP chowk. 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 analysing the traffic flow and the capacity of NH-1 from Jalandhar to PAP chowk 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-1. 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.

TABLE CONTENT

LIST OF TABLE

LIST OF GRAPH

LIST OF FIGURES

LIST OF ABBREVIATIONS

%	Percentage
mm	Millimeter
cm	Centimeter
m	Meter
km	Kilometer
Sec	Second
PCU	Passenger Car Unit
M	Male
F	Female
M/C	Motor Cycle
HMV	Heavy Motor Vehicle
LCV	Light Commercial Veh.
WB	Wheel-base

CHAPTER 1

INTRODUCTION

1.1 General

Traffic flow studies are accompanied to determine the number, movement and type of vehicles at a given location. Traffic flow analysis helps to improve the capacity of flow. Traffic flow analysis also help to reduce the accident level. Traffic flow concepts to also describe in the mathematically way the interaction between vehicles and driver.

1.2 Traffic flow analysis

1.2.1 OVERVIEW

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 +volume is 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. Basically traffic is congested in developing countries or developing cities like India. The main reason of traffic in India is the nature of traffic. The nature of traffic in India is heterogeneous. In this the traffic, the vehicles do not follow the lane rules which are specified for every type of vehicles. Due to this, the traffic flow get slow and increase the traffic volume also. The main problem due to heterogeneous traffic to analysing the traffic volume and analysing the data for the further requirement or improvement in future.

1.1:- Heavy Traffic Volume

Traffic flow in India due to heterogeneous condition it is not possible that the vehicles movement in lane. Due to this India facing problem traffic due to heavy traffic volume. Measuring the traffic volume of a heterogeneous nature traffic is represented by transforming the types of vehicles corresponding to the conveying in terms of passenger car unit per hour.

1.2.2 MODEL OF HETEROGENEOUS 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.

1.2:- Heterogeneous traffic flow in India

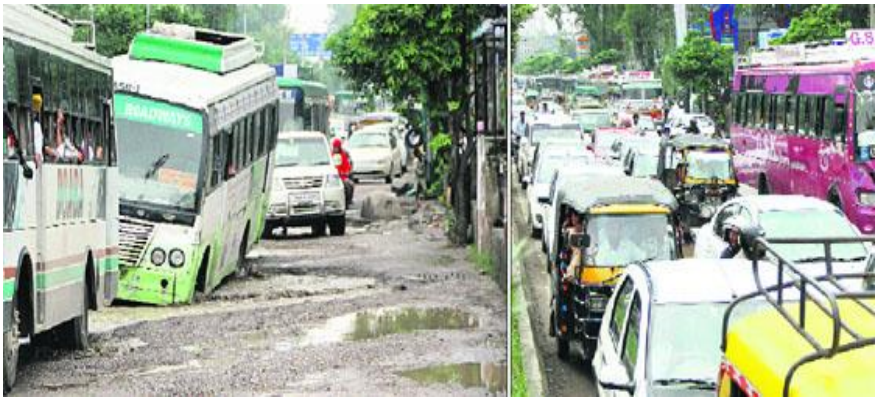
An evaluation of the literature has shown that limited revisions is already done of traffic flow for heterogeneous or mixed condition of the vehicles in developing countries. Some of the experiments are used to develop to convert the heterogeneous traffic into passenger car unit. It helps to reduce the traffic jam and improve the traffic flow.

*

1.2.3 TRAFFIC DUE TO ROAD CONDITION

Traffic is also increase due to the conditions of road. If we are talking about Indian roads in the autumn season all the drainage will get jam due to heavy rain. 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 accident. Sometime due to this there is huge accident on that road. Due to low or poorly maintenance of road accident causes. Half of the fatal auto accident will

happen due to low maintenance. It is happen at the national highways and expressways because of high speed. A driver must be avoid that situation which may cause accident like pothole or pooling water on the road. Many factors that affect the traffic flow.



1.3:- Traffic jam due to heavy drainage

1.2.4 Types of traffic jam due to bad road condition :

2. **Potholes:** In this types of road asphalt are missing in a large amount from the road. Due to potholes a huge traffic jam. Potholes is occurring due to failure of asphalt in huge amount at the time of heavy rain or blockage of drainage.

1.4:- Potholes on roads

3. **ICE PATCHES ROAD:** Due to heavy snow fall on the roads the traffic jam or to decrease the traffic flow. Due heavy snow fall the asphalt failure is occurring because after melting the snow the water get gathered on road and it will damage the whole road, accident is also occurring due to this failure.

1.5:- Ice Patch Road

1.2.5 TYPES OF TRAFFIC CONGESTION

1. MATHEMATICAL THEORIES:

Some of dynamic rules are apply to control the traffic flow. Dynamic rule is just like to flow of a fluid in a pipe. Heavy traffic can raise naturally such as an unexpected routing by a single motorist. Because of poor results of theoretical model traffic flow to actual experimental traffic flow, we are using traffic forecasting for empirical models.

1.6:- Heterogeneous Traffic

1.2.6 SCOPE OF TRAFFIC FLOW ANALYSIS:

With the help of this the traffic at BSF Chowk Jalandhar will decrease and will it also increase the traffic volume. As we that the BSF Chowk in a cant area if there is traffic jam it will also disturbed the Army. 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 passed 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 an emergence case) etc. We will design this road for the future demand.

CHAPTER 2
LITERATURE REVIEW

The study of traffic flow analysis is an interface between driver, vehicles and infrastructure of the roadway. The main purpose of traffic flow analysis is analyse a new idea to control the traffic flow and able to understand the road network by a common person. In also help to reduce the traffic jam and save the precious time of everyone.

Review on Traffic flow analysis and Highway Capacity

L B Zala et al. (2014) in this the author calculated the different type of traffic parameters of a selected area on the concept of previous parameters of that area which the author select. Author conducted different type of analysis like traffic volume, speed etc. also find the capacity of the road.

S.Yamuna et al. (2014) author expressed in his research some of the fundamental traffic flow according to the behaviour of transportation system. The main purpose the author is to define the feature of the traffic flow according to the speed of the vehicle and flow of traffic. Basically the heterogeneous traffic is in urban areas. The main purpose of the author is to evaluate the headway of the traffic and modelled a wide range of traffic flow for the vehicles.

Babitha Elizabeth Philip et al.(2014) traffic flow model is done to study interactions between vehicles and to develop an optimal road network with efficient traffic movement and reduced traffic congestion. Efficient management of traffic is the aim for sculpting the traffic flow. While sculpting the main focus is on speed, flow and concentration of vehicles. The model discussed in this paper is based on queuing theory. The model can be developed for all types of junctions. Here, the model for a straight lane is developed. The general causes, effects and solutions for traffic congestion are studied in this paper.

K Gunsekaran et al.(2015) according to this author the traffic flow is count by GPS is very easiest method in author using different types of method are used to count the traffic volume. In this author study the behaviour of heterogeneous traffic, GPS were fitted in the cars and probe vehicles formed 1-3% of the traffic flow to estimate the heterogeneous traffic speed and capacity was reduced at work zones on urban roads.

Balaji Ponnu et al (2012) in this research the author discuss the vastly condition of the Indian roads for different type of vehicles on expressways. The author aim to design a new technology for the traffic flow or new model diagram which help to control the Indian road traffic flow by calculating the passenger car unit(PCU). It also help to evaluate the capacity of highways and expressways. In this research author want to decrease the PCU and increase the capacity ratio of the traffic flow.

SK Mahajan et al (2013) in this author discuss about a rotary. Traffic rotary is a special grade change of lane at any intersection. Rotary is basically design where the traffic meet three or more intersection and the traffic volume of that intersection is maximum 3000 per hour or more than 500 per hour. With the help of this rotary crossing or intersection of traffic problems will eliminate and traffic movement is very easy.

K P Tiwari et at (2013) in this we have learnt that how to calculate the wastage of fuel. Emission of fuel increases the pollution. Author wants to decrease the pollution level. Basically wastage of fuel is more at crossing of train, signals. Author was suggest a construction of over bridge at crossing. According to author total wastage of fuel at signals or crossing point is 5.6 x 10^6 Petrol and 3.4 x 10^6 of Diesel, 1.6 x 10^6 kg per year. Total increasing of fuel in Indore 10.6 x 10^6 creating the CO_2.

Madhu Errampalli et at (2015) in this research the author was calculate the effect of congestion on fuel cost and travel time cost. The vehicles normally move at their free speeds when it is least impeded due to traffic flow under lean traffic (free flow) conditions. As traffic flow increases, the vehicles cannot sustain their free speeds due to interactions from other vehicles in the traffic stream. In addition to that the vehicles that are operating in the congested traffic conditions will consume more fuel than those operating in steady state traffic conditions for the same average speed.

Dr.M Ali Ahmed et at (2013) in this research author was purposed a rotary at an intersection. India traffic is heterogeneous, heterogeneous traffic is traffic where the driver's will not follow the lane rules. Intersection is one when either three or more road meets or intersects each other. 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. Hence, long queues on intersections often observed, causing huge fuel consumption as well as environmental pollution in the urban area beside considerable time loss.

CHAPTER 3

RATIONALE AND SCOPE OF STUDY

Basically traffic volume analysis is studied to calculate the total number of vehicles flow at the intersection at the study area. It is studied to known about the traffic conditions and required for further improvement which are required for smooth traffic flow. Before the improvement we should survey and calculate the accurate data. In this I will collect some accident data from two police station. After the analysing the traffic volume data at study area I come to known that the traffic volume is too high at PAP chowk Jalandhar. With the help of the traffic volume data we are able to calculate the total PCU (Passenger Car Unit) it is comes to be 5000 PCU/hr. During analysing the data I observed that along with lot of delay in time due to signals there is also a huge amount of wastage of fuel at survey site. Traffic volume is too high at PAP chowk. After the evaluating the all data and some calculations I will suggest a new design for traffic flow at PAP Chowk.

CHAPTER 4

OBJECTIVES OF STUDY

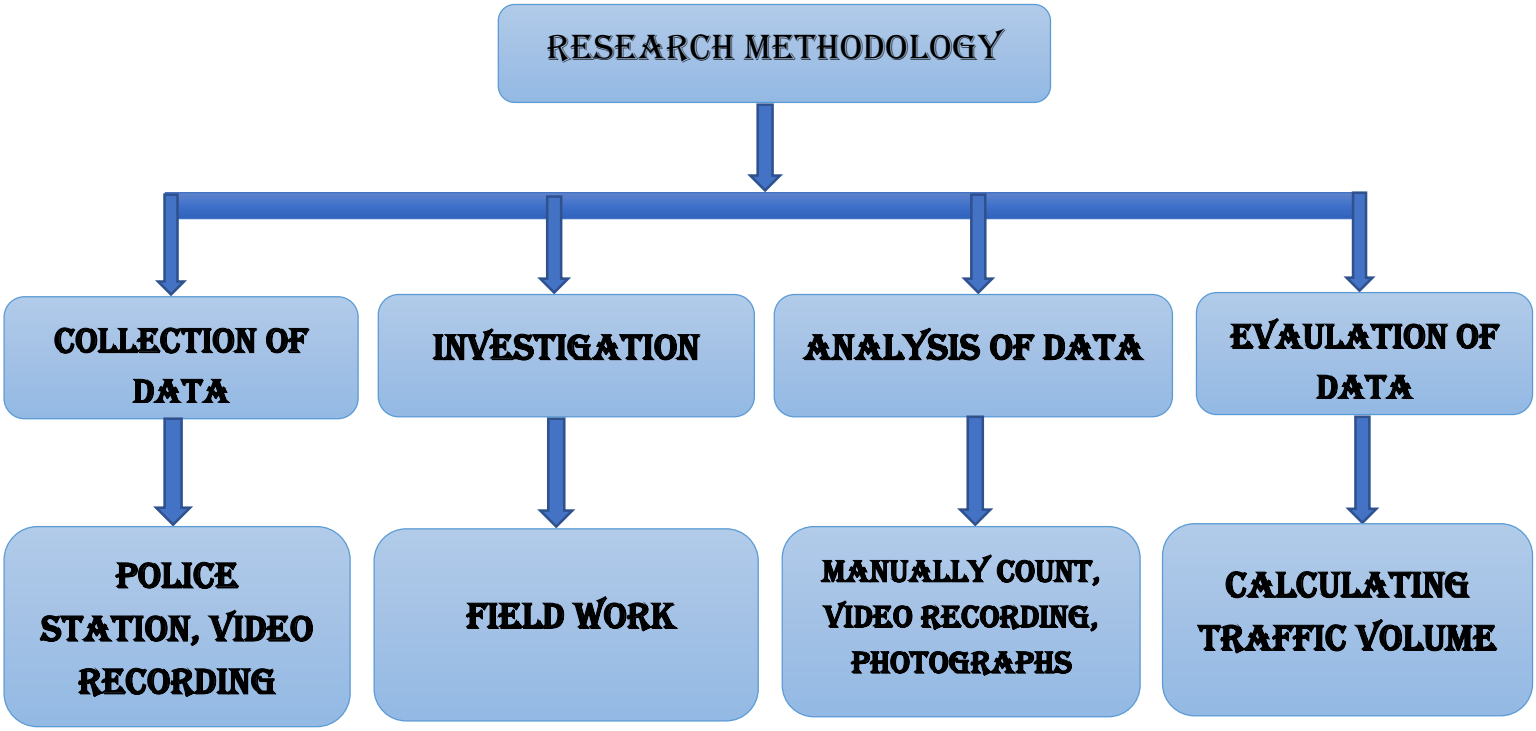
The main objective of this research is to analysis the traffic volume at BSF Chowk and PAP Chowk and suggest further improvement which is required to flow the traffic smoothly and easily.

Some objectives are to be study which is given below:

- To collect the accident data which was occur between BSF Chowk to PAP Chowk from police station.
- To analyse the traffic volume at BSF Chowk and PAP Chowk and evaluate the total PCU at both site.
- After analyse the traffic volume we are able to evaluate the factor that affect the congestion.
- To evaluate the delay in time at signals.
- After the all suitable calculation I would like to suggest a design of my own to minimize the exiting factor affecting economical and environmental too.

CHAPTER - 5

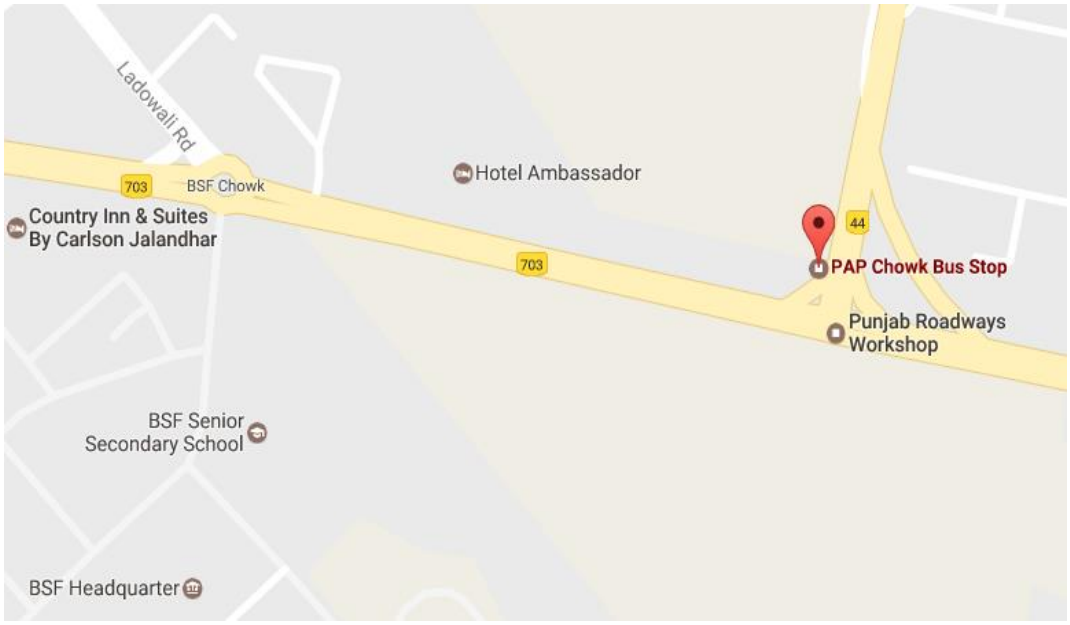
METHODOLOGY



5.1 Study Area

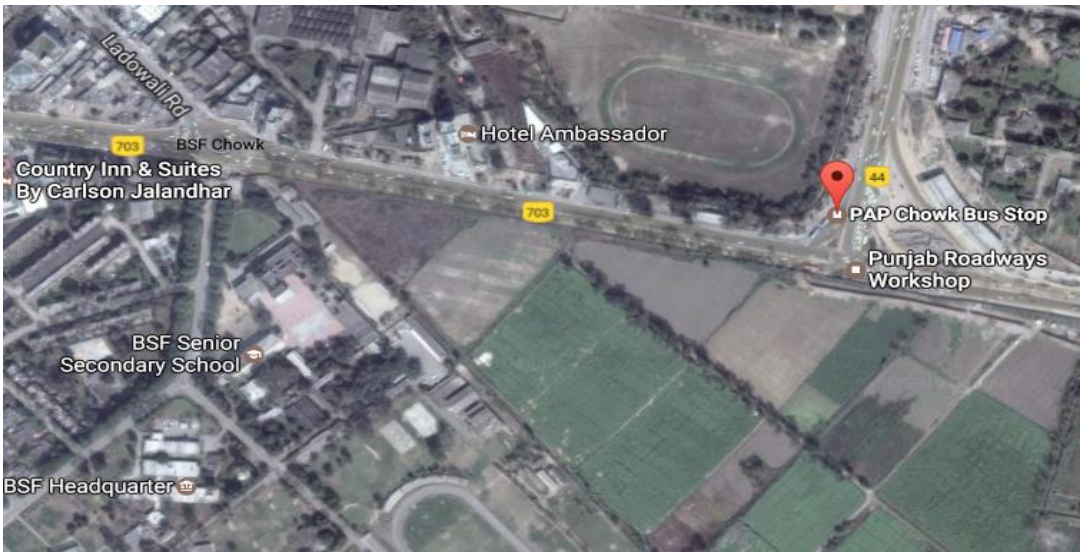
Total area of Jalandhar district is 706043 and the coordinates of Jalandhar is 31.3260° N, 75.5762° E total area of Jalandhar district is 3401 km^2 and elevation 228 m. The total number of register vehicles in Jalandhar is aprox.3 lakhs till 2011

5.1.1: Jalandhar district map



5.1.2: BSF Chowk to PAP Chowk map

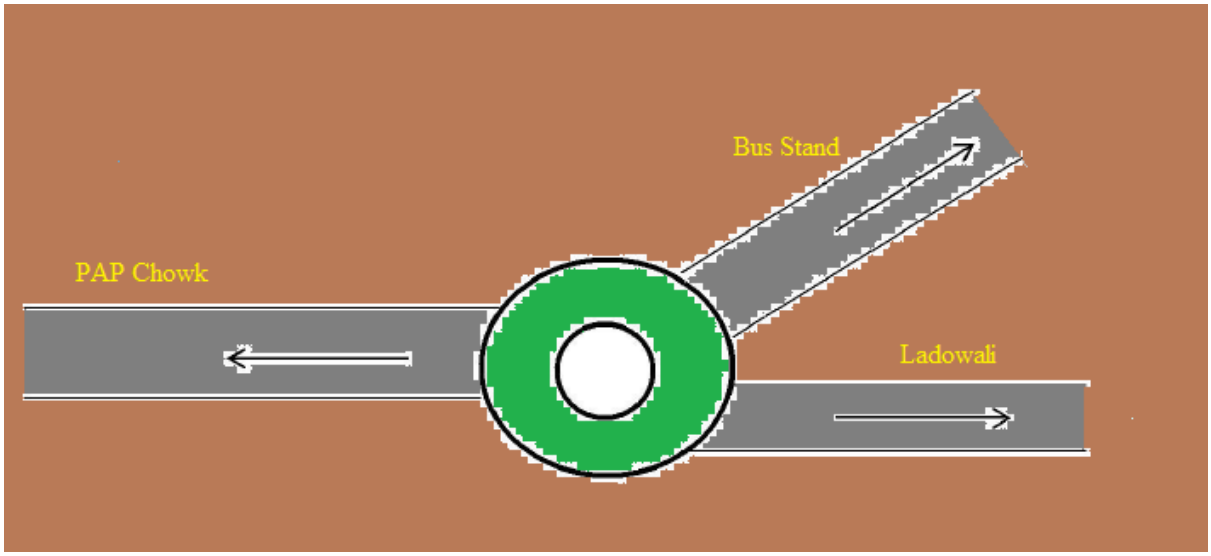
At BSF Chowk there is a rotary which is made to control the traffic volume but now a day traffic volume is increase in a huge amount.



5.1.3: Google earth map

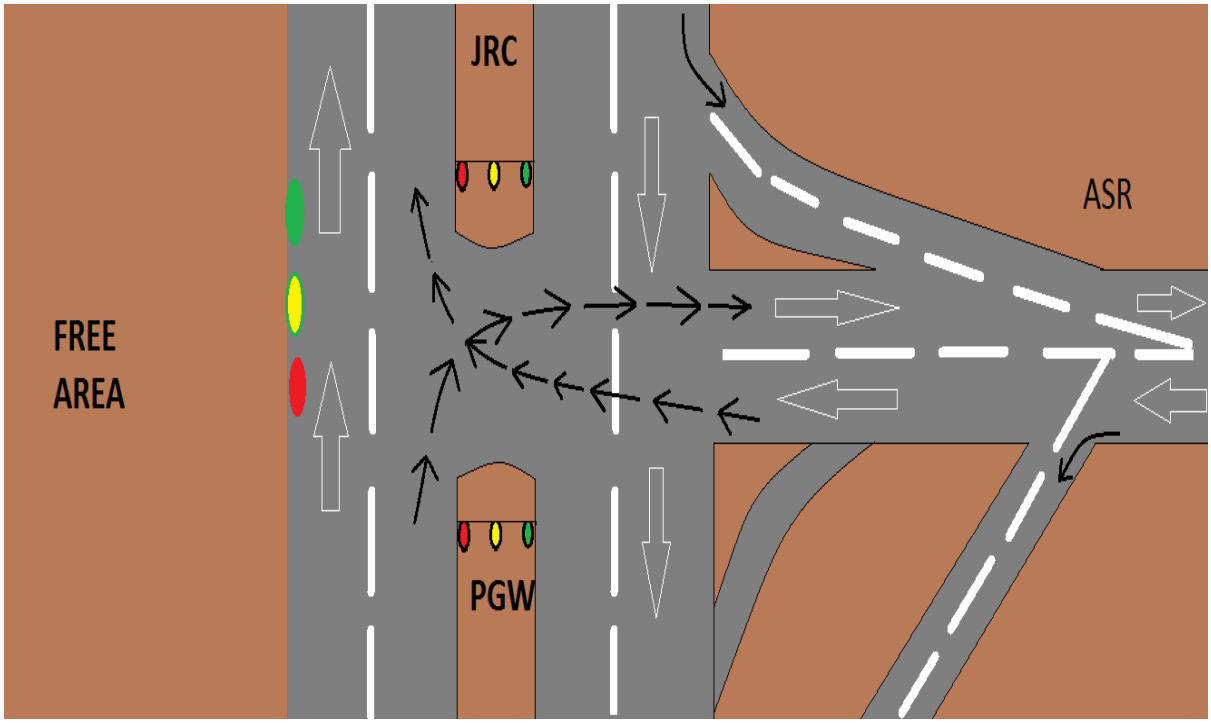
Layout of Study Area

BSF Chowk



5.1.4: BSF Chowk Layout

PAP Chowk



5.1.5: PAP Chowk

5.2 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
- 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.

Accident data is collected from the police station. Basically PAP chowk is under two police station.

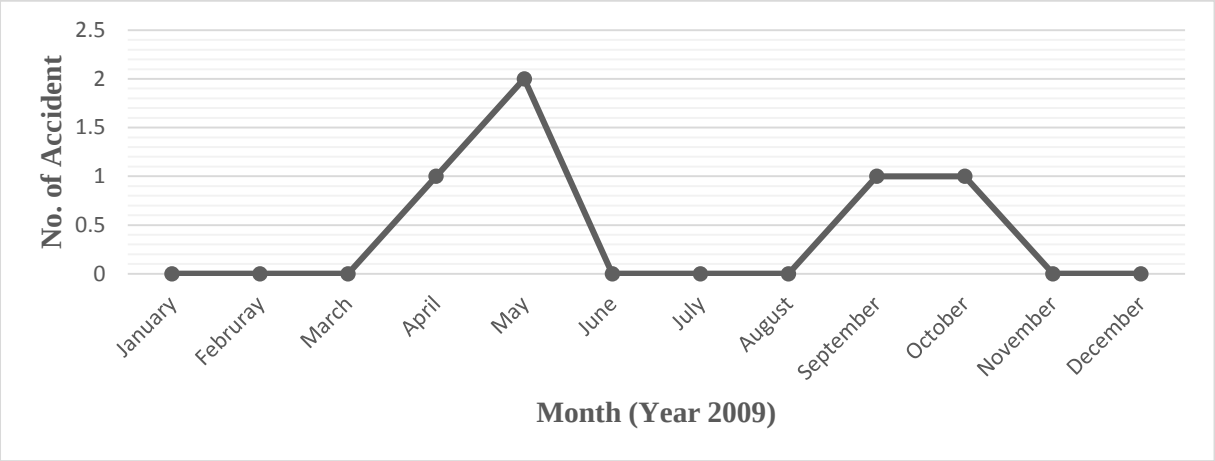
Accident at NH-44 (under Rama Mandi Division)

Table 5.2.1: Accident Data 2009

FIR Details	Accident Data	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, 337 IPC	13/02/2009	NH	0	0	0	0	1	1	0	0	Bus	Pedestrian
u/s 279, 427 IPC	15/02/2009	NH	0	0	0	0	0	0	0	0	Truck	Car
u/s 279, 337, 338 IPC	15/02/2009	NH	0	0	0	0	2	0	1	1	Truck	Pedestrian
u/s 279, 337, 338 IPC	21/03/2009	NH	0	0	0	0	2	1	1	0	Car	Cycle

u/s 279, 304A IPC	23/03/2009	NH	1	1	0	0	0	0	0	0	Car	Pedestrian
u/s 279, 304A, 427 IPC	13/04/2009	NH	1	0	0	1	0	0	0	0	Truck	Cycle
u/s 279, 427 IPC	01/07/2009	NH	0	0	0	0	1	1	0	0	Car	Cycle
u/s 279, 337, 338, 427 IPC	09/07/2009	NH	0	0	0	0	1	1	0	0	Car	Cycle
u/s 279, 337, 304A 427 IPC	20/07/2009	NH	1	0	1	0	0	0	0	0	Bus	Car
u/s 279, 337, 338 IPC	09/11/2009	NH	0	0	0	0	3	2	1	0	Truck	Car
u/s 279, 427 IPC	12/11/2009	NH	0	0	0	0	0	0	0	0	Bus	Car
u/s 279, 337 IPC	15/11/2009	NH	0	0	0	0	1	1	0	0	Car	M/C
u/s 279, 337, 338	19/11/2009	NH	0	0	0	0	1	1	0	0	Car	Cycle
u/s 279, 337, 338, 427 IPC	29/11/2009	NH	0	0	0	0	1	1	0	0	Mini Truck	Scooter

Accident Data 2009 **Source: Police Station (Jalandhar)**



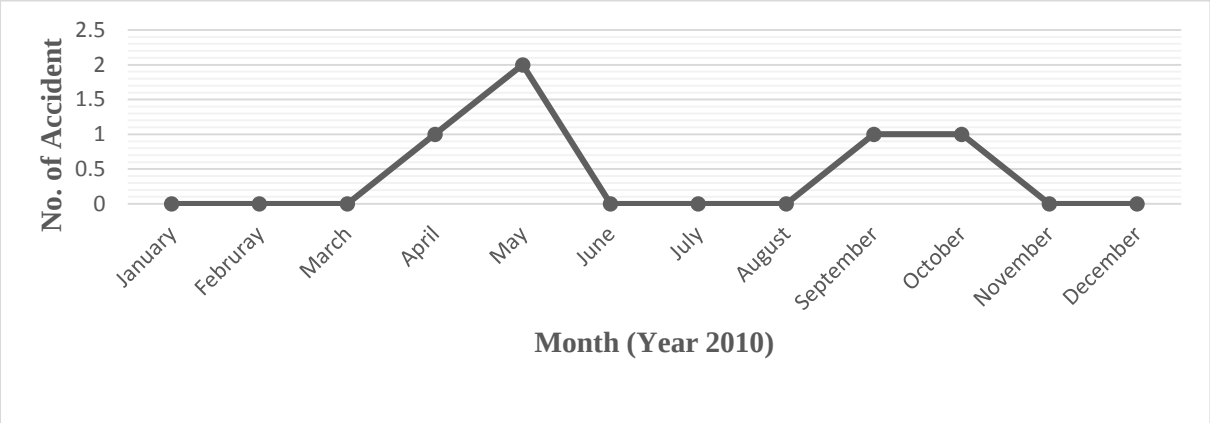
Accident Graph: 5.2.1

Table 5.2.2: Accident Data 2010

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	03/02/2010	NH	1	1	0	0	0	0	0	0	Truck	M/C
u/s 279, 337, 338 IPC	15/05/2010	NH	0	0	0	0	1	0	1	0	Car	M/C
u/s 279, 304 A IPC	09/07/2010	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 337, 338, 304 A IPC	29/07/2010	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 337, 338, 427,	18/08/2010	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian

304 A IPC												
u/s 279, 304 A IPC	11/09/2010	NH	1	0	1	0	0	0	0	0	Truck	M/C

Accident Data 2010 **Source: Police Station (Jalandhar)**



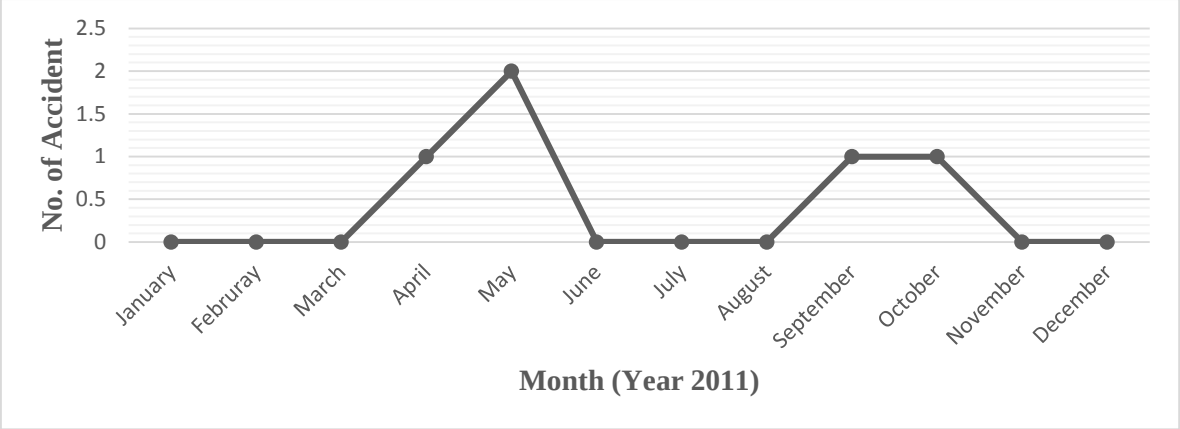
Accident Graph: 5.2.2

Table 5.2.3: Accident Data 2011

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	20/02/2011	NH	1	0	0	1	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 427 IPC	13/06/2011	NH	0	0	0	0	0	0	0	0	Car	Car
u/s 279, 304 A, 337,	04/07/2011	NH	1	0	1	0	0	0	0	0	Truck	Pedestrian

338 IPC												
u/s 279, 337, 33304A IPC	17/07/2011	NH	1	0	1	0	0	0	0	0	Bus	Pedestrian
u/s 279, 304 A IPC	27/07/2011	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 304 A, 337, 338 IPC	01/08/2011	NH	0	0	0	0	1	1	0	0	Car	Scooter
u/s 279, 337, 427 IPC	28/08/2011	NH	0	0	0	0	1	1	0	0	Bus	M/C
u/s 279, 304 A IPC	12/09/2011	NH	1	0	1	0	0	0	0	0	Army Truck	Scooter
u/s 279, 337, 338, 427 IPC	08/10/2011	NH	0	0	0	0	1	1	0	0	Mini Truck	Mini Truck
u/s 279, 337, IPC	17/11/2011	NH	0	0	0	0	1	1	0	0	Mini Truck	M/C

Accident Data 2011 **Source: Police Station (Jalandhar)**



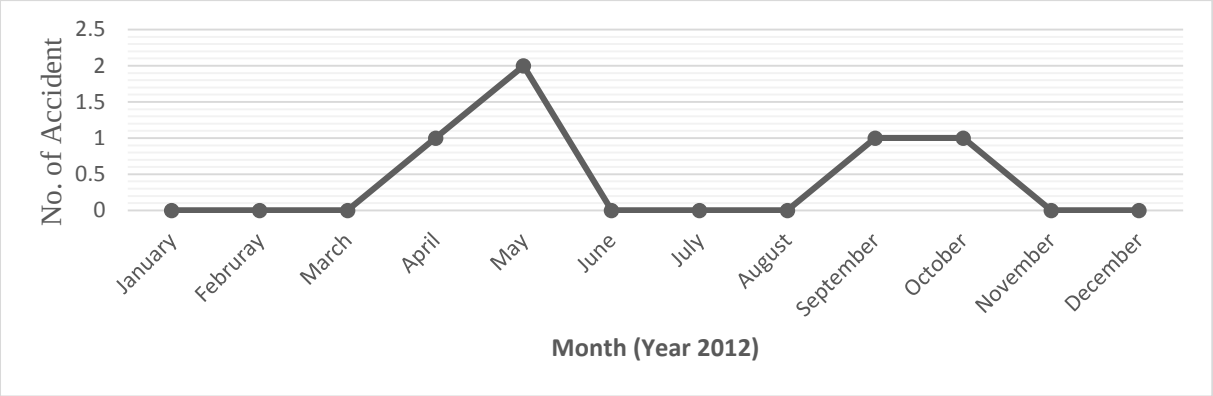
Accident Graph: 5.2.3

Table 5.2.4: Accident Data 2012

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, 337, 338, 427 IPC	10/02/2012	NH	0	0	0	0	1	1	0	0	Car Tata Safari	Cycle
u/s 279, 427 IPC	17/02/2012	NH	0	0	0	0	0	0	0	0	Truck	Car
u/s 279, 304 A, 337, 338 IPC	08/04/2012	NH	1	1	0	0	0	0	0	0	Truck	M/C
u/s 279, 337, 338 427, 304 A IPC	14/07/2012	NH	1	1	0	0	0	0	0	0	Car	M/C
u/s 279, 427, 304	31/07/2012	NH	1	1	0	0	0	0	0	0	Truck	Cycle

A IPC												
u/s 279, 337, 338, 427, 304 A IPC	10/11/2012	NH	2	1	1	0	0	0	0	0	Truck	Car
u/s 279, 304 A	06/12/2012	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian

Accident Data 2012 **Source: Police Station (Jalandhar)**



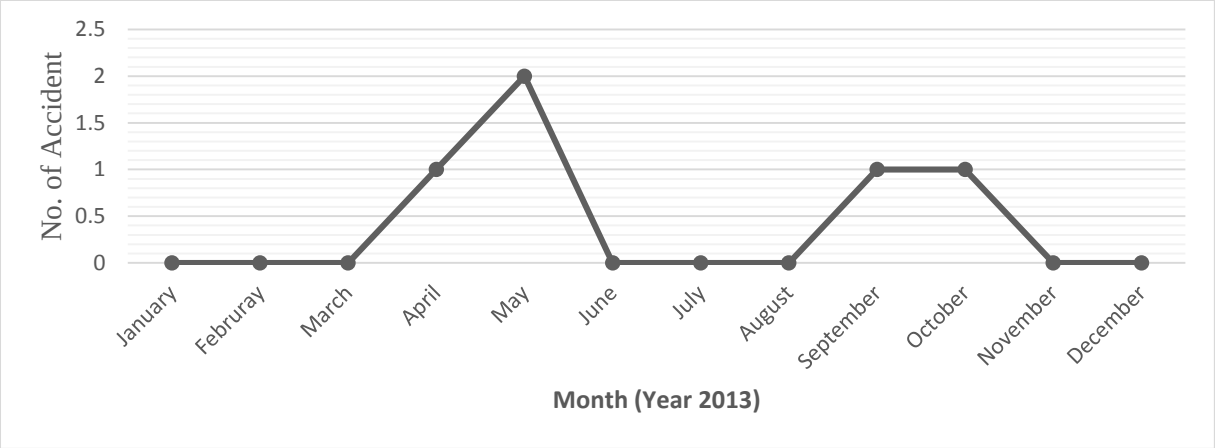
Accident Graph: 5.2.4

Table 5.2.5: Accident Data 2013

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	02/02/2013	NH	1	1	0	0	0	0	0	0	Truck	Pedestrian
u/s 279, 304 A IPC	23/03/2013	NH	1	1	0	0	0	0	0	0	Truck	M/C
u/s 279,	10/07/2013	NH	0	0	0	0	1	0	1	0	Truck	Scooter

337, 338 IPC												
u/s 279, 337, 338 427, 304 A IPC	14/08/2013	NH	1	1	0	0	0	0	0	0	Car	M/C

Accident Data 2013 **Source: Police Station (Jalandhar)**



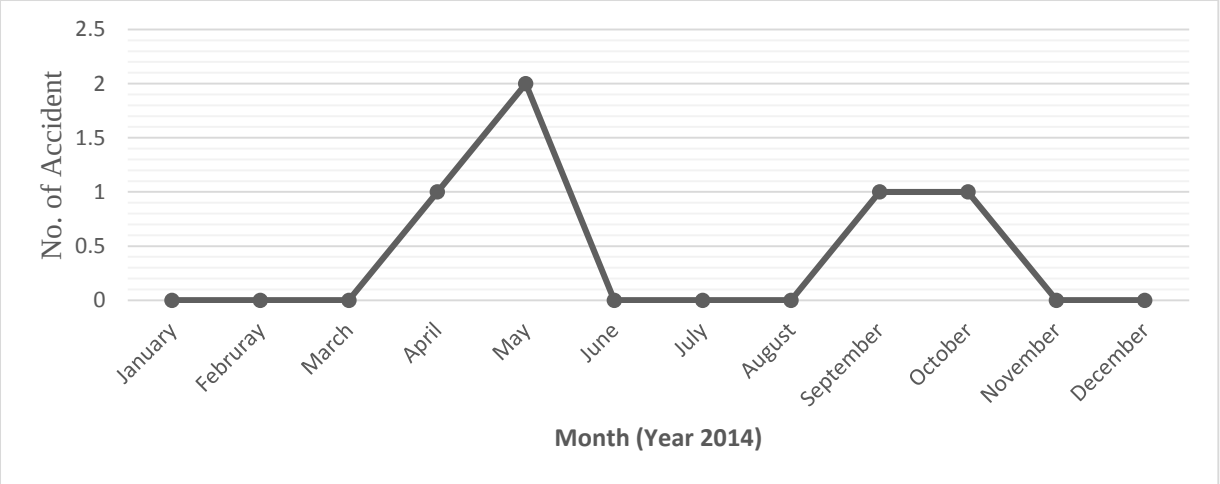
Accident Graph: 5.2.5

Table 5.2.6: Accident Data 2014

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, 427 IPC	29/01/2014	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	M/C
u/s 279, 427, 304 A IPC	20/02/2014	NH	1	1	0	0	0	0	0	0	Truck	M/C
u/s 279, 304	16/04/2014	NH	2	0	1	1	0	0	0	0	Truck	M/C

A, IPC												
u/s 279, 337, 338 427, IPC	16/08/2014	NH	0	0	0	0	2	1	1	0	Car	Car
u/s 279, 427, 337, 338 IPC	27/08/2014	NH	0	0	0	0	3	3	0	0	Truck	Zypsy
u/s 279, 337, 304 A IPC	08/11/2014	NH	1	1	0	0	0	0	0	0	Truck	Pedestrian

Accident Data 2014 **Source: Police Station (Jalandhar)**



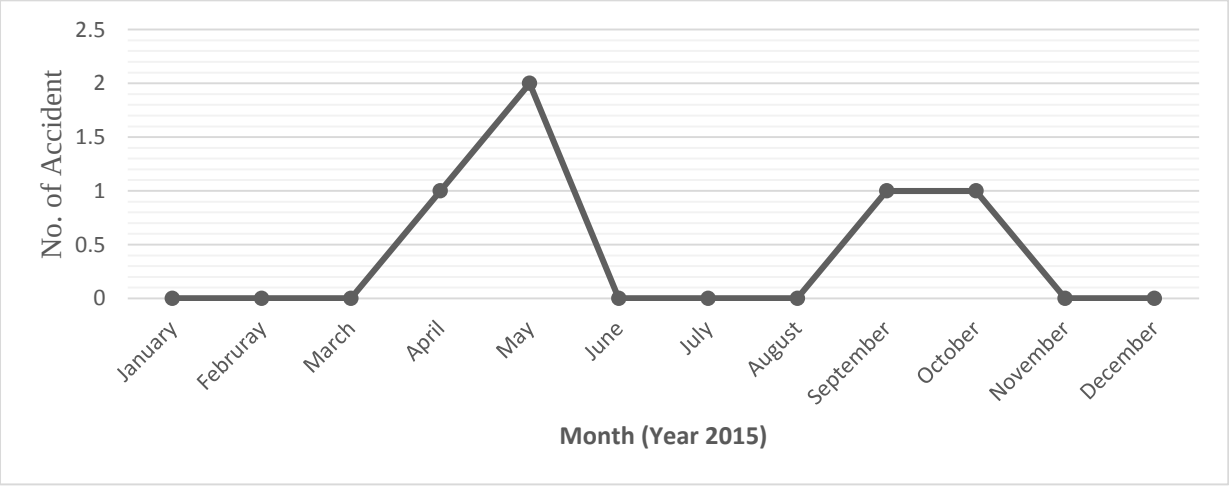
Accident Graph: 5.2.6

Table 5.2.7: Accident Data 2015

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,	18/10/2015	NH	1	1	0	0	1	0	1	0	Truck	M/C

427 IPC												
u/s 279, 427, 304 A IPC	18/10/2015	NH	1	1	0	0	0	0	0	0	Bus	Activa
u/s 279, 337, 338 IPC	25/10/2015	NH	0	0	0	0	1	1	0	0	Bus	Pedestrian
u/s 279, 337, 338 427, 304 A IPC	26/10/2015	NH	1	1	0	0	0	0	0	0	Truck	Activa
u/s 279, 427, 304 A IPC	10/11/2015	NH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 337, 338, 427, IPC	10/11/2015	NH	0	0	0	0	2	1	1	0	Truck	Car

Accident Data 2015 **Source: Police Station (Jalandhar)**

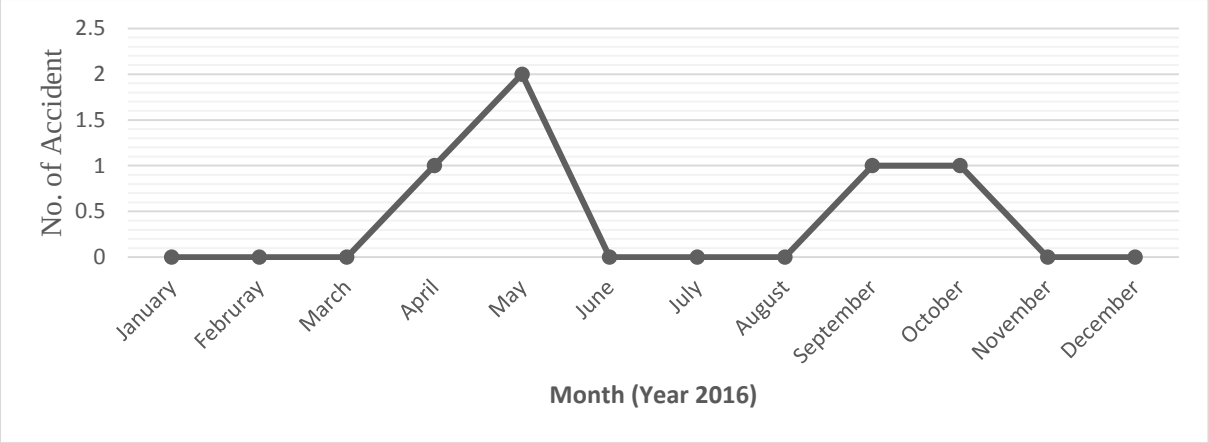


Accident Graph: 5.2.7

Table 5.2.8: Accident Data 2016

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, 337, 338, 427, 304 A IPC	20/04/2016	NH	1	1	0	0	0	0	0	0	Car	Pedestrian
u/s 279, 427, 304 A IPC	26/05/2016	NH	1	1	0	0	0	0	0	0	Bus	Pedestrian
u/s 279, IPC	26/05/2016	NH	0	0	0	0	0	0	0	0	Truck	Car
u/s 279, 337, 338 427, 304 A IPC	18/09/2016	NH	1	0	1	0	1	1	0	0	Bus	Activa
u/s 279, 427, 304 A IPC	10/10/2016	NH	1	0	1	0	1	1	0	0	Truck	M/C

Accident Data 2016 **Source: Police Station (Jalandhar)**



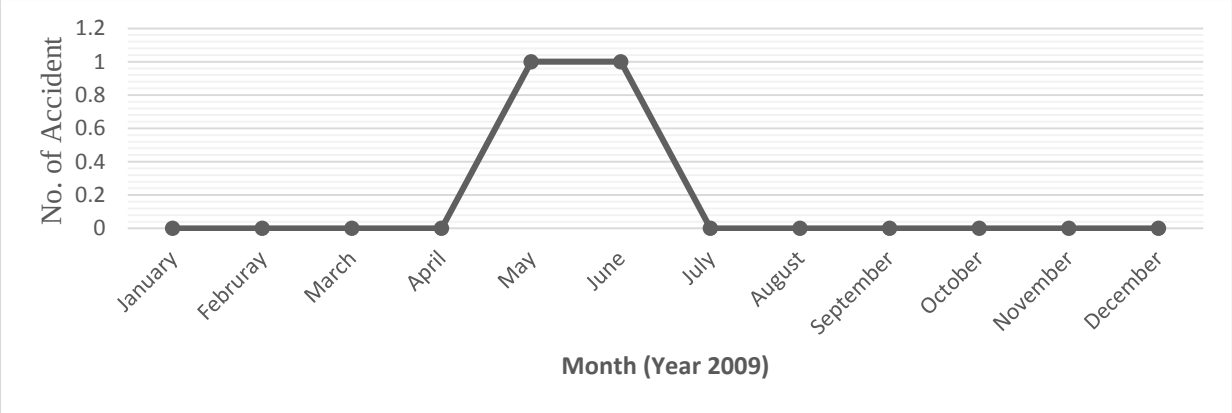
Accident Graph: 5.2.8

Accident Data at NH (under Division No.7 Jalandhar)

Table 5.2.9: Accident Data 2009

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, 337, 338, 427, 304 A IPC	17/10/2009	NH	1	1	0	0	1	0	1	0	Truck	Scooter
u/s 279, 427 IPC	15/12/2009	MCR	0	0	0	0	1	1	0	0	Car	M/C

Accident Data 2009 **Source: Police Station (Jalandhar Division 7)**

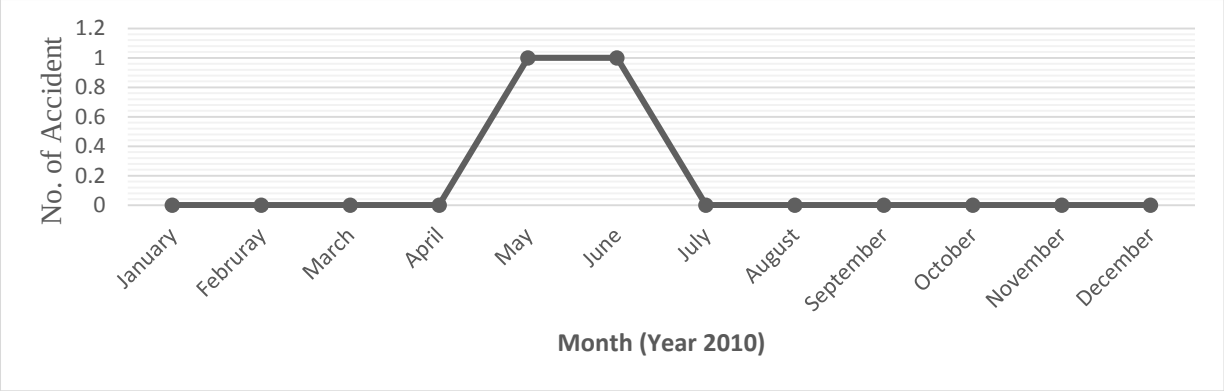


Accident Graph: 5.2.9

Table 5.2.10: Accident Data 2010

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	15/03/2010	MCR	1	1	0	0	0	0	0	0	Bus	Non-Motorized Vehicle
u/s 279, 337, 338, 427, IPC	17/06/2010	MCR	0	0	0	0	1	1	0	0	Bus	Scooter
u/s 279, 304 A IPC	22/08/2010	MCR	1	1	0	0	3	3	0	0	Bus	Auto
u/s 279, 337, 338, 304 A IPC	01/11/2010	MDR	1	1	0	0	1	1	0	0	Bus	Non-Motorized Vehicle

Accident Data 2010 **Source: Police Station (Jalandhar Division 7)**

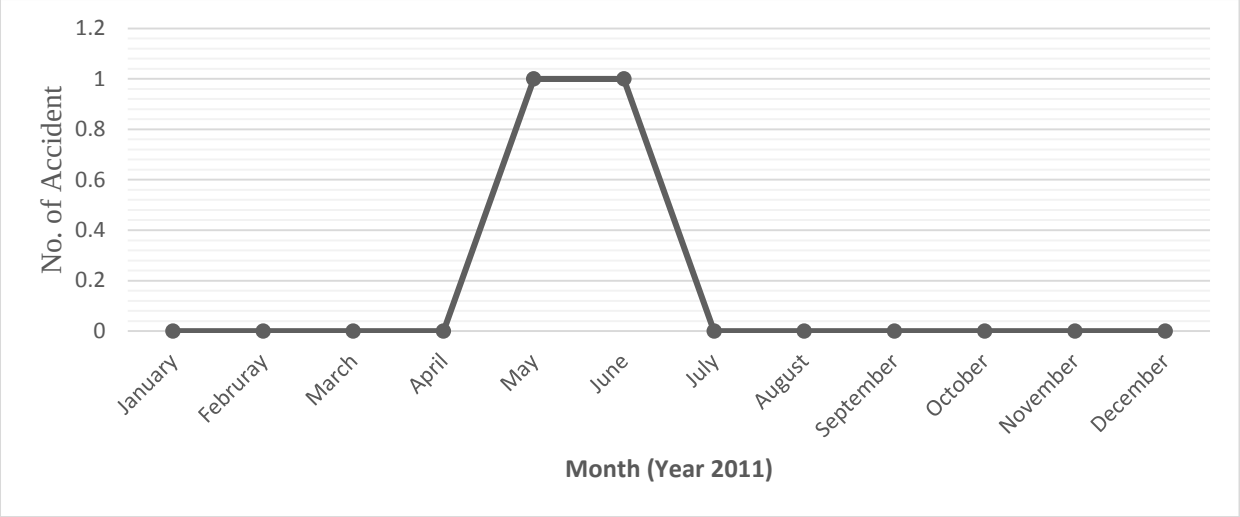


Accident Graph: 5.2.10

Table 5.2.11: Accident Data 2011

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, 337, 338, 427, IPC	08/01/2011	NH	0	0	0	0	1	1	0	0	Bus	M/C
u/s 279, 337, 338 IPC	03/04/2011	NH	0	0	0	0	1	1	0	0	Bus	Non-Motorized Vehicle
u/s 279, 337, 338 427, IPC	28/08/2011	NH	0	0	0	0	0	0	0	0	Truck	Car
u/s 279, 304 A IPC	15/11/2011	MDR	1	1	0	0	0	0	0	0	Bus	Non-Motorized Vehicle

Accident Data 2011 **Source: Police Station (Jalandhar Division 7)**

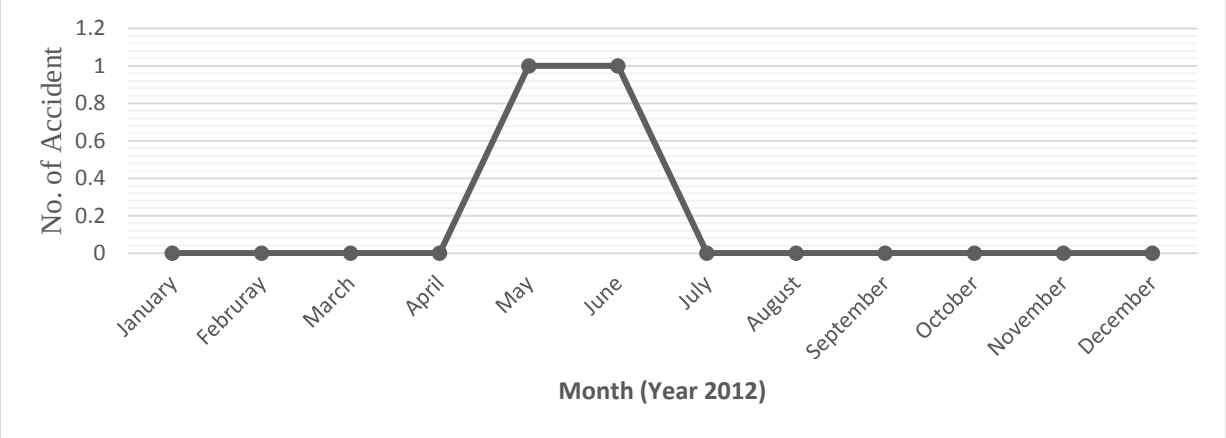


Accident Graph: 5.2.11

Table 5.2.12: Accident Data 2012

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, 427 IPC	03/01/2012	SH	0	0	0	0	0	0	0	0	Bus	Auto
u/s 279, 337, 304 A IPC	11/10/2012	MCR	1	0	1	0	0	0	0	0	Bus	M/C
u/s 279, 337, 304 A IPC	21/10/2012	MCR	1	1	0	0	0	0	0	0	Unknown Bus	Car
u/s 279, 337, 304 A IPC	10/11/2012	SH	1	1	0	0	1	1	0	0	Truck	Auto

Accident Data 2012 **Source: Police Station (Jalandhar Division 7)**



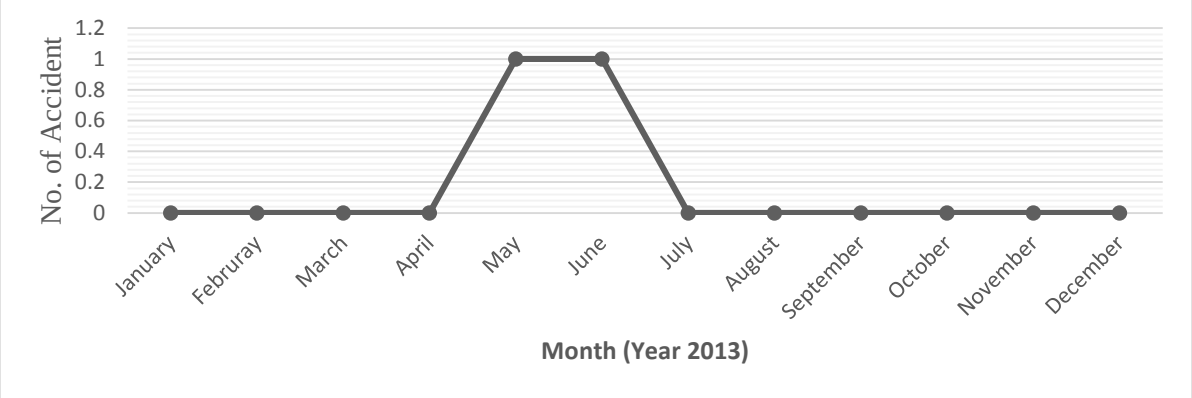
Accident Graph: 5.2.12

Table 5.2.13: Accident Data 2013

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	14/05/2013	SH	1	1	0	0	0	0	0	0	Unknown Vehicle	Pedestrian
u/s 279, 337, 338, 427 IPC	21/06/2013	MCR	0	0	0	0	1	1	0	0	Car	Activa
u/s 279, 304 A, IPC	27/06/2013	MCR	1	1	0	0	0	0	0	0	Tractor Trolly	M/C
u/s 279, 304 A IPC	29/06/2013	SH	1	1	0	0	0	0	0	0	Unknown Vehicle	M/C
u/s 279, 337, 338, 304 A IPC	13/08/2013	SH	1	1	0	0	0	0	0	0	Car	M/C

u/s 279, 304 A, 337, 338, 304 A IPC	03/09/2013	MCR	1	1	0	0	1	1	0	0	Bus	M/C
u/s 279, 304 A IPC	22/09/2013	SH	1	1	0	0	0	0	0	0	Bus	Pedestrian
u/s 279, 337, 338 IPC	22/12/2013	MCR	0	0	0	0	2	2	0	0	Car	Scooter
u/s 279, 337, 338, 427 IPC	28/12/2013	SH	0	0	0	0	1	1	0	0	Car	Activa

Accident Data 2013 **Source: Police Station (Jalandhar Division 7)**



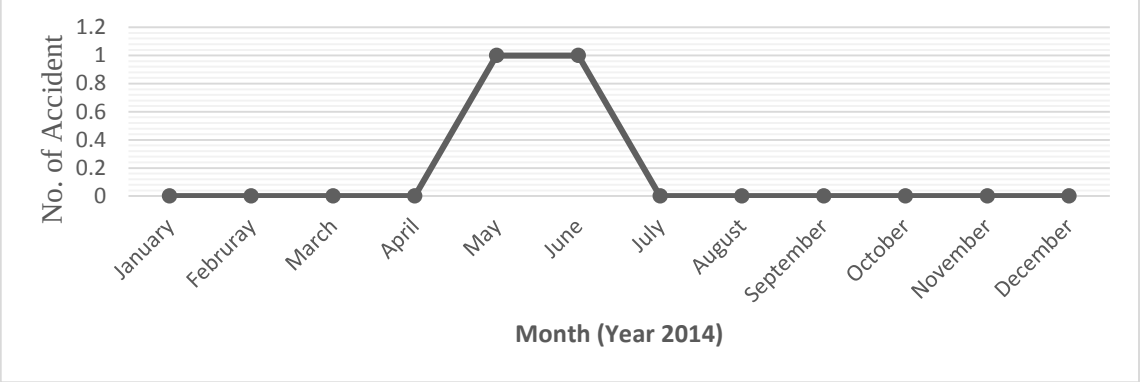
Accident Graph: 5.2.13

Table 5.2.14: Accident Data 2014

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,	13/05/2014	MCR	0	0	0	0	2	1	0	1	Bus	M/C

337, 338, 427 IPC												
u/s 279, 337, 338, 427 IPC	18/06/2014	MCR	0	0	0	0	1	1	0	0	Car	M/C

Accident Data 2014 **Source: Police Station (Jalandhar Division 7)**

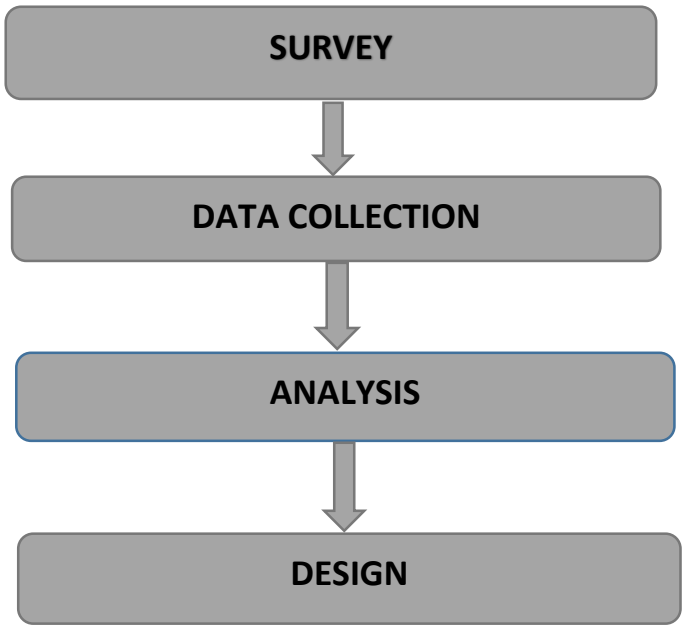


Accident Graph: 5.2.14

5.3 Investigation:

5.3.1 Field work: Field work is done by the surveyor**.** All the data collected by him/his self at the survey site.

Flow chart



Survey at site: Surveying the site area and calculate the traffic volume of the study area.

Data Collection: In this survey traffic volume data collected hourly for one week. Data is calculated by manually. With the help of this survey data we will analysis the traffic of different type of vehicles.

Analysis: After the collection of traffic data we will analyse the traffic volume and purposed a new design for PAP Chowk.

5.3.2 Terminology of Traffic volume

Average Daily Traffic (ADT)

In a given time period, more than one day and less than one year divided by the number of days in that time period is known as ADT.

These traffic volume data is collected by the method of video recording on a particular day

Table 5.3.1 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**

(Source: As per IRC)

All traffic volume data is collected from the survey site with the help of video as I already discuss above. After the evaluating these data it is converted into PCU/hr with the help of PUC value which is standard value which is recommended by the IRC. In this survey I will mention the peak hours and non-peaks hours which is very help to calculate the accuracy in the analysis and design.

According to standard PCU values which is given by IRC we will calculate the total number of PCU with the help of total number of traffic volume. PCU is calculated from the total number of vehicles as given below in the table.

Evaluating the Traffic Data

PCU of particular vehicle

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

= 891*0.5

= **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/hour**

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

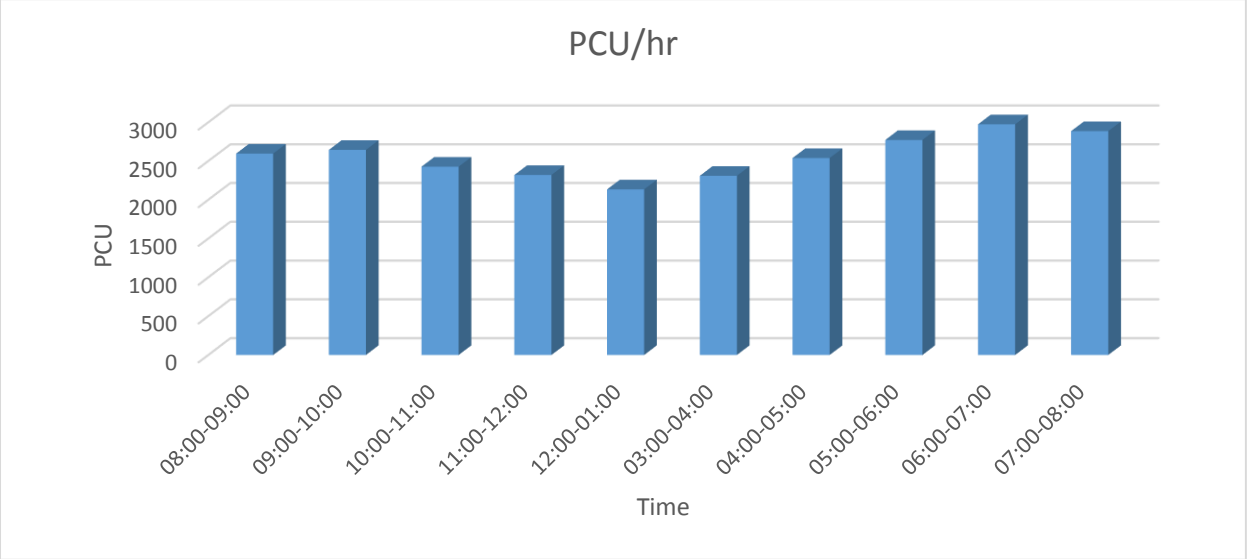
= **5184 PCU / hour**

Volumetric Data Collection at BSF Chowk

Table 5.3.2 (Traffic Data of Tuesday (28/03/2017))

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**



Graph: 5.3.1: PCU/hour

After the analysing the traffic data at BSF Chowk maximum PCU/hour = 2886

According to a survey of PCU for a rotary the it should not be exceed = 3000

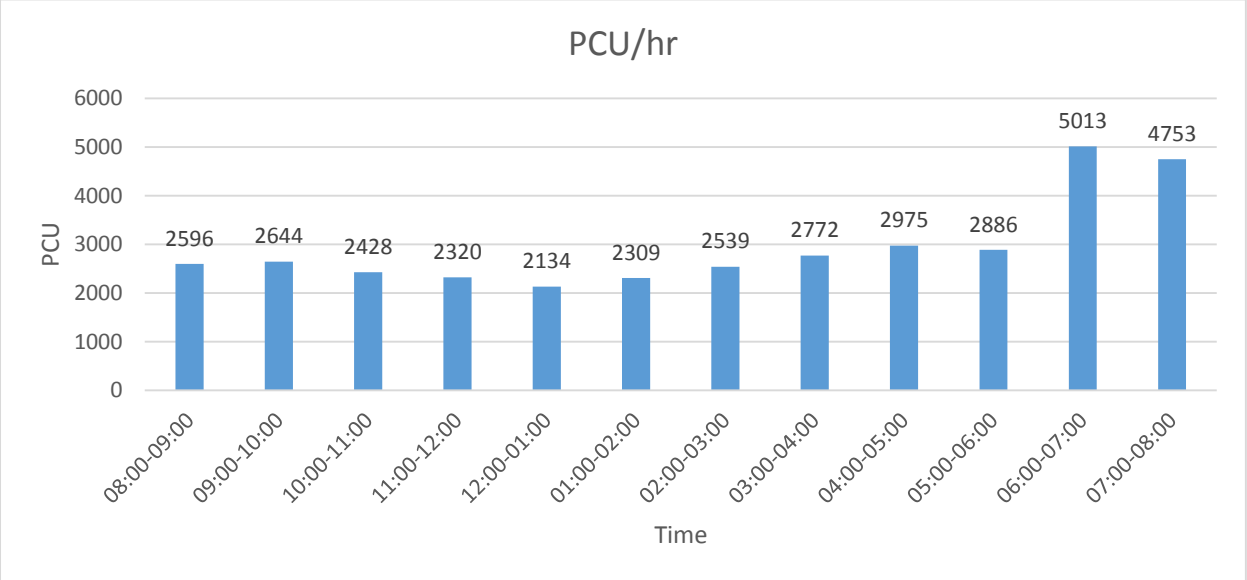
3000 > 2886

After the calculating the PCU/hour at BSF chowk rotary it is working there is no further improvement is required.

Volumetric data collection at PAP chowk

Table 5.3.3 (Traffic Data of Wednesday (05/04/2017))

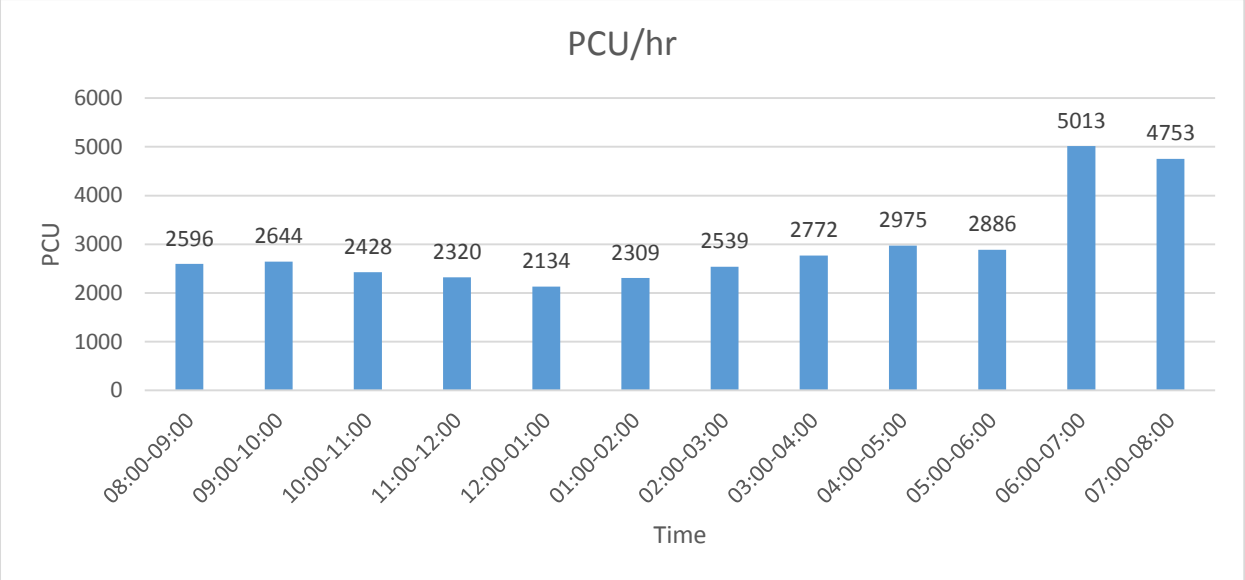
Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08-09	**802**	**575**	**2557**	**115**	**548**	**47**	**5313**
09-10	**891**	**585**	**2338**	**128**	**464**	**66**	**5184**
10-11	**858**	**578**	**1909**	**119**	**471**	**63**	**4723**
11-12	**817**	**558**	**1717**	**123**	**479**	**51**	**4529**
12-13	757	547	1743	113	468	43	4454
13-14	727	620	1795	117	456	40	4516
14-15	693	627	1809	113	470	48	4560
15-16	795	680	1895	119	413	80	4560
16-17	**855**	**755**	**2116**	**127**	**437**	**112**	**4979**
17-18	**955**	**861**	**2547**	**135**	**407**	**84**	**5435**
18-19	**825**	**754**	**2209**	**128**	**398**	**72**	**4914**
19-20	760	199	2095	119	409	39	4335
					Total		57502



Graph No. : 5.3.2: PCU/hour

Table 5.3.4 (Traffic Data of Thursday (06/04/2017))

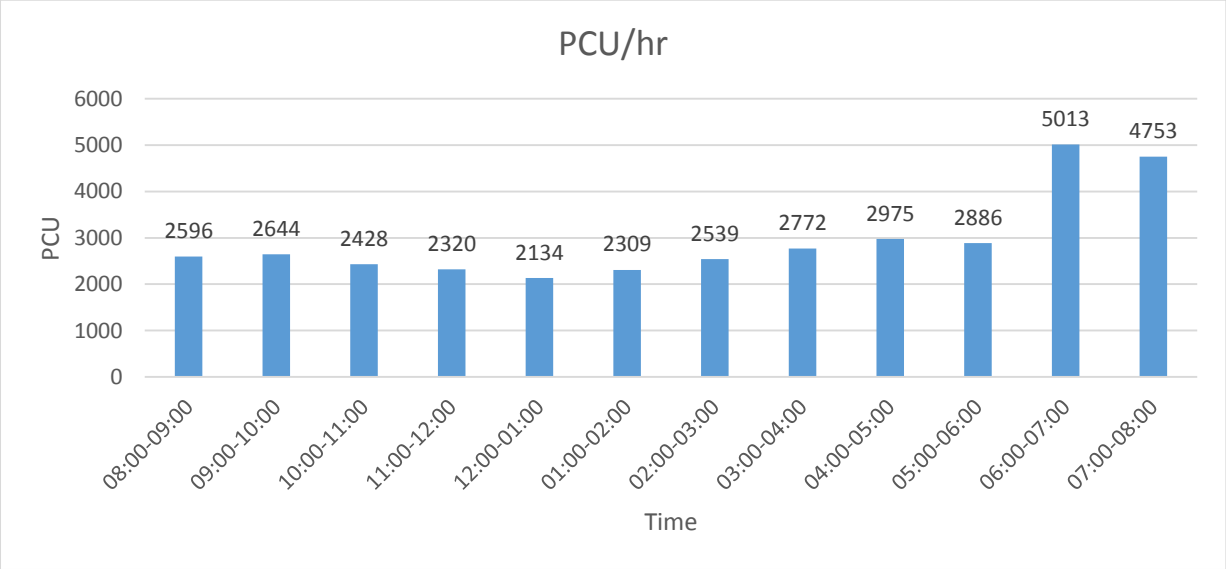
Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08-09	**968**	**515**	**2568**	**117**	**507**	**99**	**5516**
09-10	**907**	**583**	**1813**	**140**	**585**	**68**	**5102**
10-11	**893**	**586**	**1765**	**129**	**545**	**53**	**4882**
11-12	**858**	**565**	**1621**	**123**	**491**	**55**	**4502**
12-13	769	543	1605	107	472	38	4319
13-14	731	608	1795	119	466	40	4548
14-15	711	638	1775	127	434	49	4445
15-16	805	685	1798	125	409	78	4471
16-17	**875**	**768**	**1965**	**131**	**465**	**84**	**4949**
17-18	**965**	**855**	**2569**	**137**	**425**	**119**	**5524**
18-19	**865**	**754**	**2435**	**126**	**403**	**97**	**5178**
19-20	757	355	2107	117	396	76	4428
					Total		**57864**



Graph No. : 5.3.3: PCU/hour

Table 5.3.5 (Traffic Data of Friday (7/04/2017))

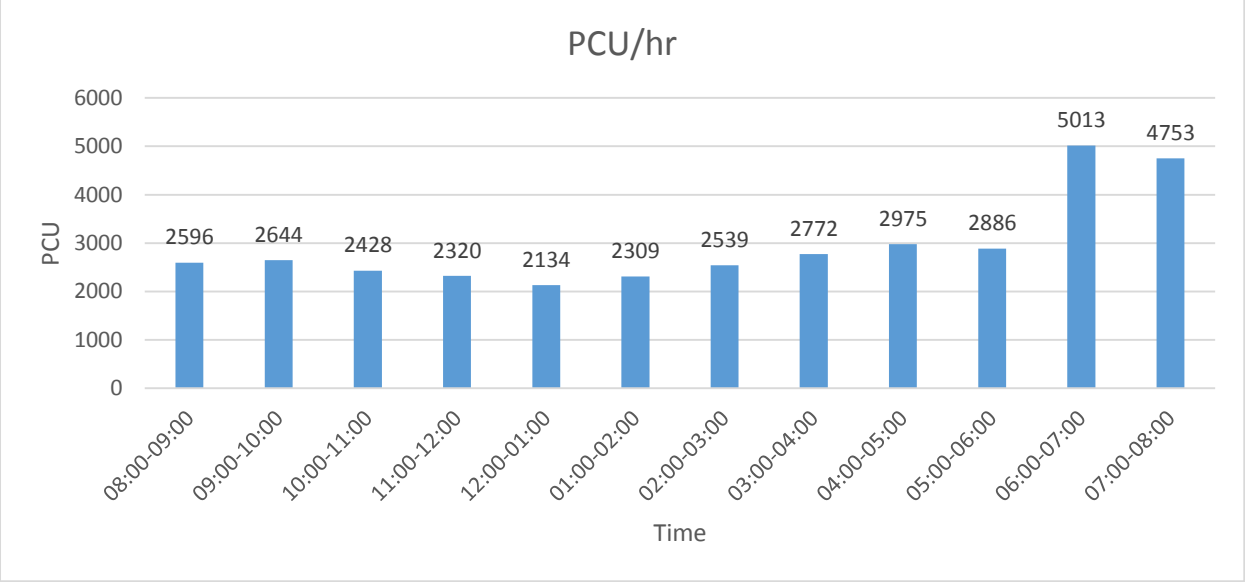
Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08-09	**898**	**568**	**2308**	**119**	**554**	**118**	**5050**
09-10	**889**	**591**	**1968**	**140**	**526**	**68**	**5436**
10-11	**868**	**577**	**1829**	**129**	**507**	**63**	**4795**
11-12	**889**	**568**	**1663**	**119**	**498**	**53**	**4577**
12-13	786	557	1625	115	495	44	4458
13-14	729	598	1695	121	461	48	4427
14-15	678	607	1756	127	434	38	4387
15-16	698	668	1895	125	409	82	4501
16-17	785	756	1936	131	465	119	4857
17-18	968	861	2567	138	425	116	5577
18-19	898	754	2268	134	403	98	5045
19-20	793	265	2097	121	411	45	4419
07-08	**768**	**498**	**2119**	**129**	**545**	**95**	**5112**
					Total		62641



Graph No. : **5.3.4: PCU/hour**

Table 5.3.6 (Traffic Data of Friday (14/04/2017))

Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08-09	**908**	**507**	**2108**	**128**	**547**	**119**	**5188**
09-10	**898**	**565**	**1914**	**127**	**515**	**69**	**4733**
10-11	**768**	**523**	**1745**	**116**	**493**	**61**	**4540**
11-12	**698**	**439**	**1735**	**118**	**491**	**49**	**4525**
12-13	691	427	1717	128	472	47	4451
13-14	678	413	1623	119	466	42	4194
14-15	669	437	1615	96	434	39	4037
15-16	657	459	1698	113	413	87	4105
16-17	**721**	**511**	**1968**	**126**	**465**	**95**	**4661**
17-18	**958**	**507**	**2396**	**113**	**425**	**119**	**5041**
18-19	**917**	**498**	**2124**	**128**	**409**	**94**	**4713**
19-20	798	309	1996	107	411	48	4326
					Total		**54514**

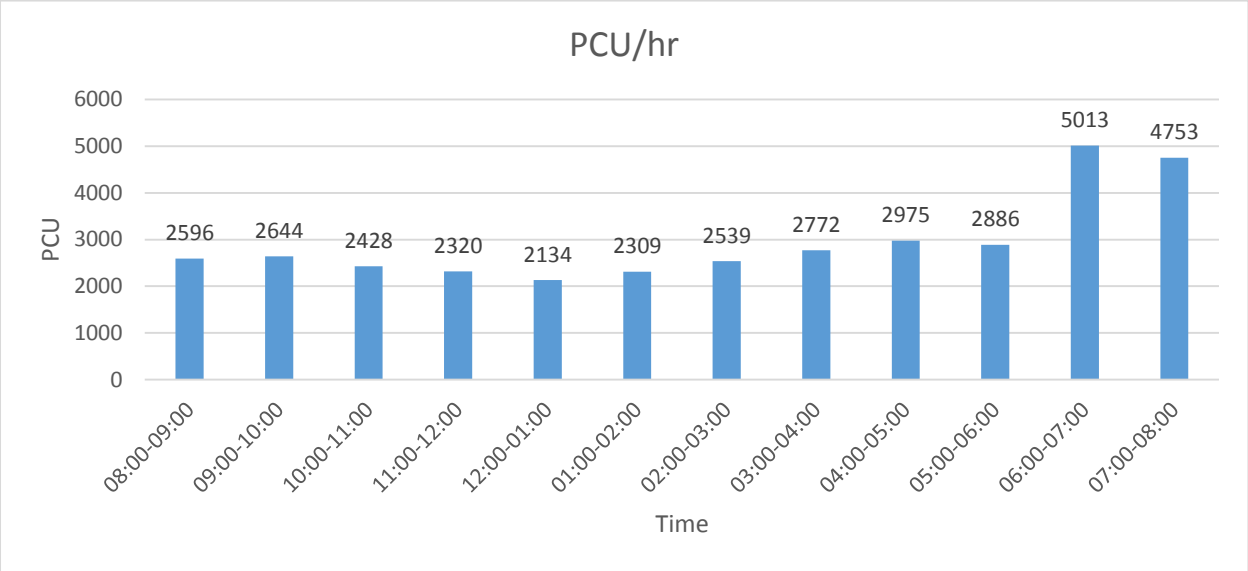


Graph No. : 5.3.5: PCU/hour

Table 5.3.7 (Traffic Data of Saturday (15/04/2017))

Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
07-08	629	357	1613	76	403	78	3806

08-09	**713**	**475**	**1567**	**98**	**498**	**95**	**4517**
09-10	**856**	**511**	**2109**	**131**	**531**	**73**	**5107**
10-11	**768**	**465**	**1921**	**125**	**511**	**62**	**4753**
11-12	**665**	**458**	**1828**	**124**	**498**	**43**	**4551**
12-13	637	448	1613	126	472	46	4228
13-14	511	451	1607	117	463	39	4109
14-15	597	437	1653	127	435	37	4173
15-16	627	418	1657	117	417	49	4221
16-17	**668**	**448**	**1819**	**119**	**486**	**29**	**4480**
17-18	**896**	**498**	**2516**	**128**	**498**	**115**	**5411**
18-19	**717**	**513**	**2295**	**113**	**401**	**112**	**4738**
19-20	658	192	1986	101	398	46	4107
					Total		58201

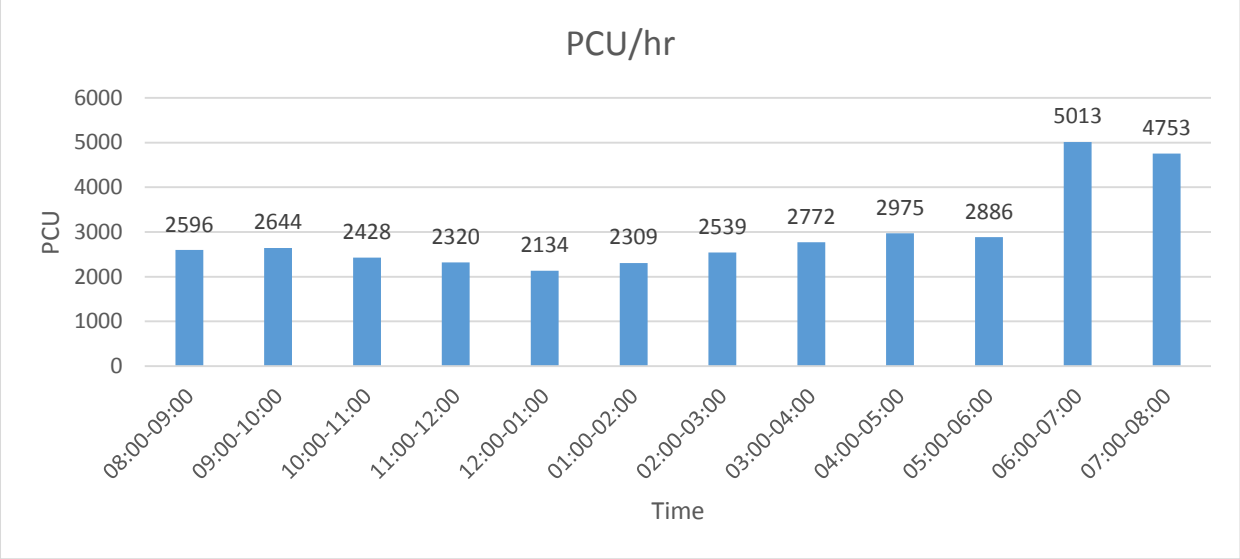


Graph No. : 5.3.6: PCU/hour

Table 5.3.8 (Traffic Data of Sunday (16/04/2017))

Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08-09	**759**	**485**	**1912**	**129**	**519**	**78**	**4795**
09-10	**717**	**498**	**1689**	**98**	**488**	**52**	**4370**
10-11	**698**	**456**	**1583**	**95**	**485**	**36**	**4211**
11-12	656	429	1454	84	481	30	4000
12-13	466	418	1478	78	472	32	3875
13-14	476	428	1341	77	463	40	3719
14-15	488	440	1253	71	445	48	3572

15-16	463	398	1147	68	427	80	3357
16-17	**498**	**456**	**1519**	**53**	**467**	**112**	**3906**
17-18	**512**	**498**	**1716**	**48**	**471**	**84**	**4141**
18-19	**598**	**496**	**1895**	**53**	**467**	**52**	**4342**
19-20	601	193	1686	61	421	40	3757
					Total		48045

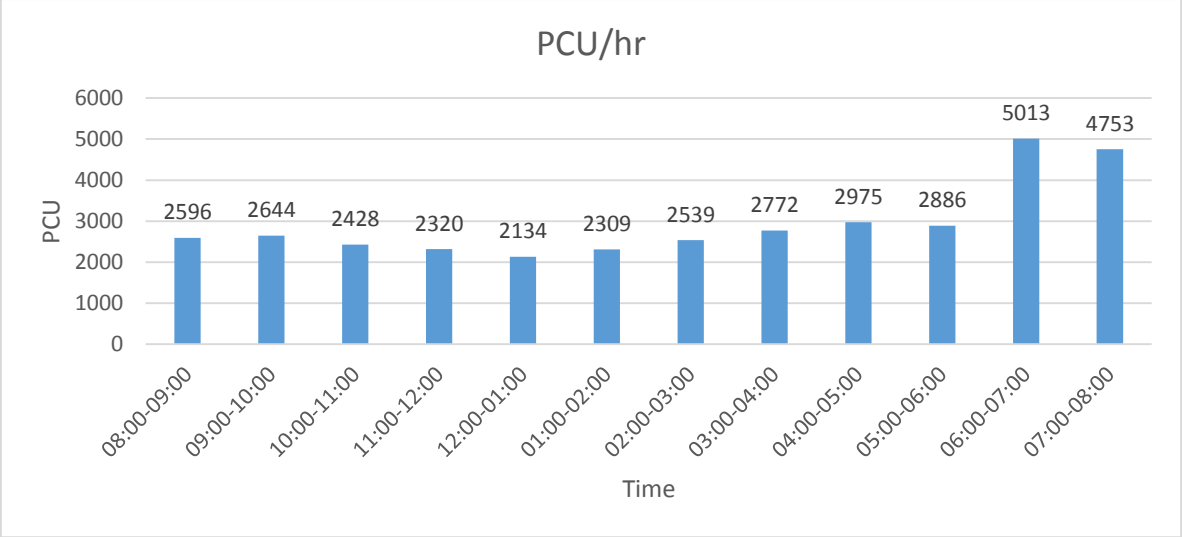


Graph No. : 5.3.7: PCU/hour

Table 5.3.9 (Traffic Data of Monday (17/04/2017))

Time	2 W	3 W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08-09	**802**	**514**	**2316**	**119**	**585**	**95**	**5457**
09-10	**782**	**519**	**2579**	**137**	**585**	**73**	**5549**
10-11	**745**	**483**	**2109**	**126**	**545**	**62**	**5056**
11-12	618	498	1883	118	491	43	4577
12-13	638	496	1643	128	472	37	4299
13-14	693	468	1634	119	466	39	4255
14-15	793	476	1616	128	434	37	4201
15-16	855	456	1737	121	437	49	4335
16-17	**955**	**498**	**1815**	**126**	**465**	**33**	**4602**
17-18	**825**	**508**	**2579**	**134**	**498**	**115**	**5459**
18-19	**760**	**467**	**2365**	**128**	**457**	**112**	**5013**
19-20	**778**	**478**	**2179**	**101**	**449**	**46**	**4753**
20-21	579	148	1890	95	407	31	3938
					Total		61494

Peak Hours show in the table in Red Colour



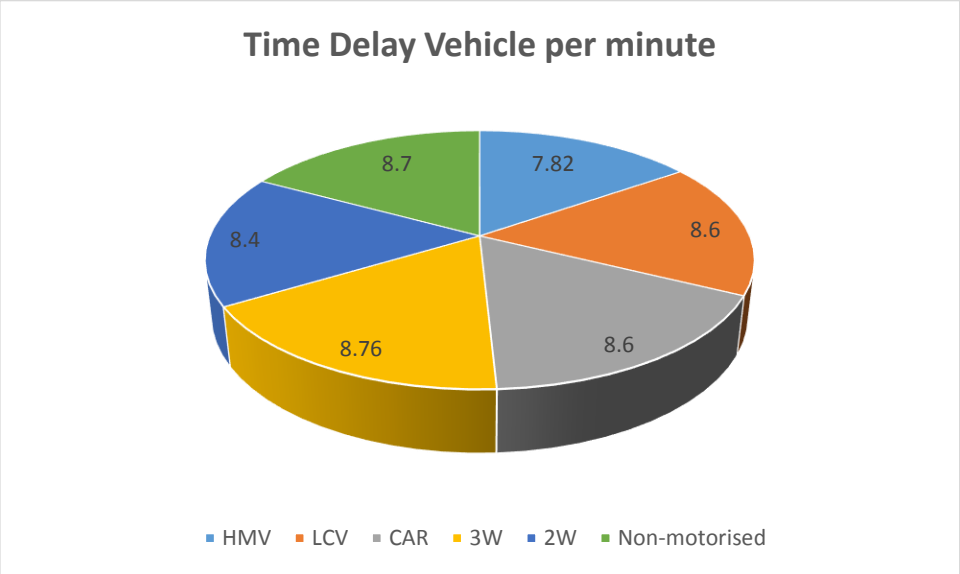
Graph No. : 5.3.8: PCU/hour

After the analyse of these surveying of traffic volume data we are able to calculate PCU/hour. We also able to evaluate the peak hour.

5.4 ECONOMIC ANALYSIS

Delay Vehicle per minute

Delay Vehicle per minute value as per IRC for different vehicle which is shown in Fig.No.13 delay time for vehicles for Non-motorised, 2W, 3W, Car, LCV, HMV are 8.7, 8.4, 8.76, 8.6, 8.6, 7.82.



5.4.1: Pie Chart for Time Delay

Occupancy of Vehicles

Table 5.4.1 (Standard Values of Occupancy of Vehicles)

Type of Vehicle	Occupancy
2W	1.8
3W	2.4
Car	1.4
LCV	1.4
HMV	64

Table 5.4.2: Delay in Vehicle per hour (Day 1)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	407	53.04	3394.56	1239014.4
LCV	135	19.35	27.09	9887.85
2W	955	140.7	253.26	92439.9
3W	861	125.7	301.68	110113.2
Car	2547	365.07	511.098	186550.77
Non-motorised	84	12.18	-	-
Total		716.04	4487.688	1638006.12

Table 5.4.3: Delay in Vehicle per hour (Day 2)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	507	66.07	4228.48	1543395.2
LCV	117	16.77	23.478	8569.47
2W	968	142.61	256.698	93694.77
3W	515	75.19	180.456	65866.44
Car	2568	368.08	515.312	188088.88
Non-motorised	99	14.35	-	-
Total		683.07	5204.424	1899614.76

Table 5.4.4: Delay in Vehicle per hour (Day 3)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	554	72.2	4620.8	1686592
LCV	119	17.0	23.8	8687
2W	898	132.3	238.14	86921.1
3W	568	85.5	205.2	74898
Car	2308	300.8	421.12	153708.8
Non-motorised	118	17.11	-	-
Total		624.91	5509.06	2010806.9

Table 5.4.5: Delay in Vehicle per hour (Day 4)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	547	71.30	4563.2	1665568
LCV	128	18.34	25.676	9371.74
2W	908	133.77	240.786	87886.89
3W	507	74.02	177.648	64841.52
Car	2108	302.14	422.996	154393.54
Non-motorised	119	17.25	-	-
Total		616.82	5430.306	1982061.69

Table 5.4.6: Delay in Vehicle per hour (Day 5)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	115	14.98	958.72	349932.8
LCV	128	18.34	25.676	9371.74
2W	896	132.01	237.618	86730.57
3W	498	72.70	174.48	63685.2
Car	2516	360.62	504.868	184276.82
Non-motorised	115	16.67	-	-
Total		615.32	1901.362	693997.13

Table 5.4.7: Delay in Vehicle per hour (Day 6)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	519	67.64	4328.96	1580070.4
LCV	129	18.49	25.886	9448.39
2W	759	111.82	201.276	73465.74
3W	485	70.81	169.944	62029.56
Car	1912	274.05	383.67	140039.55
Non-motorised	78	11.31	-	-
Total		554.12	5109.736	1865053.64

Table 5.4.8: Delay in Vehicle per hour (Day 7)

Type of Vehicle	No. of Vehicles	Delay in terms of PCU/hr	Delay in passenger hours per day	Delay in passenger hours per year
HMV	585	76.24	4879.36	1780966.4
LCV	137	19.63	27.482	100030.93
2W	782	115.21	207.378	75692.97
3W	519	75.77	181.848	66374.52
Car	2579	369.65	517.51	188891.15
Non-motorised	73	10.58	-	-
Total		667.08	5813.578	2211955.97

Delay in Vehicles in terms of PCU per hour = (Total no. of heavy vehicles * Delay time per minute) / 60

= (585 * 7.82) / 60

= 4879.36

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

= 64*4879.36

= **1780966.4 hours per day**

5.5 Idle fuel consumption

Table 5.5.1: Standard Values for fuel consumption

Type of Vehicle	**Idle fuel consumption**
2 – wheelers	0.34
3 – wheelers	0.42
Cars	0.54
HMV	0.86
LCV	0.69

(Source: PCRA study 1996)

"Based on traffic flow analysis and delay characteristics at the intersection, it has been workout that on an average daily 59012.7 litres of petrol and 111404.9 litres of diesel is estimated to be wasted due to idling of vehicles. (Source: **PCRA study 2010**). The table depict the Average Fuel Loss per day on each category of the traffic intersection".

PCRA (Petroleum Conservation Research Association)

Table 5.5.2: Total Fuel Consumption, Cost and Emission of Delay Vehicles at Study Area

Fuel	Litres/year	Rs./Litre	Amount in Rupees per year
Petrol	59012.7	73.41	4332122.307
Diesel	111404.9	57.12	6363447.888
Total			**10695570.2**

Table 5.5.3: Time travel saving in Rupees

Type of Vehicle	Time travel saving in rupees/passenger-hour
2W	62.48
3W	34.81
Car	10.23
Bus	10.23

(Source: **DMCR study**)

Table 5.5.4: Evaluation of Time travel

Type of vehicle	Time travel saving in rupees/passenger-hour	Delay in passenger per year	Time travel saving in rupees per year
HMV	10.23	1780966.4	18219286.27
LCV	10.23	100030.93	1023316.414
2W	62.48	75692.97	4729296.766

3W	34.81	66374.52	2310512.706
Car	10.23	188891.15	1932356.465
Non-motorised		-	-
Total			**28214768.62**

Economic calculation

As per NHAI 4 lane highway flexible pavement construction cost = 8 to 9 cr.

Total length is required to construct = 70m

Cost of construction of flexible road = Rs.5600000

Benefit Cost Ration: It should always come more than 1

After the calculating of above economic we are able to calculate the **Benefit cost ratio**

Benefit cost ratio = (Time travel + Fuel Consumption)/ cost of construction of road

= (28214768.62+10695570.2)/5600000

= 38910338.82/5600000

= 6.94

Benefit cost ratio is coming = **6.94**

Benefit cost ratio should be always more than 1 as we already discuss, after the calculating the benefit cost ratio we able to find that our project is perfect to construct over the survey site.

Benefit cost ratio >1

With the help of traffic flow analysis it shows that the traffic is too crowed at chowk. Due to heavy traffic vehicles are delayed at red light signals and it increases congestion and wastage of fuel.

Also we can easily found that the peak hours and non-peak hours

5.6 Purposed Design at PAP Chowk

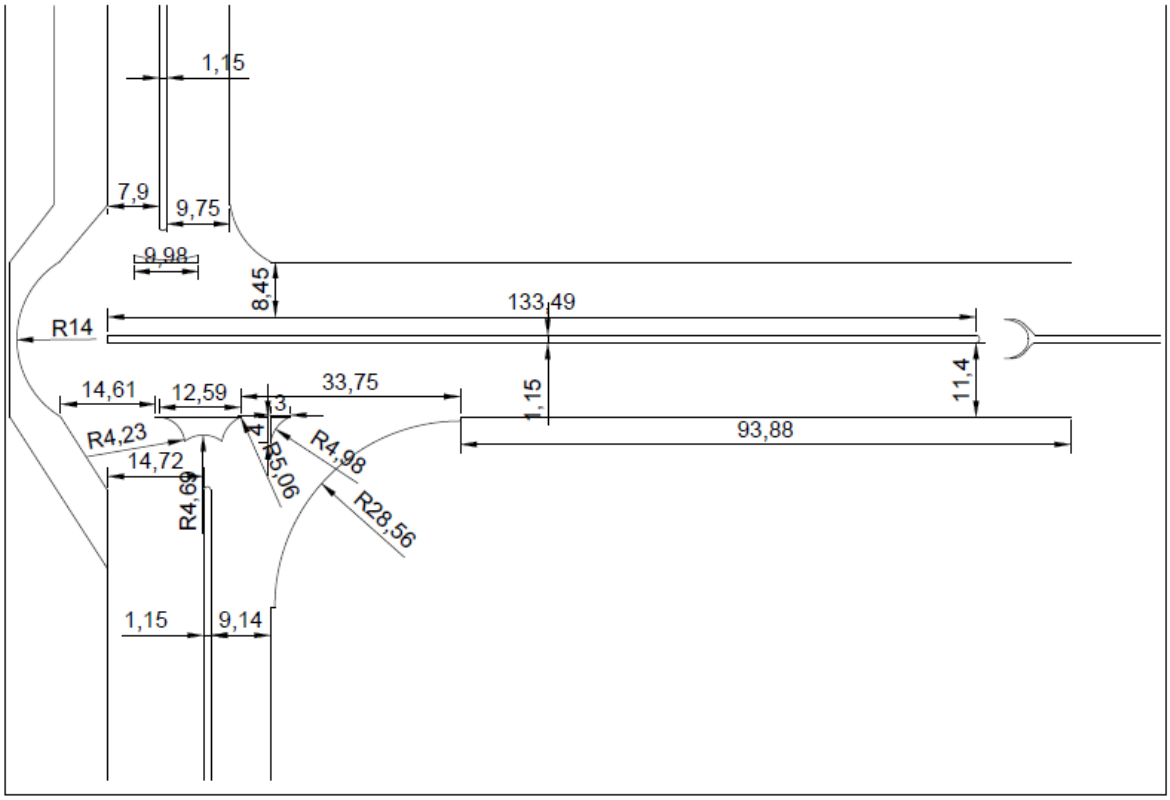
After the analysing the traffic flow conditions of current design/ status of intersection, I would like to purposed a rotary design for intersection which will very helpful to reduce measure conflict point, complicated traffic flow. This design will be based on current traffic volume at intersection.

Advantages of purposed design

1. It will reduce traffic chaos.
2. This design might be helpful to remove the traffic signals from the intersection.

3. Removal of traffic signals leads to saving in fuel consumption and reduced wastage of time.

5.6.1 Purposed Design



5.6.1: Purposed Design

5.6.2: Dimensions calculations for new Design

1. **Turning radius**
2. **Weaving length and weaving section**
3. **Capacity of rotary**

5.6.3: Minimum turning radius for bus and truck

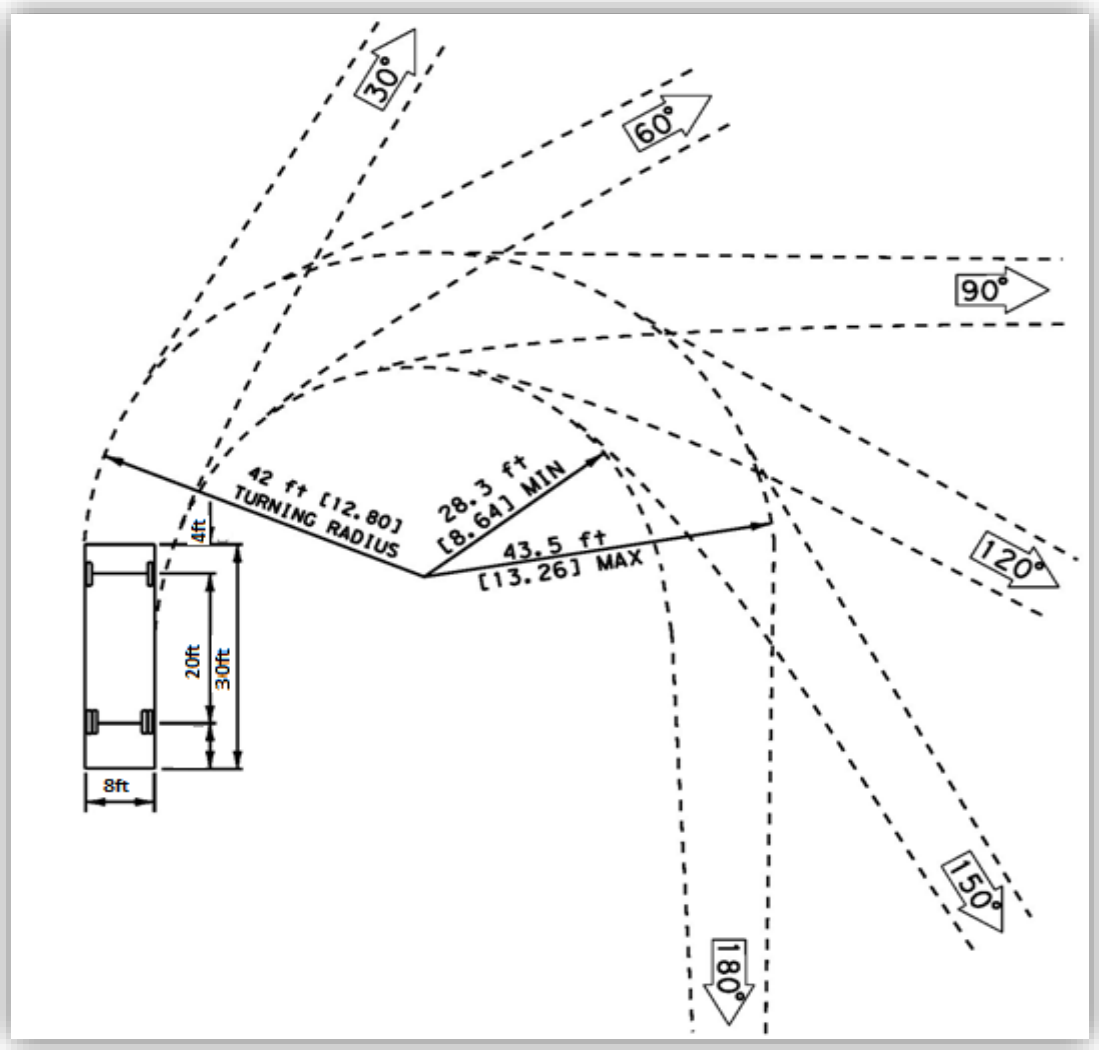
Minimum turning radius is required with wheel base:

Turning radius for bus: 40 feet (12.2m)
Turning radius for truck: 50 feet(15.24m)
Turning radius for Semi-trailer: 62 feet (18.9m)
Turning Radius for double trailer: 67 feet(20.43)

These values are provided by AASHTO (American Association of State Highways and Transportation Official) which is a policy for geometric design of highways and streets as well.

5.6.4: Turning radius for single unit truck

Turning radius for wheelbase (Single Unit)



5.6.2: Turning radius for single unit truck

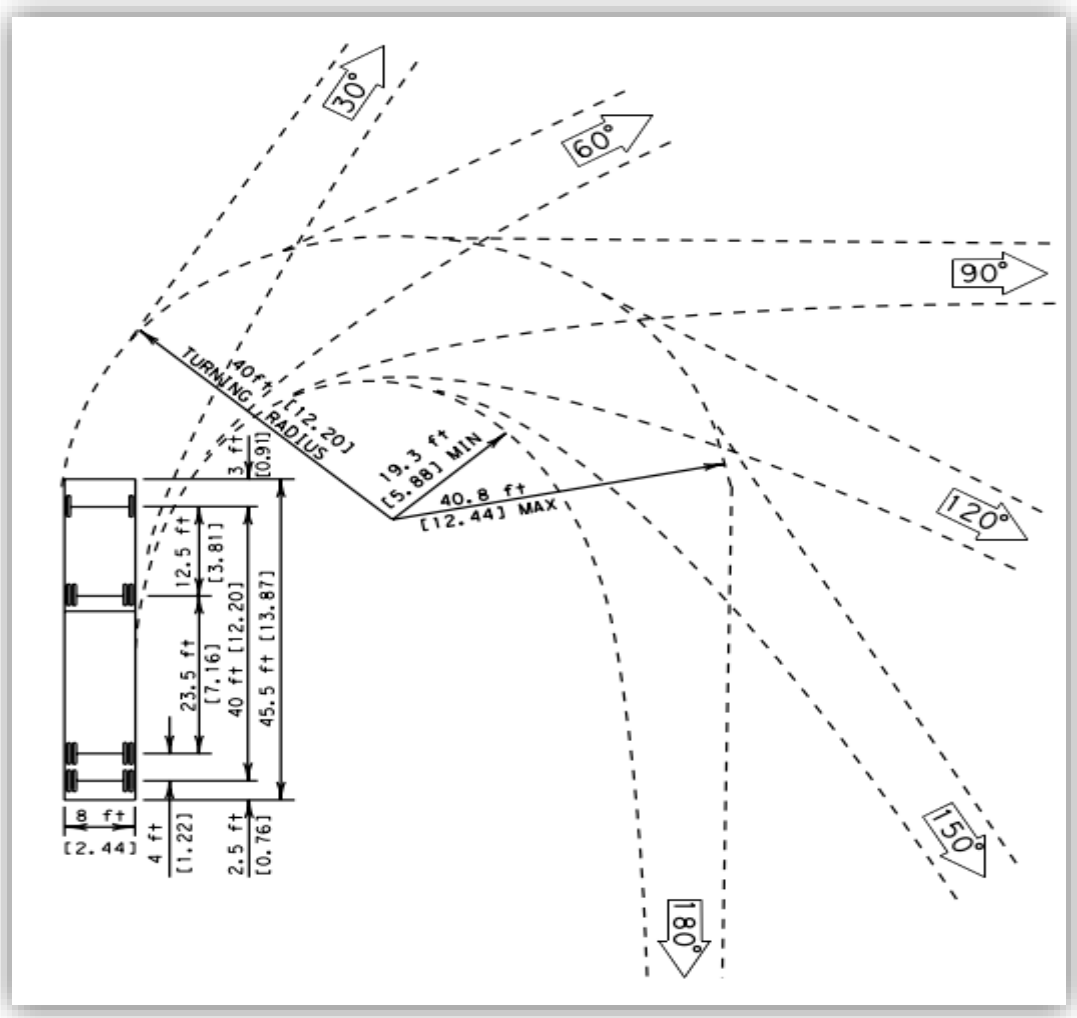
(Source: **AASHTO**)

Maximum turning radius = 43.5ft

Minimum turning radius = 28.3ft

Turning radius = 42ft

Turning radius for wheelbase (12WB)



5.6.3: Turning radius for wheelbase (12WB)

(Source: **AASHTO**)

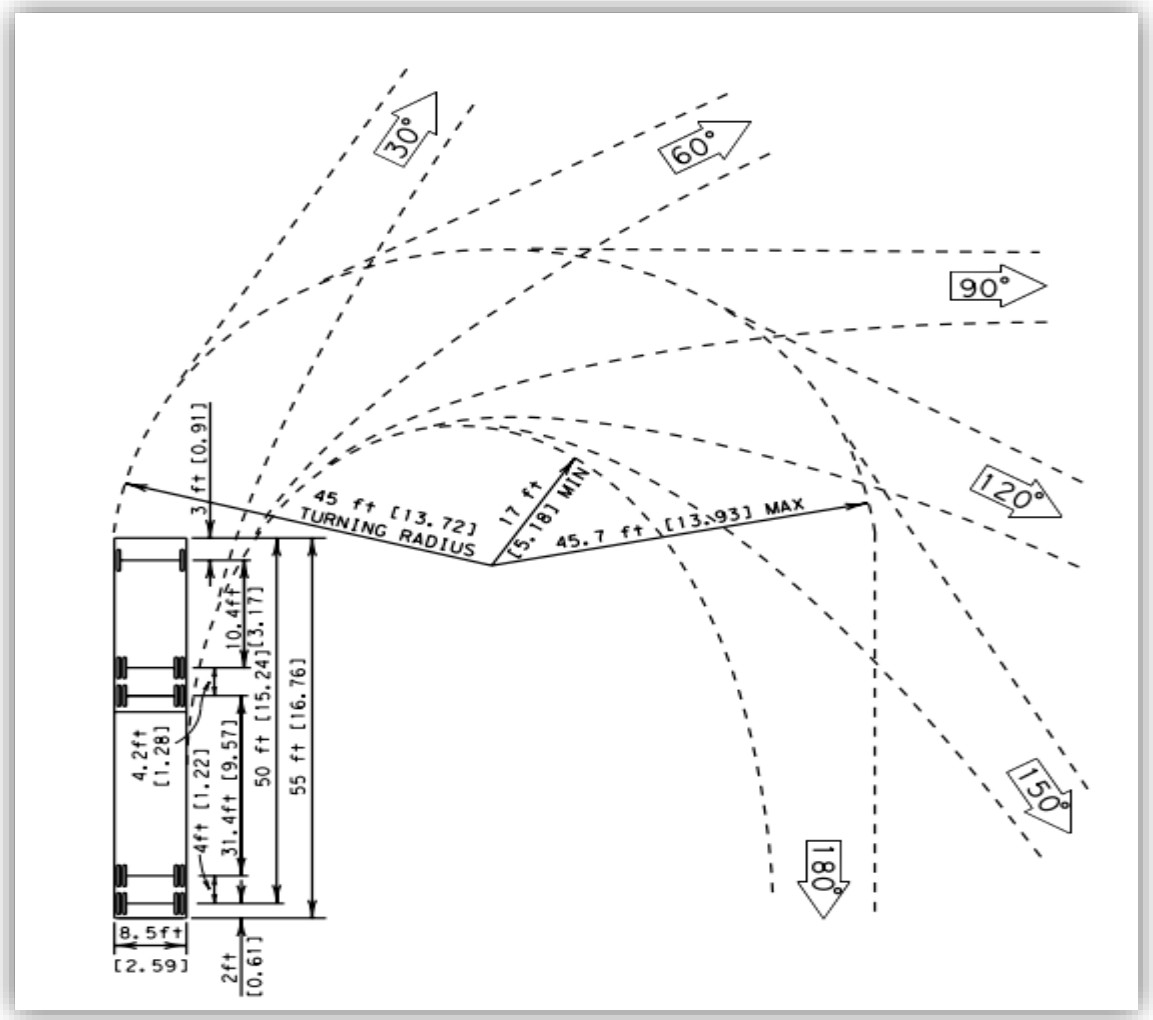
Turning radius = 40ft

Minimum turning radius = 19.3ft

Maximum turning radius = 40.8ft

Total length of trailer = 45.5ft

Turning radius for wheel-base (50WB)



5.6.4: Turning radius for wheel-base(50WB)

(Source: **AASHTO**)

Turning radius = 45ft
Minimum turning radius = 17ft
Maximum turning radius = 45.7ft
Total length of trailer = 55ft

Weaving length

Weaving length is the total distance between one edge of isometric island to another edge of isometric island.

5.6.5: Capacity of purposed rotary

Rotary capacity is based on traffic flow around the central traffic island. With the help of rotary traffic will diverge and flow of traffic is smooth it means that the traffic is flowing smooth without any interruption.

Formula used to calculate the capacity of rotary

$$Q_p = \frac{280\, w\left(1+\frac{e}{w}\right)\left(1-\frac{p}{3}\right)}{1+\frac{w}{l}}$$

Q_p = capacity of rotary at weaving section in PCU per hour

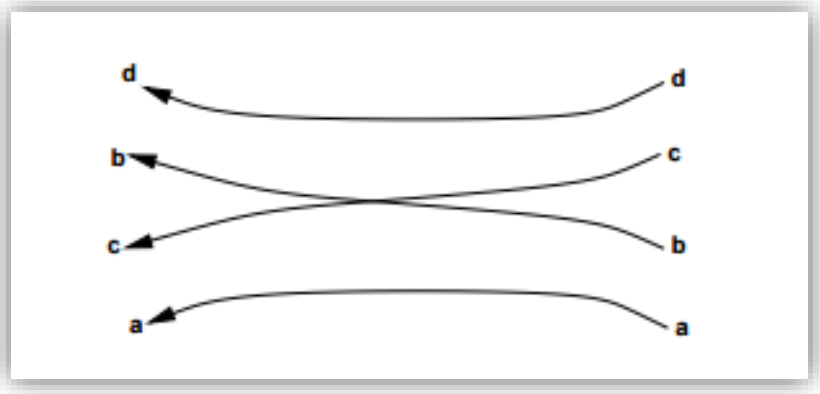
w = width of weaving section in metres

e = average entry width in metres

l = weaving length

p = proportion of traffic

$$p = \frac{b + c}{a + b + c + d}$$



5.6.5: weaving section of a rotary

5.7: CALCULATION FOR CAPACITY OF ROTARY

After the evaluating the study area we are able to calculate the all dimensions:

w = 14m

e_1 = 4.23m

e_2 = 9.98m l = 21m

a = 22.05m d = 21.08m

b = 29.25m

c = 14.21m

$$P = \frac{b + c}{a + b + c + d}$$

$$= \frac{29.25 + 29.25}{22.05 + 29.25 + 29.25 + 21.08}$$

$$= \frac{58.5}{101.63}$$

$$= 0.57$$

$$Q_p = \frac{280*w\,(1+e / w)\,(1- P/3)}{1 + (w / l)}$$

$$= \frac{280*14\,(1+ 6.75 / 14)\,(1- 0.57 / 3)}{1 + (14 / 2l)}$$

Q_p = **2755.52 PCU/hr.**

After the calculating the study area total PCU/hour comes out to be: **2755.52 PCU/hr.**

CHAPTER - 6

RESULT AND DISCUSSION

6.1 RESULT:

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.

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

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

= 891*0.5

= **445.5/hour**

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

= 585*0.8

= **468/hour**

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

= 2338*1

= **2338/hour**

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

= 464*3.5

= **1624/hour**

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

= 128*2.2

= **281.6/hour**

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

= 66*0.2

=**13.2/hour**

Total PCU/hr = Total PCU of all Vehicles

= **5184/hour**

6.1.2 BENEFIT COST RATIO:

Benefit cost ratio = (Time travel + Fuel Consumption)/ cost of construction of road

= (28214768.62+10695570.2)/5600000

= 38910338.82/5600000

= **6.94**

6.1.3 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 these all calculation I would like to purpose a new design for PAP chowk which will help to minimize the fuel consumption and save the travel time.

CHAPTER - 7

CONCLUSION

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

It will save fuel consumption.

It will save travel in delay time.

Traffic will flow without any interruption.

After the calculation the construction cost of my design is very economical in terms of benefit cost ratio.

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