ACCIDENT STUDIES AND ROAD SAFETY AUDIT

FOR URBAN ROAD NETWORK OF

PATIALA CITY

A Thesis Submitted in Fulfillment of the Requirement for the Award of the Degree of

MASTERS OF ENGINEERING

IN

INFRASTRUCTURE ENGINEERING

Submitted By

ABHINAV AGGARWAL

801623002

Under
supervision of

Dr. Tanuj Chopra

Assistant Professor
Department of Civil Engineering
Thapar Institute of Eng. & Tech.(T.I.E.T)
Patiala ,Punjab

Dr. Geetam Tiwari

MoUD Chair Professor
Department of Civil Engineering
Indian Institute of Technology(I.I.T)
Delhi.

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

DEPARTMENT OF CIVIL ENGINEERING
THAPAR INSTITUTE OF ENGINEERING & TECHNOLOGY
(A DEEMED TO BE UNIVERSITY), PATIALA, PUNJAB.
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DECLARATION

I, Abhinav Aggarwal, hereby declare that the work prepared in thesis entitled "Accident Studies and Road Safety Audit For Urban Road Network Of Patiala City" in fulfillment of the requirement for the award of degree of Master of Engineering in Infrastructure Engineering in the Civil Engineering Department, Thapar Institute of Engineering and Technology (Deemed to be University), Patiala is an authentic work carried out under supervision of **Dr. Tanuj Chopra,** Assistant Professor, Department of Civil Engineering, Thapar Institute of Engineering and Technology, Patiala and **Dr. Geetam Tiwari** , MoUD Chair Professor, Department of Civil Engineering, IIT Delhi during January 2018 to July 2018. The matter presented in this has not been submitted either in part or full to any other university or institute for the award of any degree.

Abhinav Aggarwal
Reg. No. 80162300

Date: 20/07/2018

20/07/2018
Dr Tanuj Chopra
Assistant Professor
Department of Civil Engineering
Thapar Institute of Engineering & Technology
(A Deemed to Be University), Patiala, Punjab

Geetam Tiwari
Dr. Geetam Tiwari
MoUD Chair Professor
Department of Civil
Indian Institute Technology
Delhi

DEDICATION

This humble work is dedicated to

My Family,

Teachers,

Guide,

Friends

And above all

To The Almighty SAI RAM !!

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I would like to offer my special thanks to my supervisor **Assist. Prof. Dr. Tanuj Chopra** Associate Professor, Department of Civil Engineering, Thapar Institute of Engineering and Technology, Patiala for their support, encouragement and guidance throughout the development of this study and for great intelligence.

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Abhinav Aggarwal

ABSTRACT

Road Safety Audit is the official and one of the best methods to examine the safety performance and accident potential of newly made as well as of present roads. It is an effective and very productive method and efficient method used to improve the road infrastructure. It is already proven that it has the ability to reduce the accidents and thus can save life of many people's around the world. From planning to development phase, construction stage, operation and maintenance stage it can be implemented to every stage of the project. During the design period its proper implementation, maintenance, operation and design is very crucial in project highways from safety point of view of road user with the roads. Thus, safer roads which ultimately leads to safer life.

In this thesis, crash information for the year 2013 to 2016 of Patiala has been gathered, investigated and marked .Analysis of accidents on the basis of nature, sex, and collision spot has been done. Crash matrix of impacting vehicle with victim vehicle has been prepared by analyzing the type of vehicles involves in the accident.

The point with maximum number of accidents taking place has been called as black spots as their value of accident severity index is maximum in these spots. These spotted points are of real concern as here the accidents are frequently taking place. After analysis it is concluded Dukh Nivaran chowk, Bus stand chowk, Rajpura road and lakkadmandi intersection, Rajpura Road and New Bypass Intersection and fountain chowk are the five locations which are marked as black spots. These spots are visually inspected and various deficiencies have been noted and their recommendations have also been suggested.

Safety Audit and speed analysis has also been performed on 92 spots including all the black spots and other section which is considered as major accidental road stretches comprising nearly 15 % of major road network of Patiala. Their scores concluded that all the roads of Patiala belong to the poor category as per code of "Urban Road Safety Audit" 2013 by Ministry of Urban Development. Mostly footpath is absent on every roads including arterial roads. Provision for cycle accessibility and lighting is absent on every roads of Patiala.

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LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
ADB	Asian Development Bank
ASI	Accident Severity Index
FIR	First Information Report
GDP	Gross Domestic Product
GIS	Geographic information system
GNP	Gross National Product
IPC	Indian Penal Code
IRC	Indian Road Congress
LCV	Light Commercial Vehicle
MC	Municipal Corporation
MTW	Motorized Two Wheeler
NCRB	National Crime Records Bureau
NH	National Highway
NHAI	National Highway Authority of India
PCU	Passenger Car Unit
PWD	Public Works Department
RTA	Road Traffic Accidents
SH	State Highway
TST	Three-Wheeled Scooter Taxi
TRIPP	Transportation Research and Injury Prevention Programme
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 GENERAL

The major problem in road accidents worldwide emerges out is the spectacular growth pattern in the number of motorists. These accidents pose a burden to the socio-economic structure. The rate of accidents is on the rise even after several laws and regulations have been passed in order to enhance road safety. Majority of road accidents, approximately 90% or more happen due to the negligence of the driver and the casual attitude towards the road safety and traffic rules.

According to the World Health Organization, the global status report presented in 2009 reveals that more people die due to road accidents in India than anywhere else in the world. In India rate of traffic fatalities is increasing at 8% per year in recent years. With the rise in number of vehicles eventually leading to the change in the road width dynamics, further the number of accidents is increasing every year. Majority of these traffic deaths occur in the construction zone of roads and highways. In addition, a significant number of workers engaged in road construction and its maintenance also get injured and dead every year. According to WHO September 2012 report, in the year 2012, around 50 million people were injured and around 1.2 million people were killed in various road accidents across the globe. Majority of these causalities took place in the developing countries which fall into the low or medium income group nations. The victims were majority were belonging to the pedestrian modes user, cyclists and two-wheeler owners. According to the World Health Organization report, road accidents will be the fifth leading cause in the world up to 2030. Due to the increasing road traffic crashes world health organization also declared 2004 as the year of road safety and launched World Health Day in April 2004. Due to a large number of accidents happening in all parts of the world, road safety has become an issue which is demanding for a great importance during the last few decades. In India, the total socio-economic cost of road accidents has been estimated as 3% of the GDP. People largely depend on roads in their daily life to get to school work, institutions business centers etc.

In safety audit the main aspect of safety is to ensure that the road network meet safe design principles to ensure safety for all road users.

1.2 GLOBAL ROAD ACCIDENT SCENARIO

According to report given by Global Status Report on Road Safety, 2015 some important facts occur in worldwide as follows:

- 1.3million people die yearly due to road accidents in which 49 % people are pedestrians, cyclists, motorcyclists, 31% of people are car occupants and 20% are others. Fig 1.1 shows fatal accidents caused by type of road users in different countries as well as in the world.

- Road traffic injuries are among the three causes of death for people lying between 5 and 44 years of age.

- Road accidents are predicted to become the 5th leading cause of death injuries by 2030, as compared to 9th leading cause in 2004.

- Total socio-economic costs due to motor vehicle crashes are estimated at 3% of GNP of the world countries and reaching to total $500 billion.

- Road injuries become an important cause of disability worldwide in which 20-50 million people sustain non-fatal injuries.

- It has been predicted that By 2030 Road accidents will become the 7th leading cause for death.

- In low and middle-income countries 90% of total road accidents occurred, which is almost the double the fatalities caused in high – income country. Fig 1.2 shows the percentage of road traffic deaths by country income status.

- In the world nearly 17 peoples die out of every 1 lakh population due to accidents. Fig 1.3 shows the number of fatal accidents per 1, 00,000 populations of different regions.

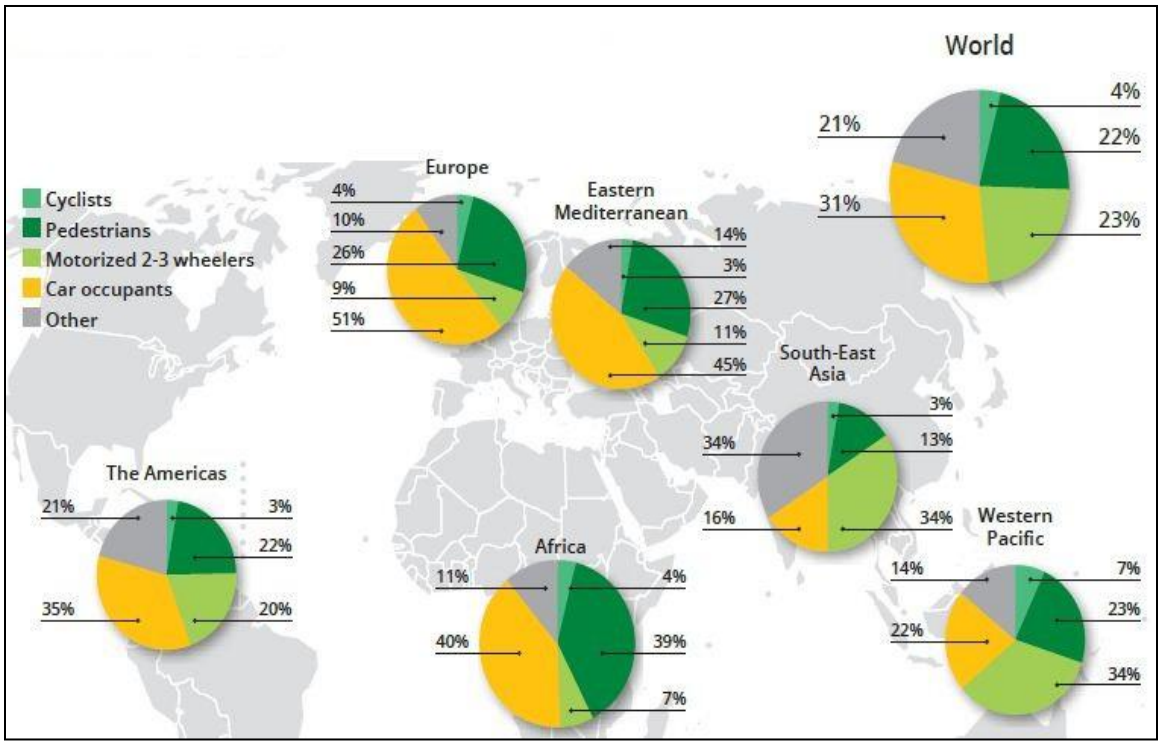


Figure1.1 Fatal accidents caused by type of road user, by WHO region

(Source: Global Status Report on Road Safety, 2015)

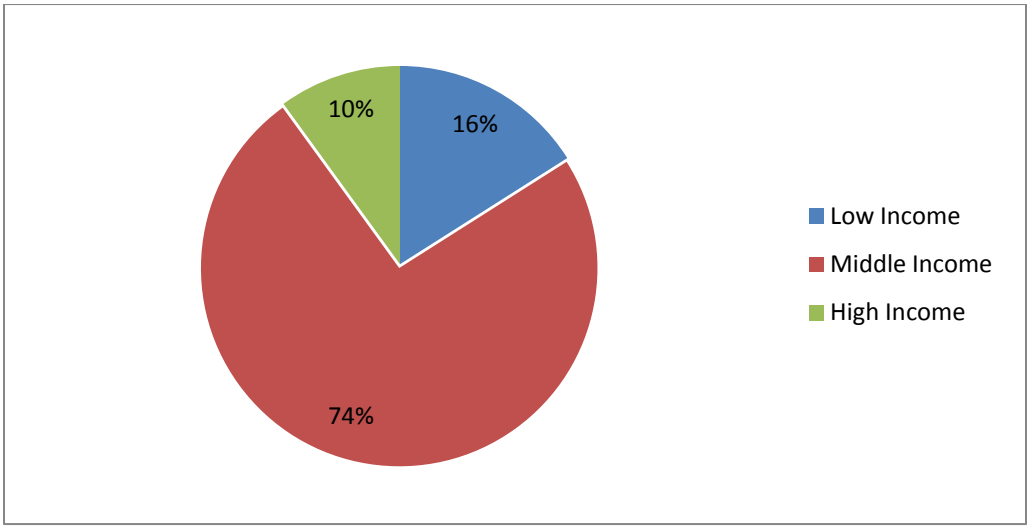


Figure1.2 Road traffic deaths by country income status

(Source: Global Status Report on Road Safety, 2015)

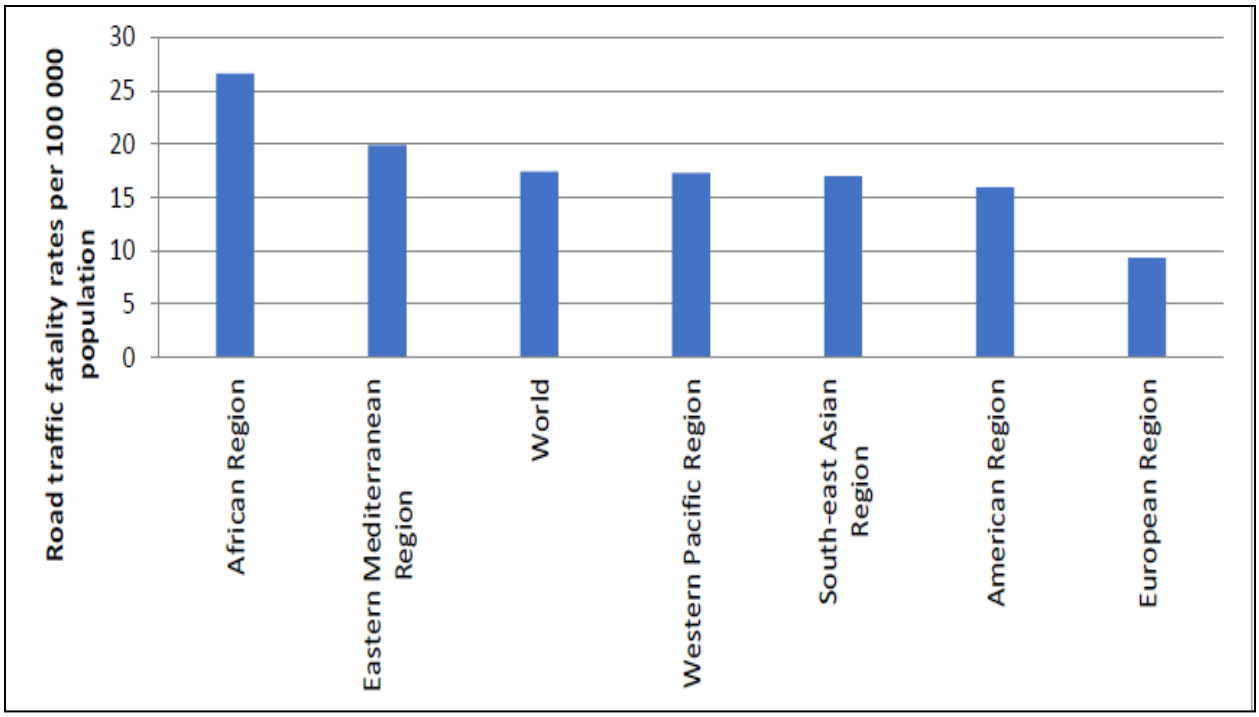


Figure1.1 Fatal accidents per 100 000 population, by WHO region

(Source: Global Status Report on Road Safety, 2015)

1.3 ACCIDENT SCENARIO IN INDIA

As per NCRB India consists of a wide road network, 48, 65,000 Km approximately as per the data recorded till 2012 March. Transportation by the Road or surface road transport is a very important part of India's transportation and economy. It further contributes 4.8% share in the GDP (Gross Domestic Product) of the country. Therefore, a comprehensive inventory record of the road data for India is extremely imperative to understand the impact of road safety on the economy of the country.

According to NCRB in the year 1970 the total number of road fatalities was less than 20,000 but until the end of 2016 it reaches above 1,40,000 road fatalities . Fig 1.4 shows the yearly variation of fatal accidents from 1970 to 2016.

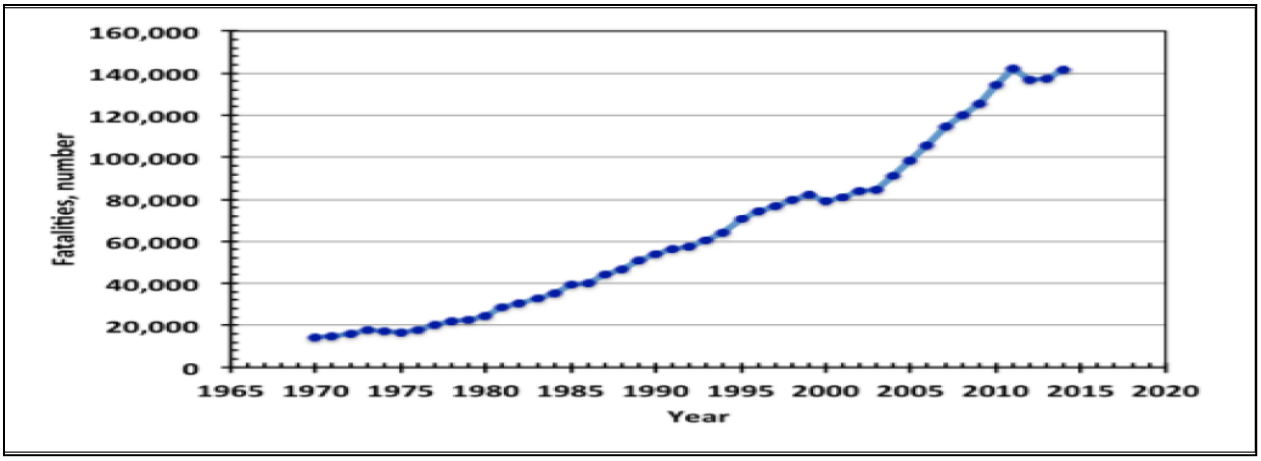


Figure1.2 Fatal accidents in India (Source NCRB)

1.3.1 Road Accidents

- 53 circumstances of accidents took place on the road every hour throughout 2015, where 17 people were killed.
- In 2015, 4,64,674 cases of road-based accidents were informed which left 4,82,389 persons injured and 1,48,707 causalities.
- Casualties due to 'Road Accidents' in India have augmented by 5.1% during 2015 (1,48,707) in excess of 2014 (1,41,526).
- The states of Tamil Nadu reported total of 69,059 cases, Karnataka (44,011 cases), further, Maharashtra (42,250 cases), While Madhya Pradesh had (40,859 cases) and Kerala (39,014 cases) and have reported the maximum counts of road accidents having a share of 14.9%, 9.5%, 9.1%, 8.8% and 8.4% of road-based accidents in India.
- The maximum death toll in road mishaps was reported in Uttar Pradesh at 12.4% (18,407 out of 1,48,707) trailed by Tamil Nadu (10.5%) and Maharashtra (9.2%) during 2015. 29.3% victims of road accidents were riders of '2 Wheelers'.
- 'Trucks or LCV such as Lorries', 'Cars' and 'Buses' comprise of 19.4%, 12.4% and 8.3% of road accidental causalities respectively.
- The National Highways of India alone accounted for around 28.2% of the total road accidents, whereas the State Highways accounted for (25.0%) of the total road accidents.

- Majority of road accidents were because of over speeding causing for 43.7% of total accidents which triggered 60,969 deaths and 2,12,815 people injured. Ruthless driving or careless overtaking caused 1,46,059 clashes which caused in 48,093 demises and 1,51,231 people injured in 2015. Besides, 3.7% of road accidents were due to poor weather condition. A total of 2,54,878 cases and 2,09,796 cases of total road accidents as reported in the rural areas and urban areas, were responsible for 54.9% and 45.1% of total accidents in India in 2015. Majority of accidents were reported near the residential areas (24.7% in rural areas and 24.5% in urban areas).

- The maximum no. of road accidents happened in the month of May (45,215) and as per time period wise analysis, a maximum number of road accidents (80,113) were recorded during 3:00PM-6: 00 PM timings.

- It was observed that the rate of deaths per 1000 vehicles has decreased from 1.0 in 2011 to 0.8 in 2015 as the number of automobiles in India have amplified by 28.6%(from 1,41,866 in 2011 to 1,82,445 in 2013 and the huge numbers of 'Road Accidents' has increased by 5.6% during the 2 years as shown in Fig 1.5. Growth in number of vehicles and road accidents is given in Fig 1.5.

Sl. No.	Year	Road Accidents (in thousand)	% Variation over Previous Year	Persons Injured (in thousand)	% Variation over Previous Year	Persons Killed (in Nos.)	% Variation Over Previous Year	No. of Vehicles (In Thousand)#	% Variation over previous Year	Rate of Deaths per thousand Vehicles (Col.7/ Col.9)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	2011	440.1	–	468.8	–	1,36,834	–	1,41,866	–	1.0
2	2012	440.0	–0.02%	469.9	0.2%	1,39,091	1.6%	1,59,491	12.4%	0.9
3	2013	443.0	0.7%	469.9	0.0%	1,37,423	–1.2%	1,82,445	14.4%	0.8
4	2014	450.9	1.8%	477.7	1.7%	1,41,526	3.0%	1,82,445*	–	0.8
5	2015	464.6	3.0%	482.3	1.0%	1,48,707	5.1%	1,82,445*	–	0.8

Figure1.3 Growth in number of vehicles and road accidents in India (2011-2015)

(Source: Accidental deaths and suicides in India 2015 Report by NCRB)

- The share of the road conflicts in number of total causalities due to un-natural causes has fallen from 45% in the year 2011 to 42.9% in the year 2015. Further, an increase in the trend in the absolute number of fatalities in road-based traffic conflicts in the last three-year

duration i.e. from 2013-2015 was observed. The number of fatalities was increased by 4.9% in 2015 as compared to 2014.

1.4 ROAD SAFETY AUDIT

Road safety audit is the examination or inspection of an existing as well as future road project in which an independent, qualified team reports on the project's accident potential and its safety initiatives. It involves complete evaluation of safety design initiatives provided by the concessionaire during all stages of design project road and provide suitable recommendations or solutions based on the road user safety. This is done by reviewing the existing road traffic crash conditions or causes and provides suitable recommendations and solutions based on the road user safety. The basic theme of road safety audit is to ensure that project highways operate safely and efficiently as practicable. Road safety audit is an extremely appreciated, low-cost procedure in the arena of road safety engineering which is proving to be a majority of effective and valuable road initiative process and now it has become an accepted practice in highway agencies around the world.

1.4.1 Elements of Road Safety Audit

- It should emphasize on the safety characteristics of the plan.
- It should be undertaken by those peoples who are not dependent on the customers, contractor or designer.
- Only experienced and well-trained peoples should carry out safety audit.
- Documentation is done officially.
- The entire road user should be involved in the audit.
- Check and inspection or consultation should be formal.
- Redesigning of the project should not be involved.
- Comparison of one project with another is not allowed.

- Judgment the quality of the project is not intended.

1.4.2 Benefits of Road Safety Audit

- It helps in fulfilling the goal of providing a safer road by doing proper examination and vision of road surface.
- It helps in making proper and accurate road design as any type of deficiency in roads can lead to major accidents and in severe cases can lead to many deaths of peoples, therefore, it can help in minimizing the risk of severe accidents.
- It is helpful in minimizing the need of redesign of the deficits work produced at any stage of project development by road safety audit.
- The overall cost of the project can be reduced with a safety audit.
- It leads to up gradation of safe design practices.
- It is helpful in creating the awareness of using safe design practice.

1.4.3 Objectives of Road Safety Audit

To decrease the number as well as the severity of crashes that will be occurring on the new or existing roads and reviewing the location of proposed wayside amenities

- Suggesting suitable solutions for various deficiencies which proves to be the cause of road accident.
- To save the number of lives by providing the safety culture to the road user.
- Increase the consciousness of the users, policymakers as well as scheme designers regarding the need and importance of road safety audit.
- Checking adequacy of proposed road furniture and appurtenances such as highway lighting, pavement markings, traffic signals, etc.

- To ensure the environmental safety of work zones.
- Checking provisions of the proposed road designs for vulnerable road users, pedestrian, cyclists and disabled users etc.

1.4.4 Role of Diverse society in Road Safety Audit

The road safety audit is done independently with the help of the client, the design engineer and the auditor wherein all three works independently.

Client: - Whichever agency like the NHAI or the PWD whosoever is responsible to construct and operate the road project is required to appoint a consultant in order to check the designs, and the audit process of the construction in the project. In this process the agency also provides all required documents to the consulting firm. In case of any conflict between the design engineer and the audit agency, it becomes the responsibility of the client agency to solve the disputes by arranging meetings between the two parties.

Designer: The client appoints this professional in order to seek help for designing of the project and further supervise the execution of the construction of the project. It is the responsibility of the designer to make sure all safety recommendations made by the auditor and the client to be incorporated into the design as well as in the on-site.

Auditor: -This person is independent of the design professional as well as the client. This person holds a special expertise in the road safety engineering, crash investigation and the preventive measures in the traffic engineering domain and road design. Auditor is responsible for carefully reviewing the crash and fatalities and further can suggest remedial measures for the black spot or site.

1.4.5 Approach and Methodology Used in Road Safety Audit

Road Safety Audit is normally used at the completion of preliminary design where ever it is possible.

Road Safety Audit Project is classified into three stages: -

Stage 1: -Safety Audit at the time of development Phase. It includes the Design and Planning

Stage 2: - Safety Audit at the time of the Construction phase.

Stage 3: - Safety Audit after the accomplishment of the project. (Operation and Maintenance Phase). Fig 1.6 shows the stages of Road Safety Audit.

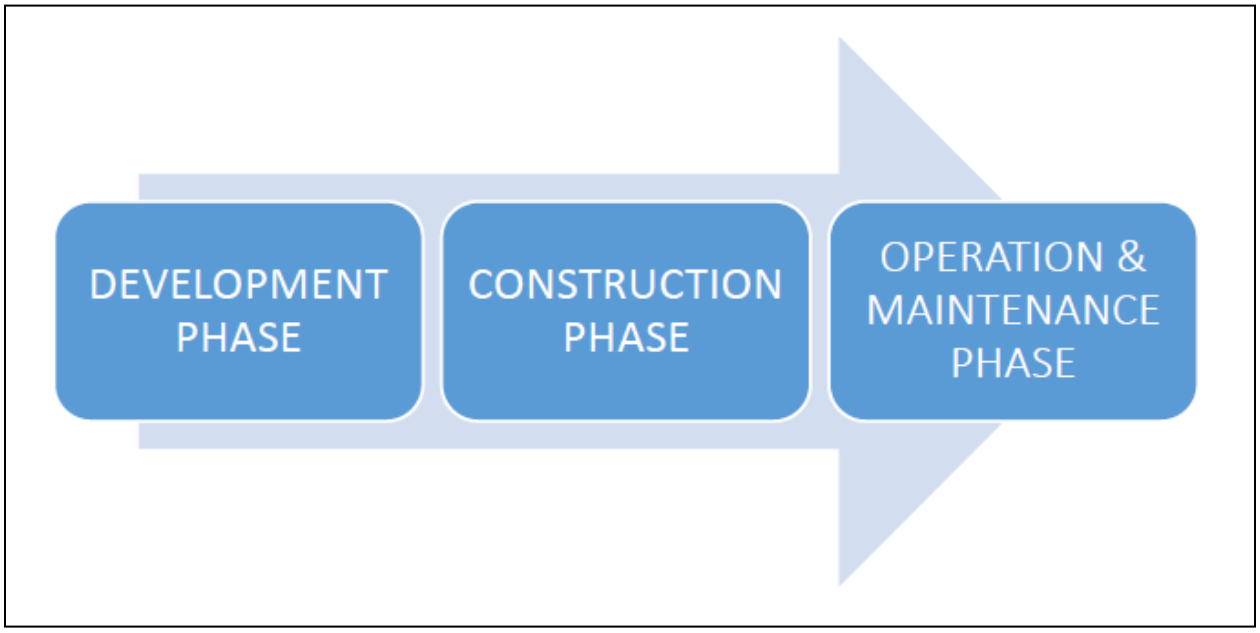


Figure1.4 Stages of Road safety Audit (Source: Inspection report of Thapar University)

Development Phase:

Development phase is the first stage of safety audit that will undertake after the finalization of Preliminary design or after an investigation of typical design aspects before planning consent of the project at the drafting stage. This is the last occasion when changes in the road alignment can be done so as to avoid any nuisance that can occur to the project before the second stage of road construction starts. Points that should be kept. in mind are covered in this stage are as follows:-

- In this stage, every member of safety audit has to visit the highway site which includes permanent changes in feature or layout of present highway.
- In this stage meetings have been organized for safety team where they discussed proposed project and the main practical points are favored to implement. Therefore this stage includes:
- Collection of crash data in the project highway from the police station or other sources of last two years.

- To carry out the analysis of fatal and major injured crashes to recognize the black spot areas and then relate this crash information with the traffic volume to calculate the trend as per traffic Volume Count.
- Workshop and seminar on road safety audit is conducted in which public safety awareness is provided by various publicity measures.
- In this stage a detailed design and draft report is prepared which includes typical considerations about the proposed road section like cross section of the road, proposal or signage and their markings, paved or unpaved shoulder width, number of lanes, intersection layouts or interchanges and profile of the project road etc.

Construction Period:

This stage audit is undertaken when the construction of the project road is going on so as to check the ongoing safety culture of the project road. This audit includes the complete examination of the project scheme which is undertaken prior to its opening to traffic. It is done by reviewing the project road by the audit team by carrying out driving, ridden or by walking on a road to ensure that the safety needs of all road users are provided or not. The issues which are raised in previous stage are also reviewed in this stage of audit. The main aspects which come at this stage as follows:

- To study the gap report between the final safety report of the development phase and final safety report which was implemented.
- Audit reports and complete documentation of safety reports is prepared to check the safety implications of the project road.
- In this stage safety audit is generally carried out once in a calendar quarter to verify the acceptability of the safety measures provided in the construction zone.
- Workshop on road safety audit at site is also conducted in which education to engineers, drivers are provided so as to improve the safety of the workers.
- Various road inspections (day and night) time inspection is done to check the road user facilities such as traffic signing, delineation or other darkness related issues

- Regular audits of existing roads by the audit team allow the road safety hazards and helps in identifying the deficiencies in safety concern before they became a cause of accidents.

Operation and Maintenance Phase

This audit is undertaken after the completion stage i.e. during the operation and maintenance Phase of project road when it is open to traffic so as to check the number and severity of accidents and provide the remedial measures to the road users. In this stage safety audit is conducted in every accounting year during the operation and maintenance phase of road. The main aspects in this stage are as follows:-

- To check whether the safety design of the project road has properly converted to safety scheme as constructed so there is no inherent road safety defect has been included into the works.
- At this stage, concentration has been given to various design changes which are incorporated in construction stage such as junction layouts, local alignment, visibility aspect, road lighting, pavement markings and road signage's etc. Fig 1.7 gives the flow diagram of Road Safety Audit.

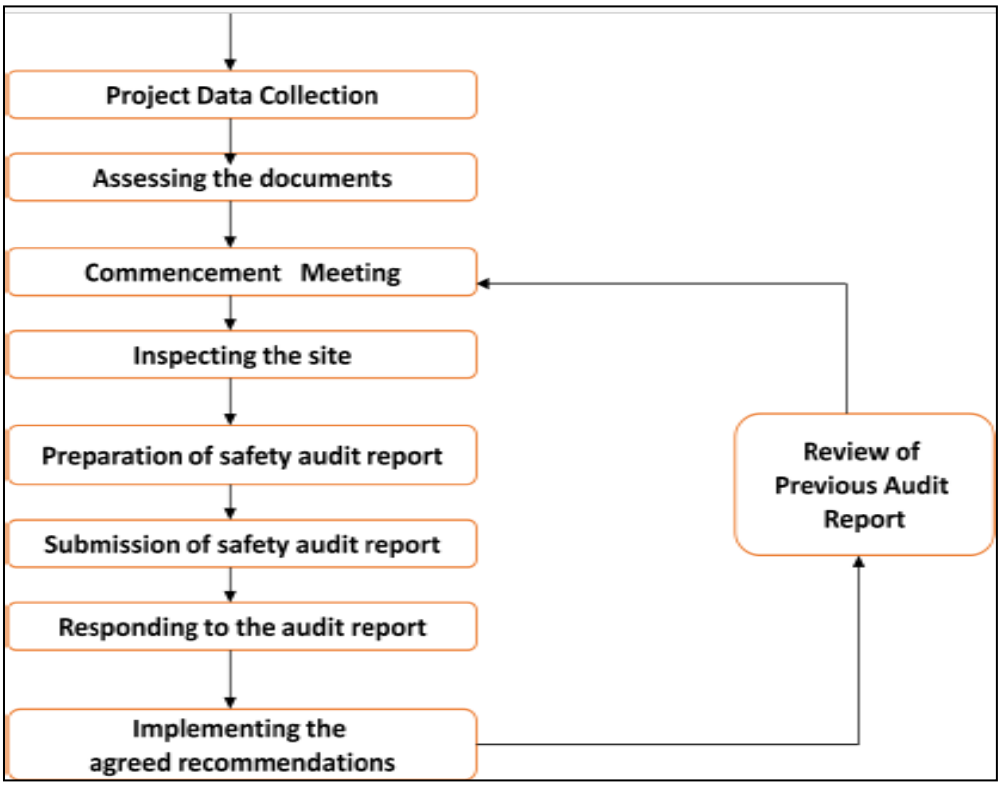


Figure1.5 Safety Audit procedure flow diagram

1.5 OUTLINE OF THESIS

The thesis has been divided into seven chapters:

- 1st chapter is about the general introduction of global accident scenario, accident scenario in India, Road Safety Audit, its elements, benefits, objective, approach and methodology involved in it and role of diverse society in safety audit.

- 2nd chapter is the literature review of analysis of accidents conducted at various places and road safety audit performed at different places.

- 3rd chapter deals with the collection of inventory data of Patiala roads .It include road network, its characteristics and road intersections of Patiala.

- 4th chapter deals with the analysis of the accident data from the collected FIR and to identify the black spots .Reasons and mitigation measures for prevention of accidents on black spot areas is also given and determination of RMEV of the Patiala.

- 5th chapter deals with the calculation of Road Safety Audit score and speed analysis of different intersection and mid blocks on various types of roads.

- 6th chapter provides the conclusion and recommendation of accidents analysis as well as of Road safety Audit. It also gives the outcomes of speed analysis.

Appendix A consists of accident summary for year 2013, 2014, 2015 and 2016 .
Appendix B gives speed analysis data on various roads i.e. Arterial Road, Collector Road and local roads.

1.6 DEFINITIONS

According IRC 053 -2012 ROAD ACCIDENT RECORDING FORMS A-1 AND A-4.

Road Accident: "An accident (which is either a collision or overturning or slipping) which has been originated or occurred on the road which results in loss of life or any type of injury or damage to property, in which minimum one vehicle should be in moving condition was involved".

Person Killed: "Any individual who was killed on spot due to the accident or whose death can be traced directly to the injury got in the accident within 30 days of accident happening".

Fatal Accident: "An accident in which one or more than one individual has lost his life".

Grievously Injured Person: "These are the person who has received grievous injuries due to the accident such as fractures, concussions, internal lesions, crushing, severe cuts and lacerations, severe general shock requiring medical treatment and any other serious lesions requiring detention in hospital. Also, those hurt grievously defined in I.P.C. in accidents, as reproduced below:

i. Emasculation.
ii. Permanent privation of the sight of either eye.
iii. Permanent privation of hearing of either ear.
iv. Privation of any member or joint.
v. Destruction or permanent impairing of the powers of any member or joint.
vi. Permanent disfigurement of the head or face.
vii. Fracture or dislocation of a bone or tooth.
viii. Any hurt which endangers life or which causes the sufferer to be, during the space of twenty days, in severe bodily pain, or unable to follow his ordinary pursuits".

Minor Injury Accidents These are the accidents in which individual does not receive major injuries only minor injuries like sprains or bruises. These accidents do not require hospitalization only first aid is required.

Non-Injury Accidents: "These are the accidents in which no injury takes place and no individual was killed but some property damage can take place"**.**

Pedestrian: "Any person other than a driver or passenger. Persons in or operating pedestrian conveyance such as perambulator, invalid chair without engine, pushcart, etc. or pulling a cycle are Pedestrians. Persons attending to a vehicle (e.g. for change or tyre, repairing engine, etc.) moving on roller skates, etc. are also Pedestrians".

Light Commercial Vehicles (LCVs): "Usually referred to goods and carriage vehicles with a light capacity with a maximum permissible capacity of 3.5 tons of mass".

Articulated Goods Vehicles: "A semi-trailer truck or articulated truck consisting of a towing engine and a semi-trailer (plus possible additional trailers) that carries the freight".

CHAPTER 2

LITERATURE REVIEW

2.1 GENERAL

Over the past few years, various studies have been conducted on the road safety audit and on accident studies of various roads at many places for the purpose of minimizing road fatalities. Road safety audit of various selected stretches has been studied by various authors. Review of the previous work done on road safety audit is explained in the following sections.

2.2 LITERATURE REVIEW ON ACCIDENTAL STUDIES AND ROAD SAFETY AUDIT

Mannering *et al.*, (1994) This paper detonates the recurrence of event of highways accidents based on multivariate investigation of roadway geometrics (i.e. horizontal and vertical arrangements) , climate and other occasional impacts On the basis of accidental information gathered in the fields, a negative binomial model of overall accidental frequencies is estimated along the models of the frequency of particular accident types .The results of the examination determinants of crash recurrence.By studying the relationship between climate and geometric components, this paper offers understanding of potential measures to counter the negative impacts of climate on highway area with challenging geometrics. The goal of this paper is to research and report the "previously" conditions to separate the variables that are adding to crashes probability. The purpose of this paper is to focus on the non-behavioral determinants of accident risks, particularly roadway geometrics and climate conditions. In terms of accidental frequencies in this investigation we will focus around modeling the number of crashes happening on a particular area of roadway in a month time period. The approach introduced in this can be utilized to assess completely the safety impacts of variable – – message/speed limit signs and different ITS advancements. Such developments will fill in as a foundation to justify future ITS consumptions.

Parida *et al.*, (2004) This paper is an exhibition of utilization of GIS for building up a productive database on road crashes taking Dehradun as a contextual analysis. With headway in innovation, new and advanced models of vehicle are accessible and their numbers are expanding day by day. For exact collision examination utilization of GIS innovation has turned into an unavoidable instrument. The city of Dehradun has been chosen to examine. Five long periods of police records were taken that about 72% of crashes prompt. to major and fatal injuries. Autos, jeeps, and vans are mostly answerable for mishaps and that the majority of crashes takes place between 2 PM to 10 PM. The examination concludes that a strict law movement administration is required for the city to check the development of activity accidents. GIS is a Geographical Information System that supports display and investigation of spatial information. The intense part of GIS is the adaptability in displaying spatial items to suit specific application prerequisite. GIS gives a social connection between various surges of mishap information – FIR Data, Inventory Data, and so forth. It gives facility to understand one too many, numerous to numerous and numerous to one relationship, which exists in spatial information. Fig 2.1 gives the flow chart of the methodology adopted in this paper.

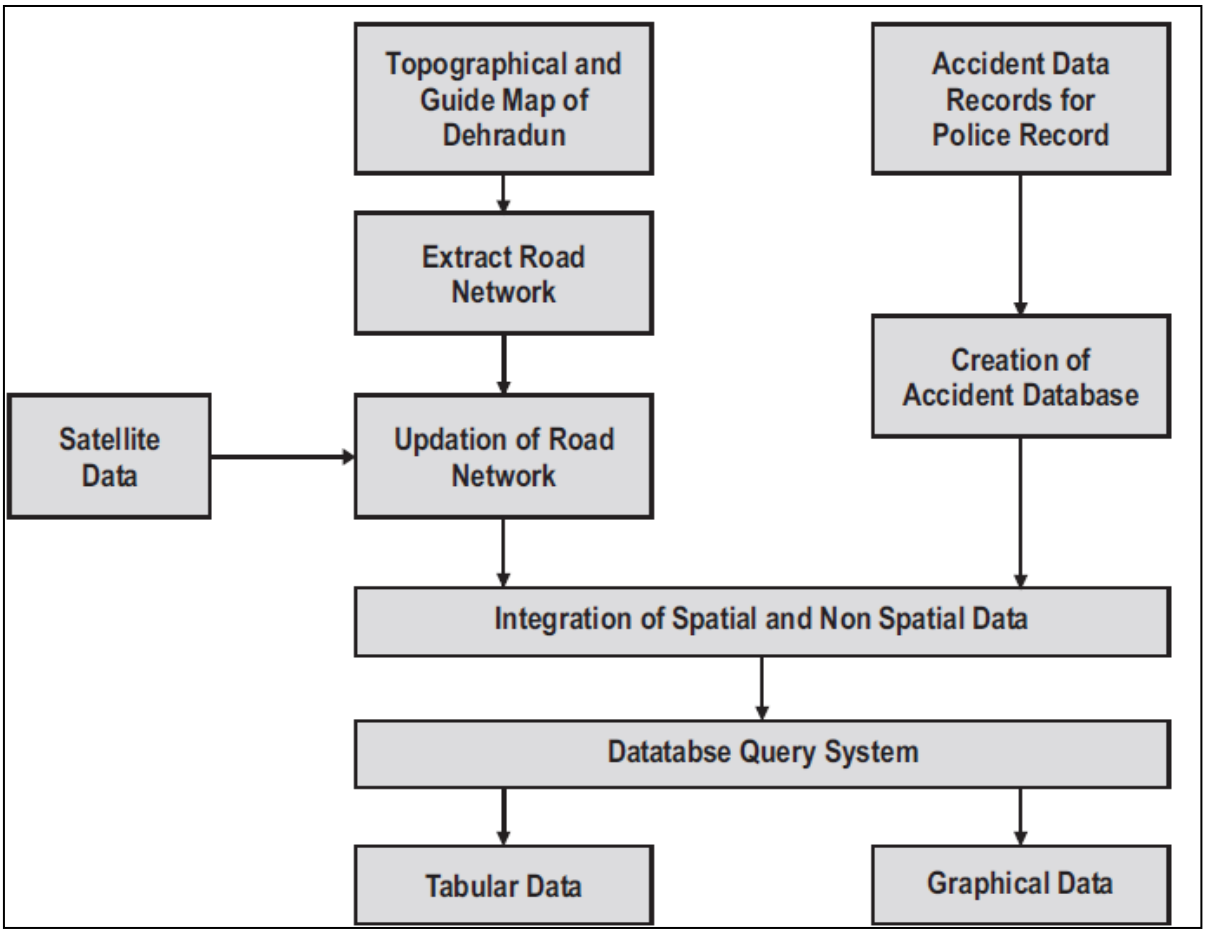


Figure 2.1 Flow Chart showing the methodology adopted

Parida *et al.*, (2005) Fatalities due to road traffic accidents (RTAs) are increasing at an alarming rate around the world. The main share of RTA deaths happens in low-salary and medium wage nations where the volume of traffic is much lower than in developed countries. Road transportation in India is a multi-disciplinary issue and handled by various organizations, resulting responsibility rests with no single body. Law-enforcing agencies and technical solutions will have incomplete success without community cooperation. This paper finds out the need to realize community interest and displays a methodology to accomplish this end. This paper describes a brief method to motivate the community to take an interest in such a security development.

The program should bring together the public and private sectors, the civil community and the administration to work towards a common goal. But to ensure an effective and sustainable road

safety program, a strong political will is necessary. The program needs to be based on integrating the 'three Es' of the transportation system Education, Engineering and Enforcement. The program cannot succeed without the 'three Cs' of management i.e. Cooperation, Coordination and Collaboration. The Majority of important group who can reduce RTA are Government and public sector, Local and regional government bodies, Police and enforcement agencies, Health agencies, Insurance agencies, Researchers/ universities, Community and cultural organizations, Religious groups and Media. To achieve this, government/local administration will have to provide the 'three Fs' i.e. funds, freedom and facility. Community activities incorporate celebration, parties and social events and on such occasions the message can be passed on effectively. Arranging cultural and social programs and using the platform to bring about awareness can prove effective. The local community has huge potential to contribute to the alleviation of the problem provided the potential is groomed and harnessed effectively. Community participation is capable of delivering results without massive injections of resources and energy.

Mohan (2009) Road activity fatalities have been expanding at around 8% every year throughout the previous ten years and hint at no diminishing. Two demonstrating models have predicted the time period when there will be no accidents as there might be some countries where accident rates can be reduced. In the event that we accept. that the present development rate of 8% every year decrease in a direct way to 0% by 2030, at that point we can expect around 260,000 fatalities by 2030. Neither of these anticipated dates (2042 and 2030) can be acknowledged as road wellbeing objectives for the nation. The aggregate number of vehicles expanded from 37 million out of 1997 to 73 million out of 2004. Be that as it may, expanding vehicle proprietorship require not bring about expanded casualty rates if sufficient security measures are implemented. Vulnerable users (people on foot, bicyclists, and mechanized bike riders) represented 84% of deaths in Delhi and 67% on expressways. The low extent of cars can be explained by the low level of cars at 7 for every 100 people who contrasted with more than 50 for every 100 people in the majority of high salary nations. 15% of the casualties were of females in 2007. Youngsters matured 14 years and more youthful involve just 6% of the fatalities; however, their offer in the population is 32%. Delhi had the most noteworthy number of fatalities in 2007 with a rate of 140 for every million population. The most minimal rate was in Kolkata and the most noteworthy in Agra. The examination revealed that trucks were the striking party in 65% of fatal accidents.

Different examinations report that larger part of the accidents includes buses, 25% of the casualties were walkers, rear-end crashes contained 40% of aggregate accidents and that accidents were expanding at a rate of 3.9% every year. The majority of the vital finding of this investigation is that the casualty rate per volume is in excess of three times higher on the four-path segment than on two-path segments.Road security strategies in India must spotlight on the accompanying issues to decrease the rate of road traffic injuries: people on foot and other non-driver in urban zones; walkers, other non-motorists, and slow vehicles on expressways; bikes and small cars in urban regions; overuse of trucks and buses , night-time driving; and wrong-way drivers on divided highways. There is a critical need to renovate the procedure of collecting the data so that every important information can be available for scientific analysis. India particular countermeasures can be feasible through steady observation and research, which will require the foundation of street security look into focuses in scholarly organizations and a National Road Safety Board that could help advance toward a more secure future.

Singh *et al.*, (2011) present the road current situations of road accident and fatalities scenario on Indian roads and provide countermeasures for various specific problems. In this study try to focus on inflammable issues like road accidents, their trends, factors responsible for road accidents, adverse effects of road accidents, prevention and control and some recent approaches to improve the safety on roads. with the rise in population and drastic change in the lifestyle of middle-class people in last two decades. Movement of people towards cities results in the increase in the traffic demand which creates a difference between demand and supply causing safety challenges on roads. Approximately 9500 people died on Indian roads annually and 260 people died daily. Around 3% loss of GDP every year. Experts researched that the ratio of accidents deaths, injury requiring hospital aid and, minor injury which show8% peoples directly affected by accidents. In the 1970's only 12% died in accidents but as compare in 2004 it reaches 21.4 %. In spite of large development in road infrastructure, designing, planning etc. The cause behind the accidents is over speeding, lack of deriver's ethics, road design and traffic violation. Accident top leading cause of death between the age of 5to 44 yr. Death. The projected 40% increase in global deaths b/w 2002-2030. The report says without any increase in efforts there will rise in 65% accidents deaths and injuries b/w 2002-2020 but in middle and low-income countries it is increased up to 80%. In such countries majority of deaths were due to pedestrians, cyclists, motorcyclists and vulnerable road user. On the other hand, in high income countries

death cause by car more predominantly but the risk factor of vulnerable road user is more. Road safety is multisectoral and multidimensional problem. This includes the development and maintenance of road infrastructure; improve legislation and law enforcement, safer vehicles, the planning, the provision of services in the health and safety of children in hospitals, on land-use planning, etc. The above data, we can say that road safety is a critical and difficult problem is in today's scenario, the Government of India and the roads would be to start thinking very seriously is the combustible problem. Countries are facing various problems and the losses due to the reduction in road safety. However, the only record of the long-term solution to the problems of road accident. Provide high quality divided road have better performance than undivided highway. Particular measures have been adopted to reduce speed in urban areas because vulnerable road user more susceptible to fatality due to high speed even also at when the vehicle on moderate speed. this reduces the large no of road fatality. Experience shows that 32% reduces in death with the reduction in speed up to 50 km/hr. in Hungary and with priority cost-effective measures have to made to accidental problem.

Jain et al. (2011) performed Road Safety Audit on the recently build section area of four lane National Highway (NH) - 58 India and spotlights the advantages that occurred after suggesting the mitigation measures after performing the safety audit. The chosen section lies on NH 58 extending from 75 to 130 km. The chosen road has been extended recently and converted to four lanes. Muzaffar nagar and Meerut highways in the states of UP are selected as most important points. Road data for selected section like width of median,carriagway and shoulder etc. are collected. Traffic volume for 15 min, 30min and 1 hrs. is studied at 75.400 km. . Normal yearly daily traffic will 20293 PCU, 14:00 to 15:00 will be the peak hour volume traffic. Mostly there are two-wheeler vehicle i.e. bike which is 23 %. Maximum variation in the traffic can be noted on Sunday . From spot speed study average speed can be calculated which is 60-70 km/hr. Crash information can be gathered for the year 2005 to 2010 in the close-by police headquarters. Results demonstrate that normal speed be 60-70 km/hr. Study demonstrates that most extreme crashes happen during 2007 and then 2006. Various Linear Regression (LR) Analysis strategies are utilized to Figure crash rate. During site visit many observations has been noticed like minor junction has not developed at Km 76.950 and at 74.060, Unauthorized Median Opening at Km 75.160. Minor Drain cover did not given on 74.080 km. and Pavement Marking missing. Underpass at Km 78.350 raised footpath not provide, confounding signboard of Truck lay bay at

Km 122. 400, Soil can be spilled at the principle carriageway on different area. Hazard marking and object marking missing at 121.800 km. From the investigation it has been concluded that street standard is rising all of a sudden due to recently redesigned from 2-path to four paths from chainage 75.00 to130.00 km, but streets parameters and street-related issues do not bring to this level, say Road user observation, surrounding environment condition etc. Design speed of road is 100 km/hr. Presently Average speed will be 60-70km/hr. and prior it is 30-40 km/hr. It has seen that slow-moving vehicles make movement hazardous for fast moving vehicles because it occupies innermost lane. Therefore, keeping in mind this service lane to be given along the whole four lanes of upgraded highway. An unapproved median opening ought to be shut at need. Study demonstrates that Condition of Shoulder, Median Opening, Spot Speed, Carriageway width, Traffic Volume and Road Markings are the fundamental explanations behind the crashes. Pedestrians guard rail should be given along the footpaths, bus lay bay etc. proper road marking with signs and arrangement of lightening should be given at different junctions and all under construction bridges can be produced because of the fact that major share of crashes happen at such sections

Parida *et al.*, (2012) The examination aims to recognize the Majority of important safety affecting factors of an area of four-lane National Highway-58 through numerical models that clarify the connection between crash counts and highway safety impacting factors. After conduct of various preliminary surveys, the information extracted was simulated for model development and validation. Examination of models was carried by Poisson – gamma or Negative binomial regression technique. It was discovered that Majority of impacting safety parameters were average Spot Speed, Road Marking, and condition of shoulder, Traffic Volume, and Road Marking. The log density function with negative binomial model was the most suitable statistical model for gathering crash information. On carefully observing of these recognized safeties affecting parameters, a road maintaining agency can ensure the safety of peoples and thus also helpful in reducing the accidents. Sufficient carriageway width, median widths decreases probability of a crash. Presence of road markings, guard rails near shoulder edges at curves, curve warning signs markings and high bunds also decreased the probability of accidents, which agreed with the expectations. Highway alignment with minimum curve sections in the road section and curves as per the design speed of the highway also minimizes the chances of accident.

Bagi *et al*. (2012) directed a road safety audit of Bannerghatta road (SH 87) of 12 km. review can be possible from four-year information. The goal of examination is to identify the black spots from FIR and to see impact of road geometrics and traffic on the road stretch and built up a measurable connection between different components causing crashes and crash rates. Road information can be gathered by sub dividing stretch of 1000 m. Volume count of the two areas for covering both peak hour and off-peak hours of day. Floating car method is used to calculate the speed. The selected section is 12 km long from micro layout bus stop to Bannerghatta village. The information gathered from four concerned police headquarters. Frame database according to IRC to gather fundamental data, like, date, time, climate conditions, crash area, vehicle damage and road severity and nature of the crash. Crash information has been organized kilometer-wise, hour - wise, month-wise and year wise to distinguish black spots. According to km-wise information demonstrates that nearly 60% crashes happen between 1 to 4 kilometers. Study demonstrates that person on foot security is low on chosen section. Gopalan shopping center opposite pedestrian crossing is the main crash spot Out of aggregate 217 crashes people on foot involves 88 crashes. The most important reason behind these large number of accidents is the presence of trees on the median which creates visibility issue, speed of vehicles and inadequate shoulder and footpath width trail width. Different graphical connection has to be produced between accidental rates and different width of carriageway, shoulder implies if the width of road expanded it is sufficient give space to stopping the vehicles, for crossing the vehicle as well as for surpassing the vehicles. To discover cash rate Barkov's partially seriousness components to be utilized. With help of crash information, street geometrics information and traffic information, from the above study it has been summarized that most of the accidents occur during 2011. The most important factor for reduction of accidents is overtaking sight distance and safe stopping sight distance.

Patel *et al.* (2013) In this paper author conducted a road safety audit of SH-188 and SH-83 which is essential state highways in Gujrat state which additionally connects NH-8. SH-83 and SH-188 are interconnected to each other beginning from, Umreth to Tarapur (72 km), Umreth to Sarsa (SH - 83) and Sarsa to Vasad(SH-188) 10 KM long. The selected study stretch for performing safety audit extends for 29 km. the goal of the examination to know the reason of crashes, land utilize design and black spots of the investigation region. Street information can be gathered by conducting studies to recognize width of the carriageway, shoulder width, Median

facility, land use pattern along the chosen strength. Classified volume count can be done by manual strategies, photographic techniques mix of manual and mechanical strategy and Automatic counters on weekly basis.at Vasad and Umreth intersection. Examine demonstrates that two-wheel and car are more in number because of high salary of peoples living along roads. Share of two-wheel vehicle is 29.83%. highest among all than different vehicles, cars, three wheelers, jeep as 26.62%. Crashes 33333 information from year (2006-2012) gathered from three distinctive police headquarters. and arranged by hourly activity variety, peak hour movement, average daily traffic, traffic composition, vehicle compose and road user type. Examine demonstrates that aggregate 250 crashes happen on chosen extend, out of which fatal 57, major 48 and minor 145. Two-wheel autos and three-wheeler are main responsible for 74% crashes. and covers 75% of aggregate movement on the investigation zone. 67% of crashes happen between 8.00 AM to 6.00 PM during day time and 33% crashes happen during 6.00 PM to 8.00 AM. Maximum crashes happened in month of May during summer season. Study demonstrates that 38% crashes happened because of head on collision, 15% because of side swipe and 23% walkers hitting by vehicle.85% crashes are happening when the vehicles are proceeding onward straight street due to poor street geometry. As indicated by crashes spot compose 38% 23%and 22% on straight street, T-intersections and cross roads.93% crashes happen due to driver blunder. In remedial measures need of street making and signs, speed breakers, median at the center of roads to isolate traffic on the two sides and island at Kanpur intersection, Vasad and Umreth intersections. Roundabout Circle is given at the center of cross street at Ahima junction and appropriate sight distance should be provided by removal of unwanted objects. From above examination, it has concluded that more crashes happened during day time as compared to night time, lack of sense of safety, Poor road geometry, Lack of traffic sense adding to street crashes.

Sayed *et al.*, (2013) studied that all the traditional method used for road safety audit are effective but more time-consuming. In this study, the researcher used the application of geographical positioning system (GIS) to carried out the road safety audit and used GIS-based software ‘Gram++. This technique gave comfort to auditor to differentiate higher accident frequency rate area with the low accident rate area at different road section of road which to is improved with cost-effective manner. This provides comfort to road auditor to identify deficiency and directly focus on real problems of particular road section. The main aim of the study is to minimize road

fatality and their adversity to meet the need of road user perceptions., to reduce the long-term cost of the project, to increase the awareness of safety culture in designing, planning, construction and maintenance of road. A National Highway (NH) between Panvel and Indapur of 3 km long stretch to be carried out study of road safety audit. He concluded that the large number of accidents can be avoided before they occur, and it helps to analyze the layer of the segments simultaneously so that the recommendations made in the initial stages can be applied to road safety in the successive stages so that improvements can be made.

Gupta *et al.*, (2014) In this paper efforts have been made to develop a data analysis tool that will help in prioritizing the maximum accidents prone intersections out of all the intersection in the given study area. It will help to produce flexible solution to decrease number of crashes. Since the area of crashes is not precisely known, therefore after mapping of points, hot spot examination is done to categories hot spot areas. This investigation demonstrates that the roadway conditions play a vital role in the event of crashes and later must be adequately studies and enhanced and thus can be a prime pointer in upgrading prioritization. The explanatory procedure approves the results of hot spot analysis by comparing them with the areas having most number of accidents named as black spots which require urgent consideration comparing to the significant parameters like surface conditions, plan attributes, roadway conditions, and so forth. In this investigation, the crash information from Chandigarh has been utilized. Geographical Information Software (Arc GIS 10.1) is utilized for crashes mapping of the whole city. Utilizing GIS, one can relate data to different factors, such as traffic-related information and represent the results in an easy to use way. The primary preferred advantage of utilizing this approach is that the outcomes can be approved effectively by considering some fundamental parameters and it also saves time. In this way, the outcomes obtained from the whole procedure can be utilized for planning road safety measures. These outcomes may be used as fast reference decision making of prioritization of streets in the city.

Damodariya *et al.*, (2014) Damodariya et al. (2014) completed the examination to study the traffic safety situation of Kapurai - Dabhoi Section of SH-11, Gujarat, India and to find out the defects of selected road section which results in fatal accidents and give a reasonable suggestions and mitigation measures for stretches. The chosen stretch has a length of 25.8 km having high density of traffic which is further associated with NH-8. Accident data gathered from 2009 to

2013 with the help of police headquarters and make a database by yearly, monthly, daily - km-wise crash record. This database gives relieves to the evaluator to discover black spot studies demonstrates that there are 505 accidents happen during 2009 to 2013.out of which 106 fatal,208 major and 191 minor injuries. Most numbers of crashes happen in the period of July. Study demonstrates that most extreme mishaps happen amid daytime between 15.00 to 16.00 PM. Greatest probability of crash when individual going to work (morning 8-11) and after leaving the job during evening 17.00 to 20.00 PM. Greatest crashes happened because of bike, four-wheeler and trucks. Having number of crashes 126,127 and 100 out of aggregate 505. Persons lies between age limits 20-30 and 30-40 are more engaged with crashes. from the above-given database blackspots are calculated at places where more number of crashes happen. It was concluded that a large number of crashes are happening during daytime as compared to evening., because of heavy load traffic, poor stretch geometry and environment, absence of traffic sense and laws, monsoon climate contribute to road crashes Different proposal are given for different deficiencies found during the site visit. some of them are as follows should be provided with emergency parking area, hoardings are expelled at chainage 2.60 km which disturb the sight distance, Zebra intersection will be given at bus bays for the person on foot. Numerous crashes happen close railway station and bus stand on SH-11 provide speed breakers to control speed. Lighting will be provided during night time for pedestrians crossing. Road marking and road sign board should be given on roadside, intersections and junction.

Vaidehi *et al.*, (2014) carried out the study road safety shows that the current transportation system minimizes the distances, but at the same time increased the risk of life. Countries such as India the accident t rate increases year-by-year. The paper, with two objectives, first is a road safety audit to reduce the vulnerability of the urban area of the main corridor, and develop the random model taking accident as the main parameter. These black spots have been determined in accordance with detail of the accident to stretch is selected. This study in the selected area onto the Naroda-Narol, Ahmadabad in Gujarat state. The primary objective of the study is to carry out road safety on selected stretch and give remedial measures to reduce accidents for study stretch. and developed an accidental model for urban areas. survey was carried out to collected accident data from five zonal police stations i.e. 2009-2013 There are 58 number of fatal accident including 310 major accident and 90 minor accidents. Traffic volume carried out at different locations i.e. Isanpur crossroad, Expressway Tran Rasta, Narol circle, Ghodasar cross road, CTM

crossroad, CTM crossroad by manual count method and intersections carried with videography method. To compare Design speed with actual speed, a spot speed survey at various locations with radar gun. The observations from the survey show that no signal has been provided at five intersections, no service and parking lane provided at Ghodasar to Jasodanagar road. Roadside parking of autos on selected stretch results congestion which further leads to accidents. Improper pedestrian's facilities and poor knowledge of rules.50% accidents occur during night time. Clear weather says summer season prone to be more accidents than in winter season. unauthorized vendors are observed at Isanpur and CTM crossroad. Majority of the accidents are occurred during night time, which leads to high speed.50% accidents occurred during the night. i.e. peak hours between 7:00 pm to 6:00 am and 12:00 pm to 6:00 pm. The remedial measures are given above observations. Vendors are removed along with the roadside. Proper Zebra crossing and footbridge to be constructed along the road. Provide proper parking along stretch. Proper signals to be provided to aware drivers. Proper sight distance to be provided i.e. removed hoarding along the road. Training should be provided to aware safe driving.

Mankar *et al.* (2014): - This paper carried out study that road safety audit serves as an important part of the transportation planning process. Because by the year 2020 road accidents become the six-leading cause of the world's largest causes of death. safety measures now included in the transport planning process and also including at maintenance, construction, operation and analysis which is significantly affecting traffic safety. The study shall be presented to the audit of road vehicles, communications, maintenance, construction, operation and analysis of the different accident occurring in the section. The main objective of the study is minimizing the accidents rate in future after the result of new infrastructure schemes and planning decisions. reducing long-term cost and minimize the severity of accidents. The stretch selected for study is Nagpur city from Sitabuldi to Butibori for analysis. The road is newly constructed and upgraded and sustained and operated by National Highway Authority of India (NHAI) under the Ministry of Road Transport and Highways (MORTH). The accident data collected from nearby police stations four years from 1/1/2010 to 31/12/2013.The study shows that maximum number of accidents occurs in the year 2013 which is 344 which is increasing every year from 2010 to 2013. Accident data can be classified on the basis of traffic flow variation daytime and evening time and different days wise. The progress rate of motor vehicles is directly related to the growth of different sectors like industries, agriculture and mining etc. The growth rate can be calculated

mainly by the population of the selected area, growth rate in per capita income and GDP of the state. As the traffic increases and no of accidents also increased, study also shows no of vehicles out of control also increases. Which is results of high speed. Spot speed survey conducted on 12 October 2013 by using Video graphics method to carry out the study. The results concluded from the study that road standard rises quickly but other related factors do not up to that level. The speed of highway is very high. but prevailing conditions do support that speed. From the data analysis, it has been found that Traffic Volume, Road Markings, Condition of Shoulder, Media Opening and Carriageway condition and spot speed, are the main factors for resulting of accidents.It has also been noticed that slow-moving vehicles were creating danger for fast moving vehicles as it always occupied the innermost lane of highway. To reduce congestion there is the provision of flyover; increase in road width, Provision of road parking signals can be provided. Or heavy traffic can be diverted to Nagpur to Wardha road. For minimizing the accidents, the condition of street lighting and speed of the vehicles must be reduced. In order to increase safe flow patterns, traffic management and their operation schemes should be adopted. Also travel time studies and conducting traffic safety program needs to be repeated frequently

Singh (2016) The primary point of the paper is to analyze the road crashes in India at national, state, and metropolitan city level. Examination demonstrates that the roads crash death and injuries in India changes vary according to sex, age, month and time. Age gathers 30-59 years is the maximum population gathering; however, males confront larger amount of fatalities and wounds than their female. In addition, road crashes are y higher in extreme climatic conditions and during working hours. Investigation of road crashes situation at state and city level demonstrates that there is huge variation in fatality risk across the cities and states. Casualty chance in 16 out of 35 states and union territories is higher than the all India average. In spite of the fact that, chances of street crashes in India is hardly lower in its metropolitan cities.

The mitigation techniques center around four key factors that add to the danger of event of a street crashes –road environment, behavioral factors, exposure and vehicle factors. There is a need to advance not just regional economies such that it lessens the requirement for long-distance travel with addition independent compacted townships which would diminish the requirement for short-remove travel inside the cities. There is a need not only to isolate quick moving from moderate or slow-moving vehicles but also from light vehicles to heavy vehicles

and also enforcing speed limit on fast-moving vehicles. In mix traffic condition, confinement on vehicle speed would similarly help in diminishing crashes to people on foot, cyclists, and other vulnerable road users. In India, improper driver training and testing facilities increases the hazard. The level of implementation of traffic law and the seriousness of punishments also affects the road user behavior. The approaches in road safety education and enforcement, for example, wear your safety belts, wear head protector while driving, say no to drunken driving, and general consideration to traffic rules are basic in bringing the number of collisions down

Tiwari *et al.*, (2016) This examination reports the consequences of fatal crash information from six medium-sized cities in India: Amritsar, Bhopal, Agra, Vishakhapatnam, and Vadodara. Out of the total road crashes, the percentage of vulnerable road user's death accounts between 84 to 93 % whereas car users fatalities accounts between 2 to 4 % and three-wheeled scooter taxi result in less than 5 %. The biggest extent of fatalities for all street client classifications (particularly vulnerable road users) is related with crashes with buses and trucks, followed by impacts with car; in any case, the extent of person on foot fatalities related with MTW impacts ranges from 8% to 25% of the aggregate. Occupant casualty rates per 100,000 vehicles for MTW and TST occupants are 2– 3 and 3– 5 times higher, respectively, than for cars. MTW and peoples on foot are generally high between 8 p.m. and11 p.m.

The information demonstrates that car users represent to a little extent of the aggregate fatalities: 4% and 3% in Mumbai and Delhi, separately, and 15% on rural highways. Vulnerable road users; like people on foot, bicyclists, and mechanized bike riders) represented 89% and 83% of the deaths in Mumbai and Delhi, separately, and 47% to 76% of those on highways. Ludhiana has the most number of cars and MTWs, whereas Vadodara and Vishakhapatnam have a considerably higher extent of TSTs. Ludhiana and Amritsar have a comparatively large number of bicyclists. The extent of person on foot fatalities related to MTW impacts ranges from 8% to 25% of the aggregate. The highest proportion was seen in Bhopal. The proportion of males and females sharing of fatalities is about 4:1 in every six cities.

Mogre *et al.*, (2017) This paper is an endeavor to break down the activity wellbeing circumstance H B Town SQUARE to Jersey Milk Processing Plant on Bhandara road in Nagpur of National Highway 53 and Asian Highway 46, India reorganization of countermeasures is done

for extends in which the aggregate damage brought about by accidents can be significantly and prompt.ly diminished. After conducting Road Safety Audit, it was concluded that trucks were halted on freeway which results in diminishing the successful width of road and making movement dangers to quick moving activity. Unapproved median openings were discovered which ought to be quickly closed. Missing road and middle markings to be done and speed signs should organize with speed. Service streets are inadequate which requires quick change. It is found that Road Markings, Condition of Shoulder, Carriageway condition and Median Opening were fundamental parameters for bringing on crashes. It was also seen that moderate moving traffics were making activity perils for quick moving movement as it generally occupied the inner majority of path of highway. The Vulnerable Road User (VRU) i.e. people on foot and cyclists offices close home are missing and should be encouraged on need.

In response of above conclusions following are the recommendations for the selected stretch are given:-All unapproved median openings ought to shut and satisfactory arrangement like zebra crossing required for crossing street for walkers or for crossing neighborhood individuals be made on priority, all undeveloped major and minor crossing points must be developed with satisfactory lighting arrangements as fast as could be possible , Pedestrian guardrail ought to be given up all along the footpath of Service Street and at bus stops , there is important to give Bus Bays to traveler wellbeing and facility, various sign boards should be reinstalled and some others need correction only, few sign board are missing and is to be installed to avoid congestion or to avoid any incident.

Vanjari *et al.*, (2017) carried out the safety audit study of the selected stretch service road adjacent to National Highway 3 passing through Nashik city. The stretch to be select from Adgaon Naka to Garware point. The objective of the study road safety and identify the black spots and safety concerns on the selected stretch. Analyze the accident data from the year 2010 to 2015 and discuss the results and discussion. NH3 is busy road in selected stretch and having mixed traffic condition. The classified volume count can be measured from 8 am to 10 pm. The survey can be conducted manually on daily basis selected stretch. The highest traffic volume at Dwarka circle is 13786. Dwarka circle is the Centre of Nasik City. Garware is away from the city having less traffic volume count. The traffic data from 2010 to 2015 is collected from the police station and National Highway Authority India (NHAI) for the stretch of study area. The

collected classified on the basis of Road user type, accidents on the basis of time of accident, on accidents on the basis of Vehicle maneuver, accidents on the basis of causes of accidents, accidents on the basis of Month, accidents on the basis of Vehicle type, accidents on the basis of Nature of accident, accidents, accidents on the basis of location and the yearly distribution of accident data. The highest number of accidents occurred in the month 2010, but the rate of accidents decreased up to year 2013.Two wheelers cause highest road fatalities i.e. 73% dues to commercial area around the stretch and minimum accidents occurred due to multi-axle. i.e. 11%. The number of accidents occurred in the time interval 8 am to 8 pm. The number of accidents occurred in the month of July i.e.13.84%. due to rainy season and minimum number in the month of May due to dry weather and clear visibility. The more in number of occurred accidents from Mumbai Naka to Pathardi phata i.e. 28%. As these pints are entry and exit points to the flyover from service roads. The black spots can be calculated of the selected stretch by visual observations. From the study, it can be concluded that at Jatra hotel junction, Rasbihari crossroad and Amrutdham ring road crosses the service road. This point mixed the traffic and traffic gets jammed. To avoid this underpass and flyover be provided. Speed breakers should be provided to reduce speed. At points where turns are blind provided signals and proper sight distance be provided. The unauthorized opening should be closed. signals can be provided to regulate traffic and prevent jams. From the analysis, it is concluded that more accidents occurred during daytime and factors contribute to the accidents are mixed traffic, disobedience of traffic rules and regulations, climatic conditions, poor road geometry, lack of traffic sense, habits and negligence of driver.

2.3 OBJECTIVE OF THESIS

- Collection of accident data of previous year and classified the collected data in order to know the Nature of accident, Cause of accident, Type of collision, Type of vehicle involved in the accident, Hourly classification number of accidents, Month wise distribution of accidents.

- Plotting of accident spots on the map and identifying the black spots areas on the basis of their ASI values.

- Performance of Road Safety Audit on the black spot as well as other major intersections, arterial, collector and local roads where the probability of accidents are more and calculation of scores .

- Review and recommendations made for major black spot based on the nature, type of accident occurred and road safety audit performed.

2.4 GAP IN STUDY

Previous studies does not include the filling of the Road Safety Audit. Scoring of the roads has been given first time. First time, accidental data of 5 years has been collected of Patiala and black spots were marked thoroughly. Identified black spot areas were visited and cause of accidents were noted and their mitigation measures were suggested. Mapping of accidents is done first time. Speed analysis of vehicles is also a new concept by which percentage of vehicles exceeding their permissible speed is calculated out.

CHAPTER 3

COLLECTION OF INVENTORY DATA FOR PATIALA ROADS

3.1 INTRODUCTION

Patiala city is the administrative headquarters of Patiala district of Punjab and is located in south eastern part of the state. It is the fourth largest city of Punjab. The city's foundation was laid by Baba Ala Singh in 1763. It is built around a fort called 'Qila Mubarak'. Patiala was an erstwhile princely state and served as the capital of PEPSU (Patiala and East Punjab States Union) before it joined the united Punjab state in the year 1956. The princely state had rulers who gave the city a rich heritage in form of beautiful architectural marvels like Moti Bagh palace, Baradari Garden, Qila Mubarak, Sheesh Mahal etc. After the independence of India, the city grew around agricultural fields and the major producer of the region is wheat and rice.

The city extends from 30°12'N to 30°27'N latitude and 76°11'E to 76°32'E longitude. Patiala is located 233 km away from Delhi and 67 km from the state capital of Chandigarh. Patiala is well connected to other important cities of Punjab as well by a network of National, State and District roads. Culturally the city is famous for its traditional Patiala Shahi Turban (headgear of Sikhs), Patiala salwar (type of female trousers), jutti (female footwear) and Patiala peg (a measure of liquor).

3.2 URBANIZATION

The first urban local body – Municipal Committee – of Patiala was established in 1904. Thus, the local administration is present for the city from a long time, i.e. more than a century. The Office of Divisional Town Planner was setup 1967 in the view to developing the city in a planned manner and as a result the first Master Plan of Patiala was prepared in the year 1971. The population of Patiala city, as per the latest Census 2011, is 406,192 and the Patiala Metropolitan Region is 446,246. The growth trends of Patiala's population from 1901 to 2011 are shown in Fig 3.1. It can be seen that a maximum population growth of 40% happened during the 1941-51 period in Patiala city which was a result of the partition between India and Pakistan.

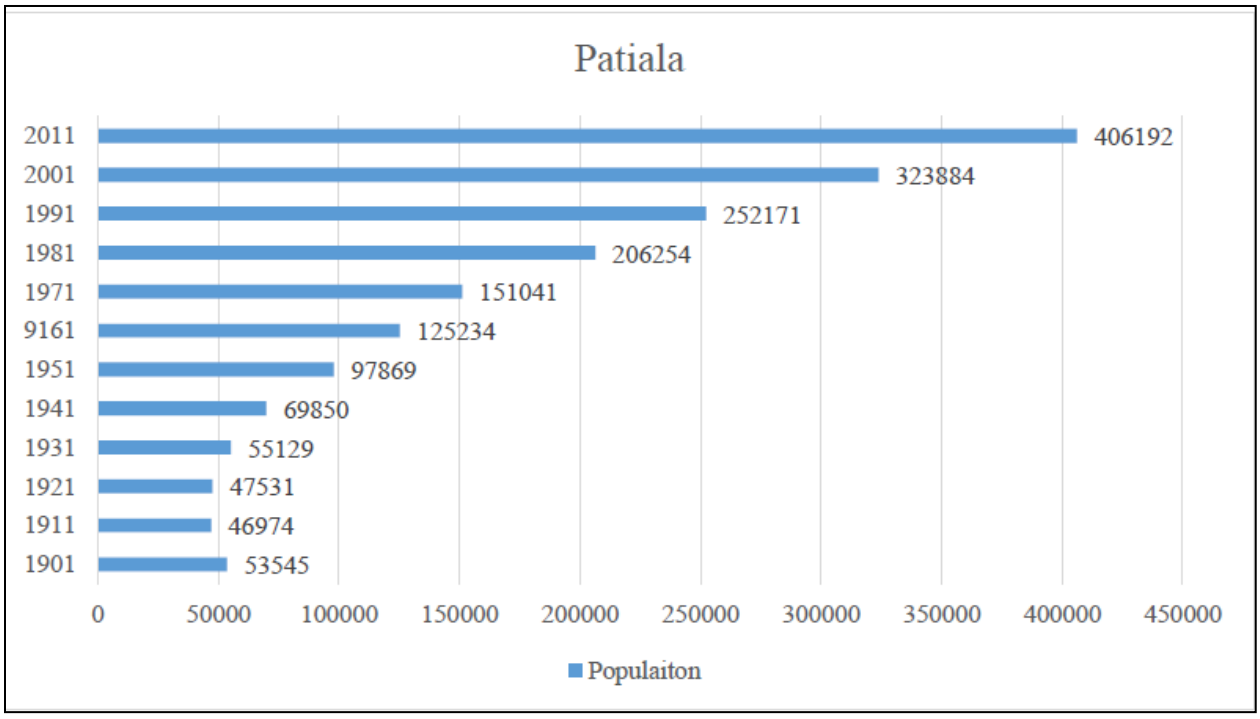


Figure3.1 Population Growth of Patiala City 1901-2011 (Source PDA, 2009)

Considering the continuous rise in population levels and being the fourth largest city of Punjab, the city of Patiala established the Patiala Urban Development Authority (PDA) in the year 2002. The authority has the responsibility for a balanced development including the areas in and around the Patiala's Municipal limits. According to the Punjab Regional and Town Planning Development Act – 2006, the Local Planning Area or the L.P.A. was notified in the year 2008.

3.3 ROAD NETWORK

Patiala is situated on N.H. 64, 29 km away from Rajpura which falls on the major highway network of India connecting directly to Delhi in the south and up to Srinagar and Amritsar in the North. Thus, Patiala has a good regional connectivity with various cities of Punjab as well as neighboring states of Haryana and Himachal Pradesh. Inside the city, the existing road network is partially radial in pattern. 9.02% of city's total developed area is covered under roads and the major roads of Patiala have a total length of 89.09 km inside the city with varying widths as given below.

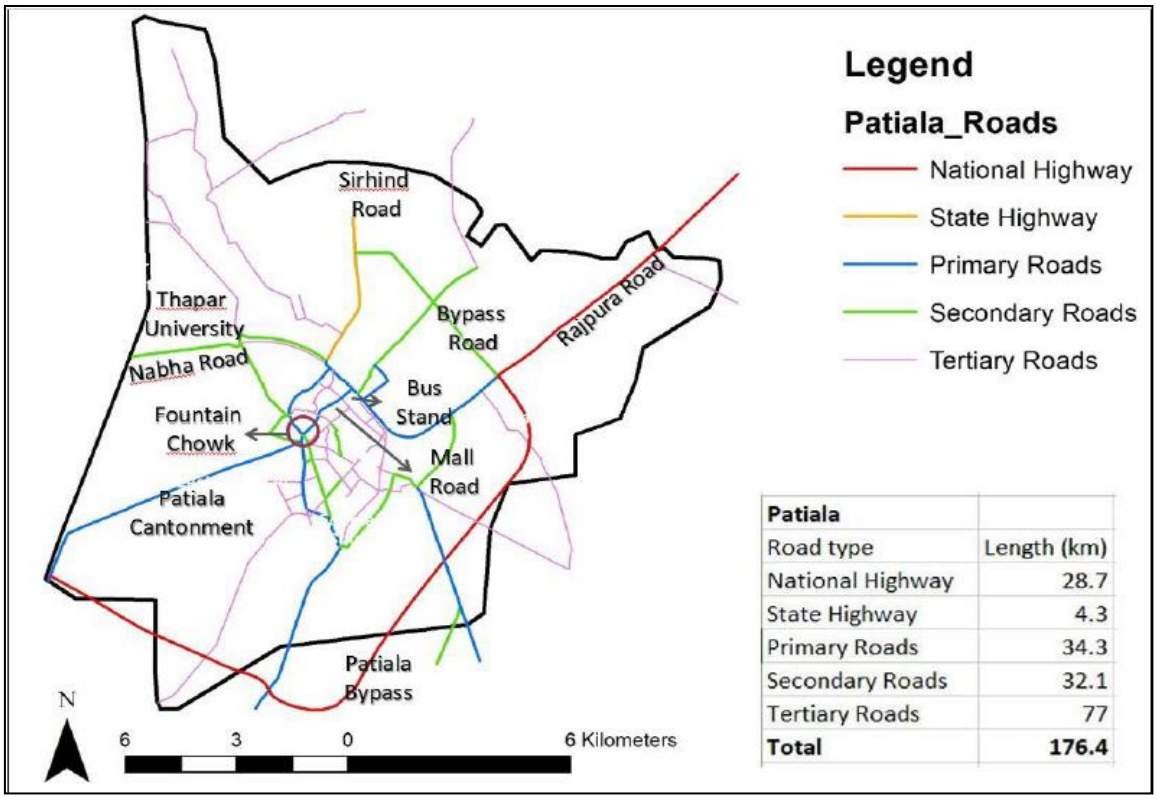
Table 3.1 Varying roads widths of major road of Patiala (Source Master Plan, Patiala)

Right of way (m)	Road length (in km)	Percentage
<10	15.32	17%
10 to 20	22.58	26%
20 to 30	24.33	27%
30 to 40	16.06	18%
>40	10.8	12%
Total	**89.09**	**100%**

Table 3.1 represents the major roads inside Patiala city and Fig 3.2 shows the map for the major roads of Patiala which indicates the partial radial pattern of the city aforementioned in the same section. All majority of half of the city roads have a considerable carriageway width of more than 20 m. The Rajpura road entering the city from northwest brings the traffic from Chandigarh and Delhi side directly into the city. The bus stand and the railway station are located at the heart of the city and Majority of the major roads converges near this location. The famous 'Mall Road' of the city also starts from the Bus Stand of Patiala up to Fountain Chowk as shown in Fig 3.2. The same stretch is discussed in detail in further sections of the report.

Right of Way (RoW)

About 27.31% of the road length has RoW between 20 to 30 m, 25.35% has RoW between 10 to 20 m and 17.20% has RoW less than 10 m and about 30% road network has RoW more than 40 m as shown in Table No 3.1



Patiala	
Road type	Length (km)
National Highway	28.7
State Highway	4.3
Primary Roads	34.3
Secondary Roads	32.1
Tertiary Roads	77
Total	**176.4**

Figure 3.2 Map for major roads of Patiala (Source First Phase Draft Report by TRIPP)

3.4 ROAD NETWORK CHARACTERISTICS:

The L.P.A Patiala is well served by roads connecting it to various cities of other districts and within district.

1. National Highway 64 passes through the city connecting Rajpura and Sangrur.

2. State Highways 10 and 8 passes through the city of Patiala connecting Samana and Devigarh. Major District Road 25 connects Patiala to Cheeka towards Haryana.

3. There are three scheduled roads namely Patiala-Nabha (S.R.-32), Patiala-Sirhind (S.R.-31) and Patiala-Samana (S.R.-18).

4. Other major roads connecting Patiala are Patiala – Sanaur, Dakala, Main and Bhadson.

The present road network in the city is partially radial in pattern. The Nabha road also carries the traffic of Bhadson road which merges at Thapar University Chowk and meets Sirhind road at Gurudwara Dukhniwaran Sahib and then leads to the city. Similarly, Sangrur road also

carries the traffic of Samana road which bifurcates near Bhakra mainline. Rajpura road carries the traffic from Chotti Nadi onwards and from transport nagar it also carries the traffic of Sanaur road, Cheeka road and Pehowa road. The National Highway 64 enters the city from two sides i.e north east and south-west, and south directions.

These important roads entering the city are listed below;

1. Sangrur – Patiala (N H 64)
2. Rajpura – Patiala (NH 64)
3. Pehowa – Patiala (SH 8)
4. Samana – Patiala (SH 10)
5. Nabha – Patiala (Scheduled Road)
6. Bhadson – Patiala (Scheduled Road)
7. Sirhind – Patiala (Scheduled Road)
8. Sanaur – Patiala (Other distt. Road)
9. Cheeka – Patiala (Other distt. Road)

3.5 ROAD INTERSECTIONS

During road network examination of Patiala city, it is seen that there are 27 number of road intersections which are within the limits of MC which remains almost busy for 24 hours. The detail of road intersections is given in the table below: -

Table3.2 Road Intersection in Patiala City (Source Master Plan, Patiala)

Sr No	Name of Junction	Type of Junction
1	Bus Stand Battiyan Wala Chowk	Signalized
2	Sirhind Gate Chowk	Signalized
3	Truck Union Chowk	Signalized
4	Devigarh/Sanaur Road Chowk near Bari Nadi	Signalized
5	Gurdwara Dukhniwaran Chowk on Rajbaha Road	Signalized
6	Police Line Road near Dhillon Residence	Signalized
7	Mini Secretariat	Signalized
8	Thapar College Chowk	Signalized

9	Civil Line Chowk	Signalized
`10	P.R.T.C. Workshop, Nabha Road	Signalized
11	Children Memorial Chowk	Signalized
12	. Capital Cinema Chowk	Signalized
13	State Bank of Patiala Chowk/Sheranwala Gate	Signalized
14	Ranbir Marg at Bhupindra Road	Signalized
15	Modi College	Signalized
16	Model Town Chowk	Roundabout
17	Fountain Chowk	Roundabout
18	Sewa Singh Thikriwala Chowk	Roundabout
19	Y.P.S. Chowk	Roundabout
20	N.I.S. Chowk	Roundabout
21	Lahori Gate	Crossing
22	Bye Pass Rajpura Road	Crossing
23	Ragho Majra Chowk	Crossing
24	Ayurvedic College Chowk	Crossing
25	Sirhind Road T-point (Near Dukhniwaran Sahib)	T-Junction
26	Bye Pass Sirhind Road	T-Junction
27	Corner Hotel on Mall Road	T-Junction

3.6 LENGTH AND WIDTH OF MAJOR ROADS IN PATIALA CITY

The length and width of major roads in Patiala is given in Table no 3.3.These roads carry a huge traffic from one point to another having irregular alignment and varying widths. The below data comprises of length and width of NH, SH and other major road available in the city .

Table 3.3 Length and width of Major Roads in Patiala City (Source Master Plan, Patiala)

Sr. No.	Name of the Road	Length (KM)	Width of Road (m)	Width of Road carriageway (m)
1	Bus stand to Rajpura Road	4.80	37.80	8.23
2	Gurudwara Dukhniwaran Sahib to Thapar Univ. (Jail Road)	2.25	27.43	7.30
3	From Thapar University to Nabha Road unto M.C. Limit.	2.60	25.00	6.90

4	Gurudwara Dukhniwaran Sahib to Sirhind Road up to M.C. Limit	4.40	25.00	7.32
5	From Mahindra College to Dakala Road up to M.C. Limit	1.30	12.00	7.00
6	From Thapar Univ. Chowk to Bhadson Road (up to Jail end)	0.80	23.48	6.71
7	From Jail end to Bhadson Road (up to M.C. Limit)	1.05	21.00	10.00
8	From Bus Stand to Gurdwara Dukhniwaran Sahib Chowk	0.90	18.29	6.71
9	From Fountain Chowk to Leela Bhawan Chowk	0.70	32.93	13.5
10	From Fountain Chowk to Mahindra College (Lower Mall)	2.25	29.30	10.0
11	From Leela Bhawan Chowk to Nabha road Chowk (Bhupindra Road)	2.10	34.15	7.32
12	From Leela Bhawan Chowk to Gurudwara Dukhnawaran	1.46	32.93	13.5
13	Leela Bhawan Chowk to Sheran Wala Gate (Through Baradari)	1.10	14.33	6.5
14	Leela Bhawan Chowk to Lal Singh Memorial Hospital Chowk (Income Tax Road)	0.70	30.48	21.95
15	Gurudwara Dukhniwaran to Bhupindra Road (Passey Road)	2.00	18.29	10
16	From Hotel Fly Over to Bundha (Factory Area Road)	0.80	18.6	5
17	From Nabha Road to 24 No. Phatak	1.45	9.0	4.8
18	From Nabha Road to Ablowal Grid	1.4	8	4.6
19	From Tripuri to Ranjit Nagar	2.0	10.0	6.0
20	Road Backside Thapar University	1.5	6.0	5
21	From Bus stand to S.S.T.Chowk	1.80	24.39	7.32
22	From S.S.T. Chowk to Sangrur Road up to M.C. Limit	2.20	38.41	6.71
23	S.S.T Chowk to Gurudwara Moti Bagh (Upper Mall)	1.90	37.50	7.5
24	S.S.T Chowk to Lal singh Memorial Hospital Chowk	0.80	34.0	30
25	From Kohli Sweet Chowk to Gurudwara Kashmirian (Tripuri Road)	1.00	27.4	13.4

3.7 TRAFFIC VOLUME ON MAIN ROAD NETWORK

The District Town Planner of Patiala has conducted this survey on the below mentioned roads in order to know the volume of the road and vehicular composition.

Table 3.4 Traffic Volume of Patiala City (Source Master Plan, Patiala)

Sr. No	Name of the road	Rikshaw /cycle	2-W	Car/ Jeep/ Auto	Bus /Truck	Cart	Total
1	Fountain chowk to bus stand	984	1263	1466	225	25	3963
	Fountain Chowk – Leela Bhawan	830	705	864	438	5	2842
	Fountain Chowk – Lower Mall	822	722	878	34	12	2468
	Fountain Chowk - Thikriwala Chowk	1181	1633	1625	521	13	4973
2	Leela Bhawan Chowk-Cantonment	431	547	265	33	4	1280
	Leela Bhawan Chowk-Thapar College	903	1275	1106	112	8	3404
	Leela Bhawan Chowk-Gurdwara Sahib (Rajbaha Road)	700	1427	1179	714	20	4040
	Leela Bhawan Chowk-Baradari	551	580	144	2	3	1280
3	Thapar Univ. - Bhadson Road	316	350	371	112	22	1171
	Thapar Univ. - Nabha Road	126	251	215	42	3	637
	Thapar Univ. - Bhupindra Road	307	552	285	33	5	1182
	Thapar Univ. - Gurudwara	496	548	347	196	5	1592

	Sahib						
4	Gurdwara Sahib Chowk – Sirhind road	179	272	317	120	12	900
	Gurdwara Shib Chowk – Nabha Road	348	563	447	80	3	1441
	Gurdwara Sahib Chowk – Bus Stand Chowk	468	584	535	129	15	1731
5	Bus Stand Chowk – Rajpura Road	771	1062	1440	544	21	3838
	Bus Stand Chowk - Gandhi Nagar	1347	1137	577	325	16	3402
	Bus Stand Chowk - Gurbax Colony	866	1104	65	5	—	2040
	Bus Stand Chowk – Dukhniwaran Sahib	400	1029	1258	704	12	3403
6	Thikriwala Chowk – Sangrur Road	398	651	880	425	3	2357
	Thikriwala Chowk – Badungar Road	329	470	338	29	2	1168
	Thikriwala - Upper Mall	454	512	407	67	8	1448

CHAPTER – 4

ACCIDENT COLLECTION AND ANALYSIS

4.1 STUDY AREA

The data of fatal accidents for year 2013,2014 and 2015 was collected from the Kirat's research paper "Method To Identify Black spots With Minimal Available Police Data" 2017.For 2016 accidental data was taken from office of Traffic advisor Punjab where records of all the registered FIR s were available. From the records, all the fatal and non-fatal road traffic injuries cases of the police stations within the city boundary were enlisted and the print was taken out from the Punjab police website knowing the FIR number and the police station name. There are five police stations in Patiala. All the FIRs in which charge 304A was lodged were collected. These essentially include the cases in which at least one person died.

The different IPC sections with their explanation are given in Table No 4.1 and list of police station headquarter in Table No.4.2.

Table4.1 The Indian Penal Codes of Road Accidents

Sr. No	Section	Explanation
1	IPC 279	Rash driving or riding on a public way
2	IPC 427	Mischief causing damage to the amount of Rs 50
3	IPC 337	Causing hurt by act endangering life or personal safety of others
4	IPC 327	Voluntarily causing hurt to extort property or to constrain to an illegal act
5	IPC 304A	Causing death by negligence
6	IPC 283	Danger or obstruction in public way or line of navigation
7	IPC 338	Causing grievous hurt by act endangering life or personal safety of others

Table4.2 List of Police Stations of Patiala

Sr. No	Police Station
1	KOTWALI PATIALA
2	CIVIL LINES PATIALA
3	URBAN ESTATE
4	TRIPRI PATIALA
5	LAHORI GATE PS

4.2 ANALYSIS OF ACCIDENT DATA

After collecting accident data of 2013, 2014, 2015 and 2016, given in Appendix A, a complete analysis can be done for all the accidents which occur at various locations, in order to know the cause of accidents, nature of accidents, classification of accidents, type of collisions, types of vehicle involved in the accident and month wise classification. The analysis has been performed and the results are shown in Figures

4.2.1 **Nature of Accident**

It was seen that 29 % of accidents leads to fatal accidents in which at least one person has died. 45% of accidents are minor in which small injuries have taken place whereas 26 % accidents lead to serious injuries.

The classification of nature of accidents with their percentage is given in Table No 4.3 and its percentage pie – chart is given in Fig 4.1.

Table4.3 Accidents on the basis of their nature

Nature	No of Accidents	Percentage
Minor injury	237	45
Grevious Injury	198	26
Fatal	153	29

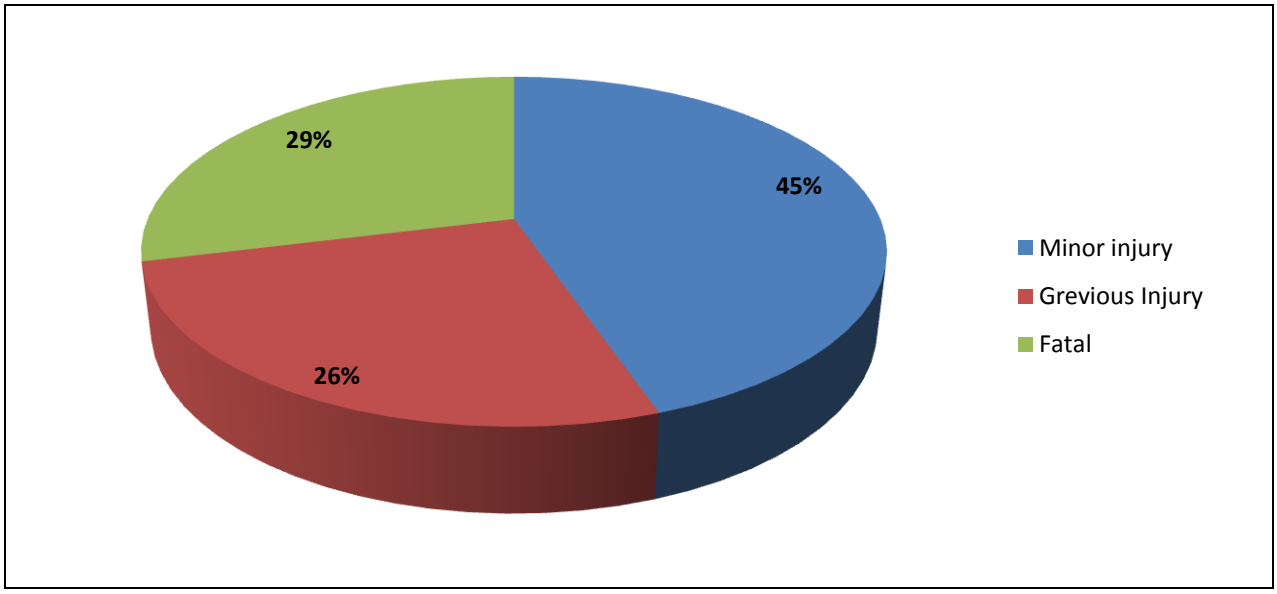


Figure4.1 Nature of Accident

4.2.2 Victim Sex

As mostly male drive the vehicle therefore their percentage of the accident was also higher as compared to females. 87 % of males were prone to fatal accidents. Table 4.4 gives the sex of the victim and Figure4.2 shows their respective percentage.

Table4.4 Location with and their ASI values

Sex	Person died	Percentage
Male	199	87
Female	30	13
Unknown	1	-

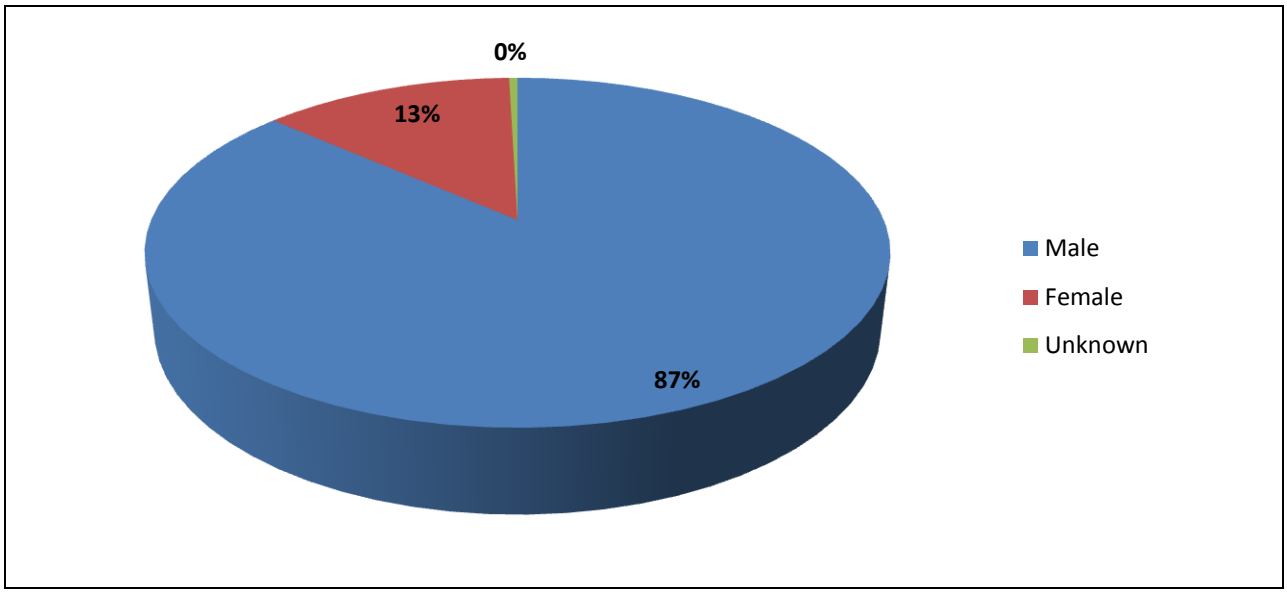


Figure4.2 Accident on basis of sex

4.2.3 Monthly wise classification of road accidents

Here, monthly wise road accidents scenario shows that most numbers of accidents were occurred in the month of June, July and December which accounts for 11% of road accidents and remaining are occurred as shown in table 4.5 and their percentage in fig 4.3.

Table4.5 Monthly wise distribution of Accidents in Patiala

MONTH	2013	2014	2015	2016	TOTAL
JANUARY	5	6	4	2	17
FEBRUARY	5	3	5	3	16
MARCH	2	4	5	4	15
APRIL	6	6	5	3	20
MAY	2	5	3	2	12
JUNE	7	9	4	4	24
JULY	9	7	4	5	25
AUGUST	3	8	3	3	17
SEPT.EMBER	2	4	7	6	19
OCTOBER	7	6	2	6	21
NOVEMBER	4	6	5	4	19
DECEMBER	5	8	5	6	24
TOTAL	57	72	52	48	

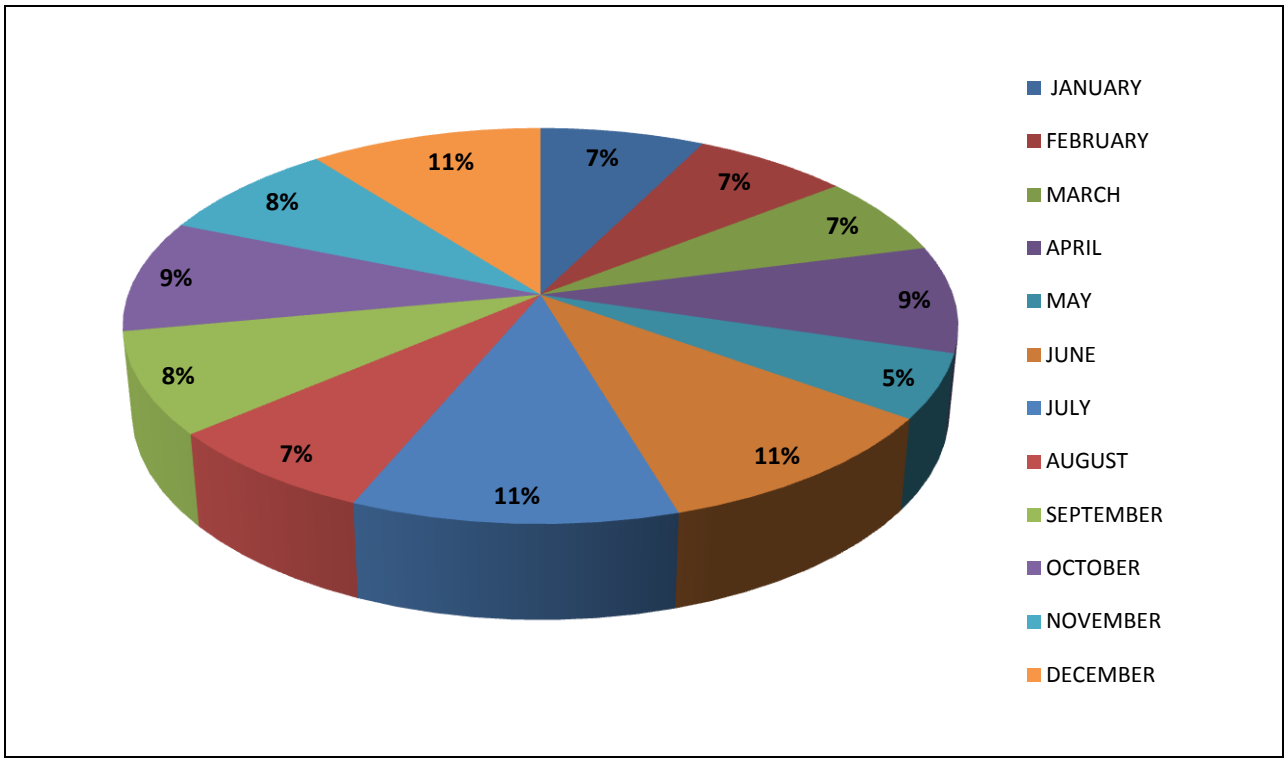


Figure4.3 Monthly wise classification of road accidents

4.2.4 Number of accidents according to hourly

Maximum number of accidents during day hours (6.00 AM to 6.00 PM) occurs during the period of 3:00-4:00 PM and maximum number of accidents occurs during night hours (6.00 PM to 6.00 AM) during the period of 09:00-10:00PM and 6:00- 7:00 PM. Table 4.6 gives the hourly distribution of accidents in Patiala.

Table4.6 Hourly distributions of Accidents in Patiala

TIME	NO OF ACCIDENTS
00:00 TO 01:00	7
01:00 TO 02:00	-
02:00 TO 03:00	3
03:00 TO 04:00	1
04:00 TO 05:00	1
05:00 TO 06:00	6
06:00 TO 07:00	7
07:00 TO 08:00	2

08:00 TO 09:00	4
09:00 TO 10:00	10
10:00 TO 11:00	9
11:00 TO 12:00	7
12:00 TO 13:00	10
13:00 TO 14:00	12
14:00 TO 15:00	9
15:00 TO 16:00	13
16:00 TO 17:00	10
17:00 TO 18:00	11
18:00 TO 19:00	15
19:00 TO 20:00	14
20:00 TO 21:00	11
21:00 TO 22:00	15
22:00 TO 23:00	10
23:00 TO 24:00	5

4.2.5 Day of Accident

It was observed that in Patiala most of the fatal accidents take place on Tuesday followed by Wednesday and then Sunday and Friday. Table 4.7 show the day of accident and Figure 4.4 shows the percentage involved in it.

Table4.7 Day of Accidents in Patiala

DAY	FATAL COLLISION	PERCENTAGE
Monday	28	12 %
Tuesday	38	16%
Wednesday	36	16%
Thursday	31	13%
Friday	34	15%
Saturday	29	13%
Sunday	34	15%

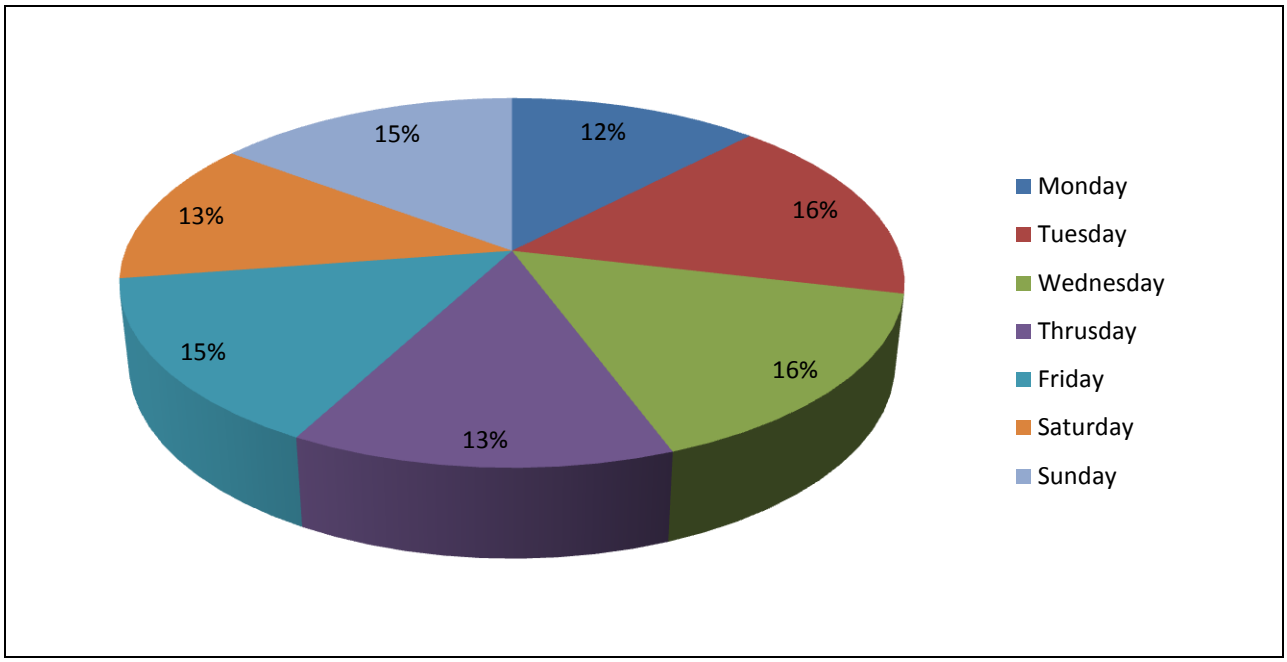


Figure4.4 Day of Accident

4.2.6 Type of Collision:-

The type of collision i.e. whether vehicle hitting another vehicle from back, or front or from sides way or it is hitting the pedestrian involved in accident is given in Table 4.8 and its pie chart is given in Figure 4.5.

Table4.8 Type of collision of vehicles in Patiala

Collision type	No of Fatal	Percentage
Hit Pedestrian	55	24%
Vehicle Head On	36	16%
Vehicle hit from Back	73	32%
Vehicle hit from side at right angle	23	10%
Sideswipe (same direction)	4	2%
Vehicle Sides swipe (opposite direction)	9	4%
Overturn	2	1%
Vehicle hit fixed object	3	1%
Run off the road	2	1%
Others	6	2%
Unknown	17	7%

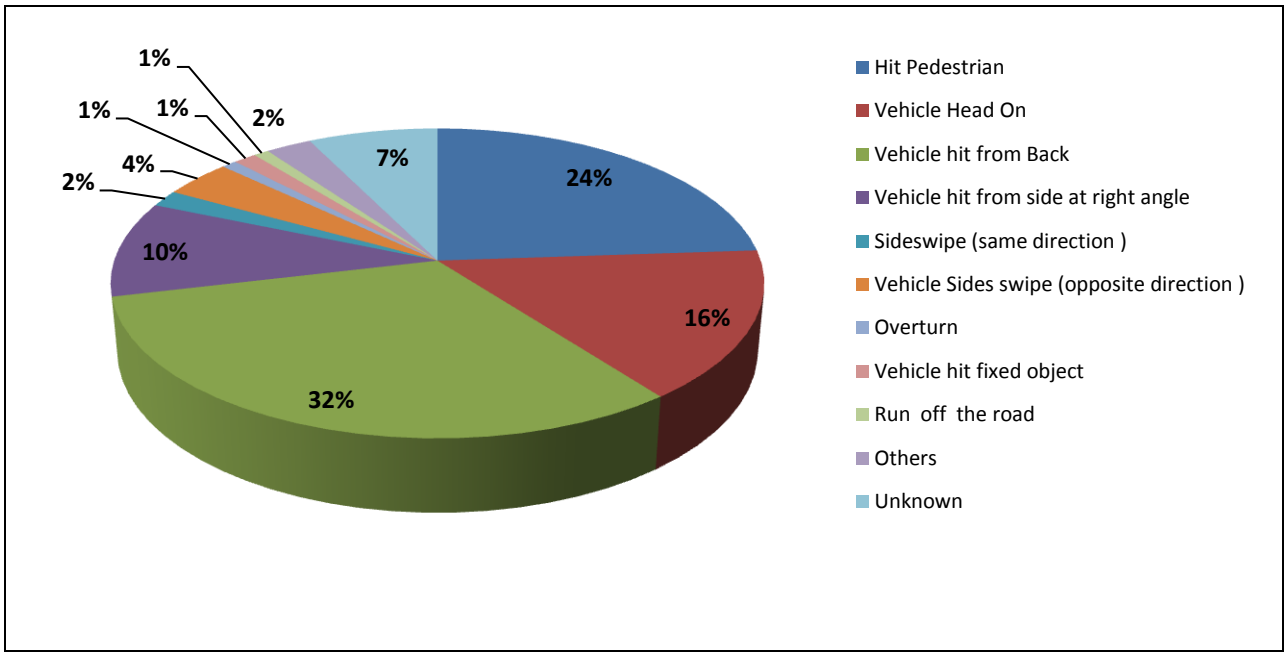


Figure4.5 Type of collision of Vehicles

The maximum collision occurs due to vehicle hit from back which accounts for 32 % of the total collisions. The second type of collision is of pedestrian. Pedestrians were generally hit by moving vehicle while crossing the road. They account for 24 % of the total collisions. Head on Collision also having a high percentage of 16%. The main cause of head on collisions is wrong side movement.

4.2.7 Collision spot

It was observed that accidents usually take place on straight roads but road junction was the most critical section of a road network which comprises 21% of total fatal accidents of Patiala. Table 4.9 gives the collision spot of accident of Patiala where as its pie chart is given in Fig 4.6.

Table 4.9 Collision spot of Accidents in Patiala

Collision Spot	No of Fatal Accident	Percentage
On straight Road	178	**21**%
Road Junction	48	**77**%
Unknown	4	**2**%

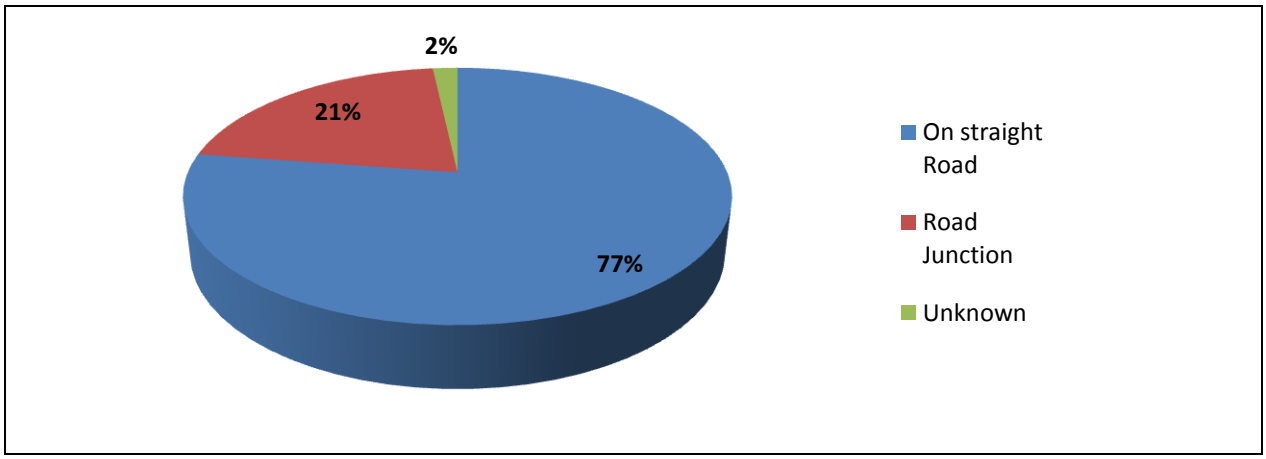


Figure4.6 Collision Spot

4.2.8 Hit and Run Case

It was analyzed that 26 % of vehicles hit another vehicle or pedestrian and ran away from there. This can be avoided if proper camera system is installed. Table 4.10 and Fig 4.7 shows the percentage of hit and run case in Patiala.

Table4.10 Hit and Run cases in Patiala

Hit and Run	No of Fatal Collision	Percentage
Yes	59	26%
No	168	73%
Unknown	3	1%
TOTAL	130	

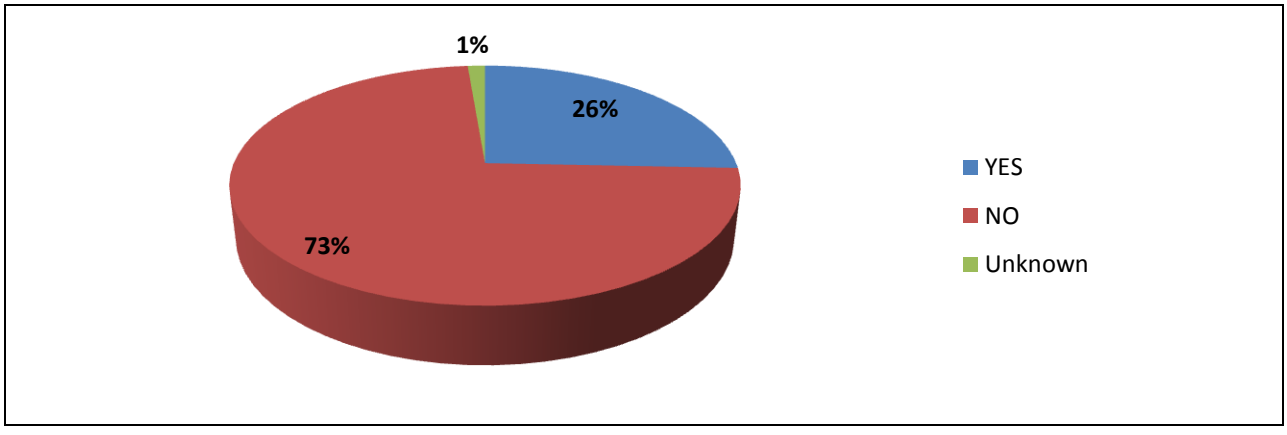


Figure4.7 Hit and Run Cases

4.2.9 Composition of vehicle wise road accidents

In this analysis it was observed that 38% of fatal accidents were occurred due to cars/van /jeep as they were the most used vehicle in Patiala, 18% due to 2 Axle Heavy Goods Vehicle,11% due to bus, 14% were occurring due to unknown vehicles who hit and run away from there. Table 4.11 gives the composition of impacting vehicles in Patiala and its pie chart showing percentage in given in Fig 4.8.

Table4.11 Composition of Impacting Vehicles in Patiala

Impact Vehicle	No of Fatal Accident	Percentage
Multi Axle Heavy Goods Vehicle	1	1%
2 Axle Heavy Goods Vehicle	42	18%
Light Goods Vehicle	4	2%
Bus	25	11%
Car/Van /Jeep /Taxi	87	38%
Ambulance	1	-
Fire Fighting Vehicle	1	-
3-Wheeler Passenger	6	3%
Tractor without Trailer	1	-
Tractor with Trailer	14	6%
Motor cycle /Scooter /Moped	17	7%
Unknown	32	14%

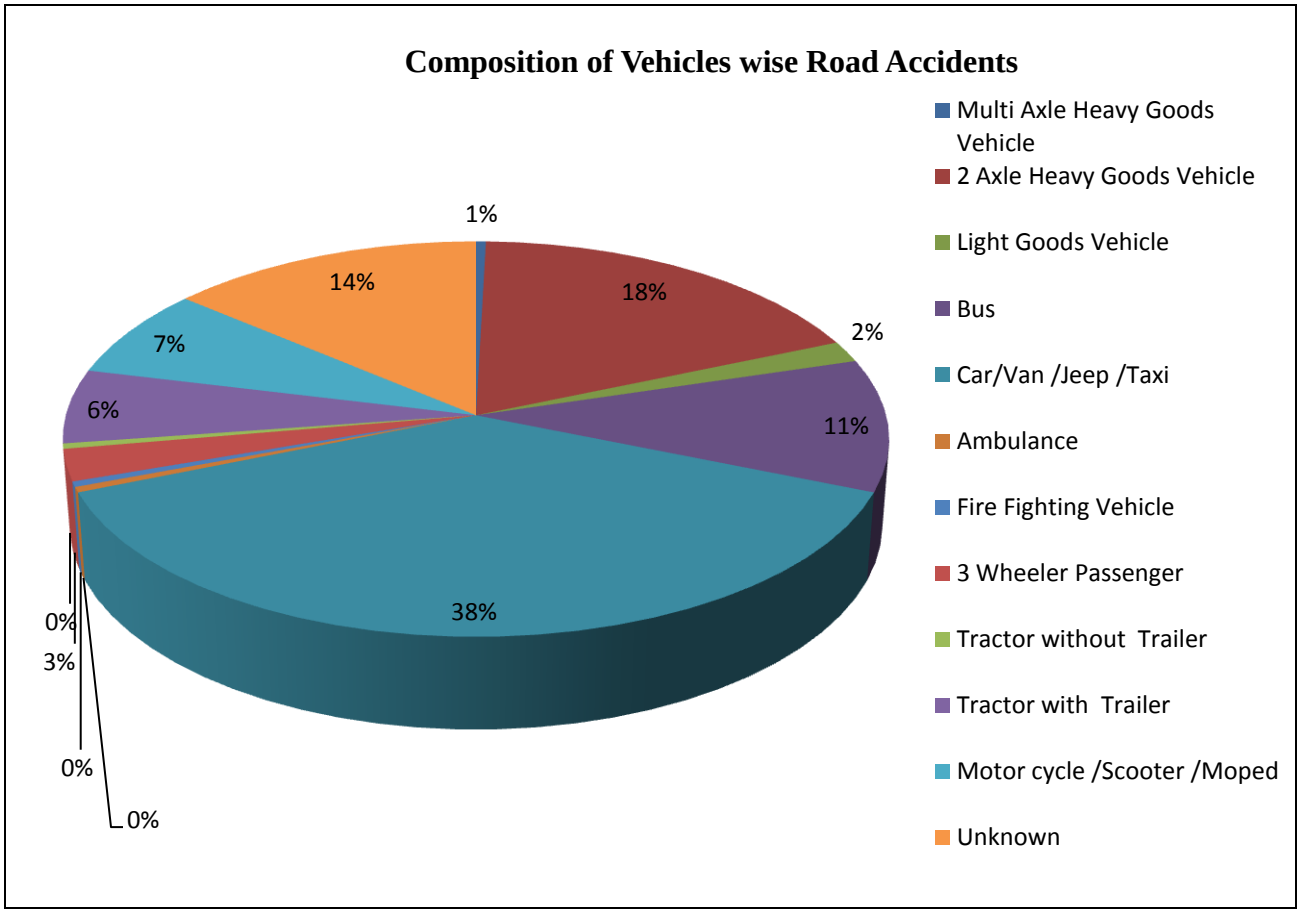


Figure4.8 Composition of Vehicles wise Road Accidents

It was also been concluded that 48 % victims were those who were using 2-wheeler like Motor cycle /Scooter /Moped followed by cycles 11 % and 29 % were pedestrians. Pedestrians and 2-wheeler were the most vulnerable road users. Proper footpath and zebra crossing should be there for pedestrians. For two-wheeler helmets should be made compulsory. Table 4.12 gives the composition of victim vehicles and its pie chart is shown in Fig 4.9

Table4.12 Composition of Victim Vehicles

Victim Vehicle	No of Fatal Collision	Percentage
Car/Van /Jeep /Taxi	13	6%
3-Wheeler Passenger	3	1%
3-Wheeler goods	2	1%
Thela	1	1%

Tractor with Trailer	3	1%
Cycle Rickshaw	5	2%
Motor cycle /Scooter /Moped	108	48%
Bicycle	24	11%
Pedestrian	66	29%

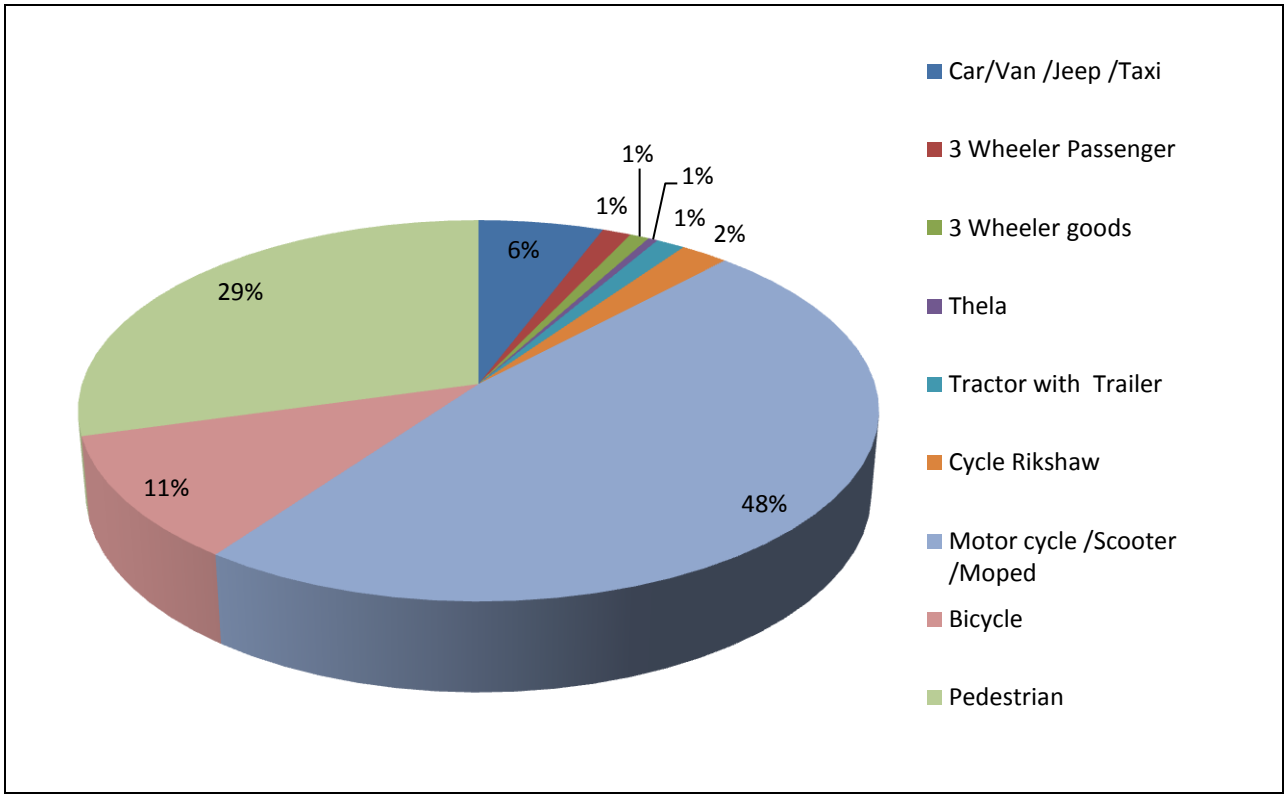


Figure 4.9 Compositions of Victim Vehicles

4.2.10 Crash Matrix

Table 4.13 shows the crash matrix of the victim vehicles with the vehicle causing the fatal accident of Patiala district in the year 2013,2014, 2015 and 2016 and their respective codes are present in Table 4.14.

Table4.13 Crash matrix of Victim Vehicles with impacting vehicle

	Vehicle causing fatal accident / Impacting vehicle												
Victim Vehicle	**1**	**2**	**3**	**5**	**6**	**7**	**8**	**9**	**13**	**14**	**16**	**99**	**Grand Total**
6		7		2	4								13
9				1	2							1	4
10				1	1								2
11				1									1
14					2					1			3
15		1		1	3								5
16	1	25	3	12	33	1	1	1	1	9	7	14	108
18		5		1	15			1			1	1	24
24		4	1	6	24			3		4	9	15	66
Grand Total	**1**	**42**	**4**	**25**	**84**	**1**	**1**	**5**	**1**	**14**	**17**	**31**	**226**

Table4.14 Codes of Vehicles used in Crash Matrix

Code	Vehicle Type
1	Multi Axle Heavy Goods Vehicle
2	2 axle heavy Goods vehicle
3	Light Goods Vehicle
5	Bus
6	Car /Van /Jeep Taxi
7	Ambulance
8	Fire Fighting
9	3-wheeler passenger
10	Three-wheeler Goods
11	Thela
13	Tractor without Trailor
14	Tractor with Trailor
15	Cycle Rickshaw
16	Motorcycle /Mooped/ Scooter
18	Bicycle
24	Pedestrian
99	Unknown

4.3 CALCULATION OF SEVERITY INDEX (ASI)

For estimation of ASI, the fatal accidents were assigned a weightage 10, A serious injury was assigned a weightage 7 and 4 is assigned to minor injury accident.

Based on fatal accidents, the equation can be given as

$$ASI_F = N_F \times W_F$$

Where, N_F = Fatal accidents at the location

WF = Weight age given to fatal accident

Table 4.15 Location with the number of accidents

NAME OF LOCATION	No of Fatal Accidents	ASI Values
Rajpura Road and Nardu Road Junction	4	40
Buldev Karyana Store Patiala Rajpura Road	2	20
Casba Resort Patiala Rajpura Road	3	30
B P Petrol Pump Patiala Rajpura Road	2	20
Bahadurgrah Petrol Pump	4	40
Bahadurgrah Patiala Junction	4	40
Senior Secondary Model School	3	30
Reliance Market Patiala Rajpura Road	3	30
Enquiry Punjabi University Patiala	4	40
Botanical Garden N H 7	2	20
N H 7 and Phase 3 Main Entry	3	30
Radha Soami Satsang Bhawan	3	30
Punjabi University Guest House	2	20

Rajpura Road and New Bypass Intersection	5	50
Hotel Iqbal Inn	3	30
Gurudwara Sahib Near Patiala Truck Union	4	40
ITBP Indo Tibet Border Police	3	30
Rajpura Road and Lakkadmandi Road Intersection	5	50
Sheetla Mata Mandir	3	30
Bus Stand Chowk	5	50
Infront Of Patiala Railway Staion Parking	3	30
Omex Mall	3	30
HDFC BANK Mall Road	2	20
Sadar Market Chowk	3	30
Fountain Chowk	5	50
Children Memorial Chowk	4	40
Delhi Plaza,Rajaha Road	4	40
Dukhniviran Chowk	6	60
Area Manager FCI Patiala Office, Sirhind Patiala Road	3	30
Thapar Chowk	4	40
Delta MRI and CT Scan Centre	2	20
Prime Multi Speciality Hospital	3	30
Hanuman Mandir, Mini Secretariat Road	2	20
Maharaja Yadwinder Enclave SCO	4	40
Main Post Office Road Between Fountain and Leela Bhawan Chowk	2	20

Multani Mal Modi Modi College	2	20
Police Chowki No 2, Dakal Terain Bhanari Main Road	2	20
Shivala Shiv Mandir	2	20
All India Pingla Ashram,Sanaur Road	2	20
Guru Kripa Motars Royal Enfield, Sirhind Patiala Road	2	20
Jashan Banquet	2	20
Carrier Academy School Bhadson Road	3	30
Gugga Rana Mandir Alipur Araian	3	30

The highlighted row in Table 4.15 gives the black spots .Here locations where number of accidents are more than 4 will be considered as black spots. Figure 4.11 gives the Map showing all the fatal points obtained from 2013, 2014, 2015 and 2016 years FIR with the black spot areas.

Figure 4.10 Map showing all the fatal points obtained from FIR with black spot areas

4.4 CALCULATIONS OF BLACK SPOTS

Black spots are the locations on roads which have high accident potentials and generally have large number of crashes on that location.

Locations having Accident severity index (ASI) having value higher than threshold value are classified called as hazardous spots or black spots.

Threshold value can be calculated as = Average severity + 1.2 (Standard deviation)

Average Severity = 31.3953

Standard Deviation = 10.59680

Threshold value = 44.11146

There were five Spots having ASI more than threshold value which was treated as Black Spots which are highlighted in Table 4.15.The black spot position and their ASI values are given in Table 4.16. These places were visited and their reason for accident and their mitigation measures are enlisted in Table no 4.17 which will be helpful in reducing these accidents.

Table4.16 Location which are treated as Black Spots and their ASI values

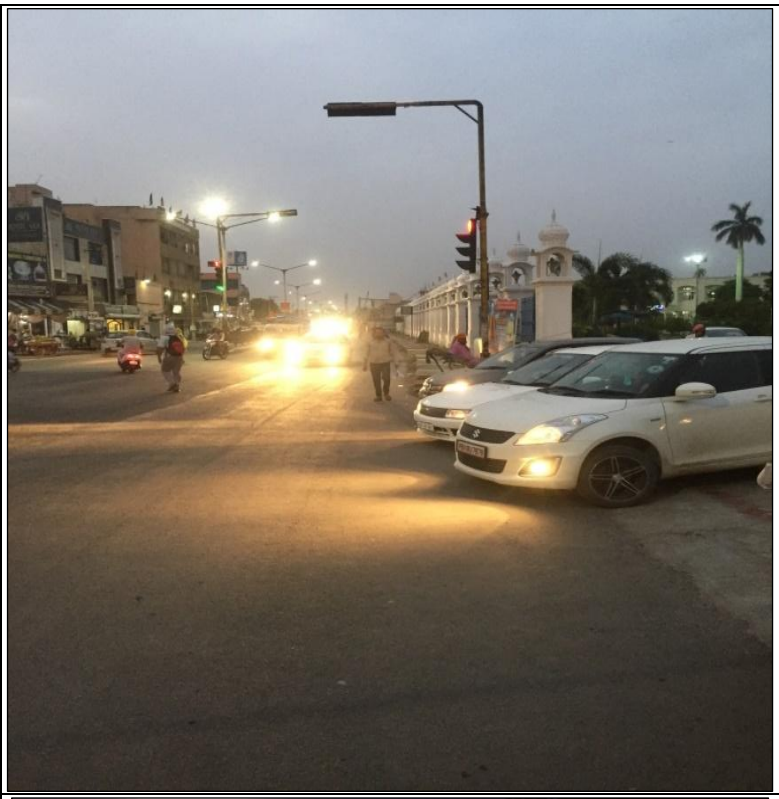
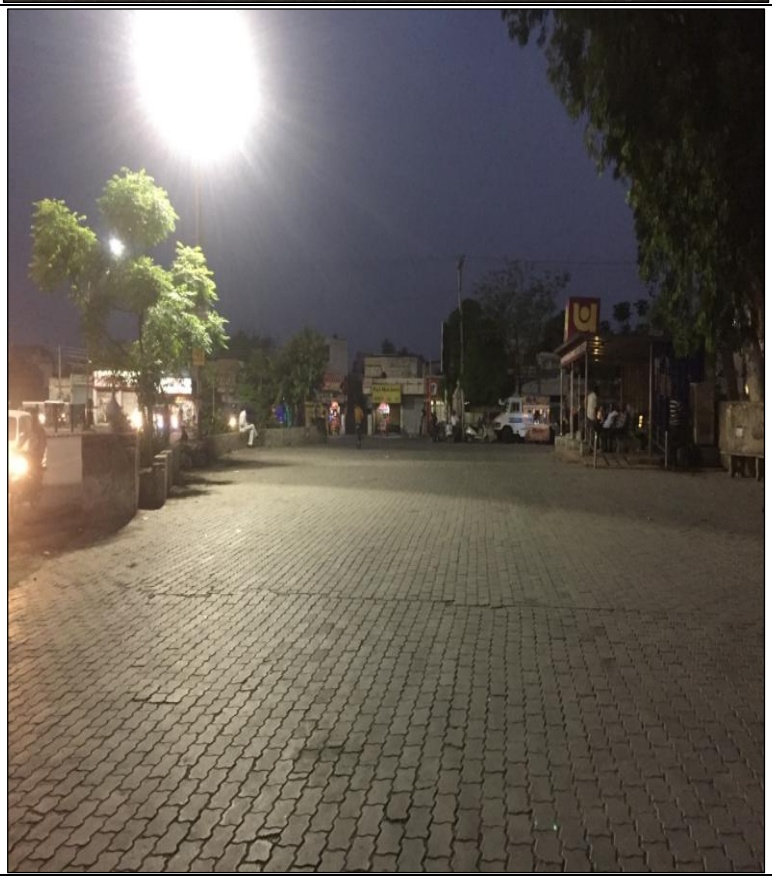
LOCATION	ASI VALUE
Dukhniviran Chowk	60
Bus Stand Chowk	50
Rajpura Road and Lakkadmandi Road Intersection	50
Rajpura Road and New Bypass Intersection	50
Fountain Chowk	50

4.5 REASON OF ACCIDENTS AND THEIR MITIGATION OF BLACK SPOT AREAS

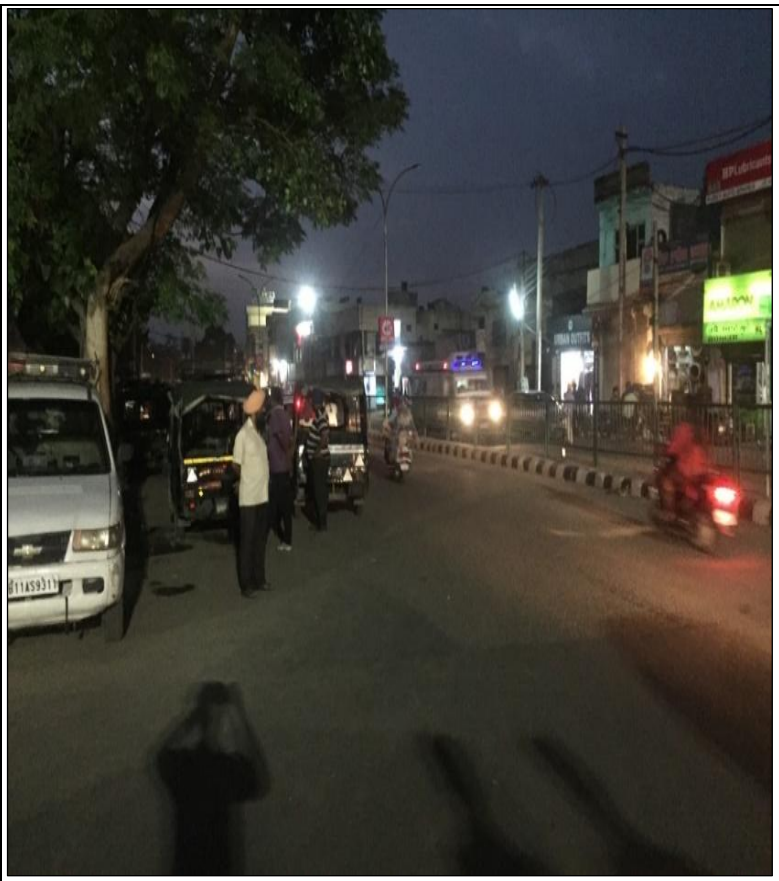
After finding the area of Black spots visual inspection has been done of these places and reasons for accidents have been found out. Against the reason mitigation measures has also been suggested in Table4.17.

Table 4.17 Reason for Accident and their mitigation measure

LOCATION- 1 DUKHNIVIRAN CHOWK			
Sr No	**Picture**	**Reason for accident**	**Mitigation Measures**
1		i)As zebra crossing was not there therefore vehicles were standing beyond the divider line during the red light. ii)No sign for pedestrian walking.	Zebra crossing marking should be made as per IRC 103:2012 "Guidelines for pedestrian's facilities" with accompanied by a "STOP" line at a distance of a 1 m for signalized intersection as per IRC 35-2015 'Code of Practice for Road Markings'. The width of pedestrians crossing should be between 2 to 4 m.

2		i) Traffic congestion on Dukhnivira n exit was making difficult for the vehicle movement from Sirhind road to Bus Stand. ii)NO markings on road surface	A white line should be made on main road representing right of way behind which every vehicle has to stand during red light. Markings should be made according to IRC 35 - 2015.
3		i) In spite of having large area no island was provided for vehicular movement from Bus Stand to Nabha Road. ii) Unnecessar y area provided for bus stop resulting in decreasing road vehicular density.	i) Formation of island for left to left turn vehicular movement. ii) Reducing the bus stop area and increasing the width of main road will decrease congestion.

4		i) Green signal was not visible. Condition of traffic lights was worst.	Signal light should be bright enough that the vehicles standing can see it properly.
5		i)No timer was set on traffic light for vehicles going Dukhnivaran to Sirhind. ii)The time for green light was only for 10 sec which was too short for vehicles to understand and cross the road.	i)Timer has to be set on traffic light so that driver can decide how much time is left for red light and whether vehicle can safely cross the road by that time or not. ii)Green light time should be increased to at least 20 sec.

6		i) Autos waiting for passengers on Sirhind road further making the road more congested. ii)No footpath was there on any of the road on this junction.	i) Proper place /space should be provided to autos where they can stand so that vehicles and pedestrians can get proper right of way. ii) Footpath for pedestrians is very important in all the sides of roads.

LOCATION -2 BUS STAND CHOWK			
1		Unpaved shoulders near the left hand turning making the vehicle to use unpaved path.	i)Shoulders should be maintained properly so that vehicles can properly move on the road section.
2		i) Unpaved shoulders with mud accumulation after rain was making it hard for pedestrians to walk on shoulders i.e they were using main roads. ii)Poor drainage system.	i) Adequate width, of shoulders should be provided on all existing road so that sufficient space for parking of vehicles and for emergency stops of vehicles away from the carriageway. ii)Proper railings with delineators can be provided

3		Condition of islands were worse than worst. ii)No rumble strips was provided.	Proper islands should be made so that peoples can follow proper path while taking turn. ii) Use of rumble strips before entering to main road can be done to alert the drivers.
4		i) No road divider fence was there. ii)No speed limit sign for fast moving vehicles. iii)No zebra crossing.	i) Road surfacing can be provided with proper sight lines and speed limit sign boards can be provided beyond 90 m distance. ii) Proper railings with delineators can be provided. iii)There is no provision of Pedestrian crossings

LOCATION -3 RAJPURA ROAD AND LAKKADMANDI ROAD INTERSECTION			
1		i) Carelessness movement of vehicles was there due to no traffic signal were provided. ii)There was no provision for pedestrian crossing iii) Lack of traffic signs (Regulatory, Warning and Informatory signs) and pavement markings.	i)Road surfacing can be provided with proper sight lines and speed limit sign boards and other sign board can be provided as per IRC 67-2012 Code provisions. ii) Proper markings should be there for pedestrians and vehicles as per IRC 35-2015.
2		i) Bad visibility of sign boards. ii) Medians were not safe. iii) Street lights were not working.	i)It is essential that drivers and other road users have an unobstructed view of road signs. ii)The medians should be safe enough if any vehicle gets stuck to it, it does not cause severe injury iii) Proper lighting should be

			there on road surface.
3		i)No footpath for pedestrians.	i)Road side parking prohibition sign board to be provided. ii) Proper footpath should be there for pedestrians.
4		Absence of advance stop sign and speed breaker at the roads which were approaches to main lane.	i) Pavement markings with speed breakers can be provided at all link roads. ii) Speed Breaker and its sign should be used to warn the drivers of the presence of the speed breaker. This sign should be posted 50-60 m in advance of the speed breaker location

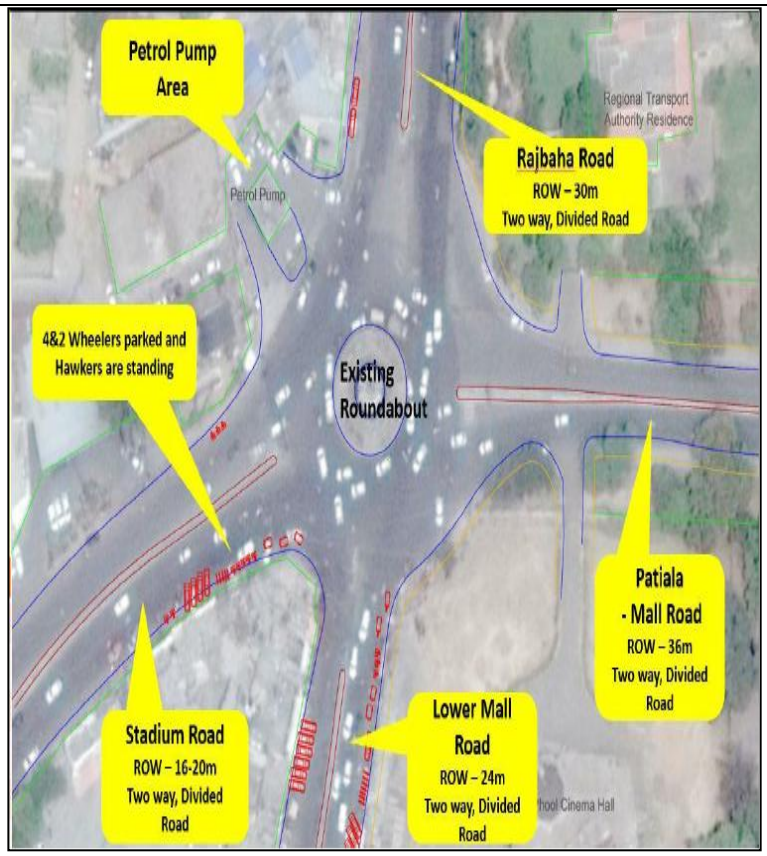
LOCATION- 4 RAJPURA ROAD AND NEW BYPASS INTERSECTION			
1	 	i) STOP sign and T intersection sign were fully covered with tree branches. ii)No stop line.	i) STOP sign shall be installed on the left side of the approach. ii) Stop signs should be sited as close to the stop line as possible but not in such a position as to impair visibility along the major road. Normally, these should be fixed 1.5 m in advance of the stop line as per IRC 067-2012 iii) Branches of tree should be cut timely.

2		i) Informatory board was behind the tree branches. ii) There was no rumble strips on road joining the main highways.	i)Informatory sign should be clear to vehicles from very far away. It should be placed according to IRC067-2012. ii)Proper rumble strips should be provided by posting suitable advance warning sign on the road side located 40 m in advance of the rumble strips.
3		i) Presence of loose material on paved shoulder at various locations highway. ii) Lack of speed control measures on project highway.	No loose materials should be present on road surface. If construction work is going on than proper fencing should be done. ii)Speed of vehicles should be checked at regular intervals and punishment should be given who

			exceeding the speed.
4		i) No speed limit or any other caution sign was present. ii) Footpath was absent.	Adequate speed limit sign boards as per IRC067-2012. ii) Inadequate width, of shoulders on all existing road which is not sufficient for parking of disabled vehicles and space for emergency stops for vehicles away from the carriageway.

LOCATION- 5 FOUNTAIN CHOWK INTERSECTION			
1		The junction has no footpath in three legged .On mall road it was having but of varying width from 1 m to 3 m. The quality of footpaths was of substandard and was disconnected at various places causing discomfort to pedestrians and especially for the disabled. The lighting was also missing at the pedestrian paths.	Dedicated and continuous footpaths with minimum width of 1.8 m throughout the corridor .This will ensure comfortable movement of pedestrians without any obstructions.
2		Encroachment on footpaths – The whole junction lacking a good quality pedestrian infrastructure and where ever it was present, often it is occupied by parked vehicles There were no parking space designated on	Organized parking bays The vacant space available is to be used for parking both the two wheelers and four wheelers. Thus parallel or perpendicular parking, whichever is suitable on

		the stretch which makes the vehicles to climb over the existing walking spaces and park. All these obstructions force the pedestrians to walk on the road.	the designated space is proposed
3		There was no crossing for pedestrians on any of the intersection	For easing the movements of pedestrians and for controlling the traffic speed raised crossings should be proposed on all the arms merging on to a particular junction.

4		Issues on the Fountain Chowk, a. Higher vehicle speeds. b. Poor traffic circulation and conflicts due to poor geometry of roundabout. c. No safe or segregated infrastructure for pedestrians. d. No provision for current activities such as parking and hawkers.	. Planned and designated two and four wheelers parking bays around the junction. ii.Introducing pedestrians crossing. iii.Redesigning of fountain chowk .
5		Street lightings were not in working condition.	Street lighting should be repaired and its functionality should be checked at regular basis. Lighting should be proper on road for cycle and pedestrians users especially.

CHAPTER 5

ROAD SAFETY AUDIT

Road safety audit (RSA) is necessary as it is a means of accident prevention rather than accident reduction (DFID 2003). RSA can be performed at any stage of a project, beginning with the project planning stage ending to the design stage. It can also be performed on roads that have already completed and they are in operating mode.

5.1 DEFINITION

Urban safety

"It defines as the road accidents, casualties in a city or town, having dissimilar and integrated discipline". (GIZ 2011)

Road Safety Audit:

JSRPRCD (2012) defined "RSA as a formal method for evaluating accident potential and as well as performing safety in the provision of the newly made road as well as enhancing, rehabilitation and preservation of existing roads"

Austroads (2002) describes it "as a formal assessment of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project's crash potential and safety performance".

ADB (2003) defined "RSA as a systematic procedure for accessing the road safety of roads and road schemes".

5.2 CLASSIFICATION OF ROADS

The roads are categorized into three groups: -

1) Arterial Roads: -These are the roads which connect the town to a State Highway or a National highway.

- Arterial roads are divided into midblock and junctions with separated lanes
- Arterials give emphasize to mobility for through movements over long distances.
- Volume of traffic is very high.
- Arterial Road speed limit is 50 km/h
- The width of road is generally above 24 m.

Sub Arterial Road: These roads are also called as major roads or secondary roads.
These are limited within the city limits and they do not connect important towns.

- The width of road is generally between 18 m to 24 m.

2) Collector Roads: These roads are the minor roads. The traffic is collected from different parts of the towns and leads it to other major or minor roads.

- These streets collect and distribute the traffic from arterial roads to local roads.
- Collectors' roads may or may not have separate lanes.
- Collectors offer approximately balanced service for both mobility and access.
- Volume of traffic is low as compared to Arterial Roads**.**
- Collector Road speed limit is 30 km/h.
- The width of the road is generally between 12 m to 18 m.

3) Local roads: -These roads are roads which are connected locally.

- Local roads do not have separate lanes
- Local road emphasizes the access function

- Volume of traffic is very low
- Heavy vehicles are generally not allowed in this type of roads
- Local Road speed limit is 20 km/h.
- The width of road is generally less than 12 m.

5.3 THE CHECKLIST FOR URBAN ROAD SAFETY AUDIT

Checklist depiction

The program depends on sorting of the street and region that have to be examined as appeared in Figure 1.

- If in the event we need to select mid-block or intersection of the Arterial road we need to go to number A-1.
- If in the event we need to select Educational offices and hospital centers on Collector road then we need to go B -3

Similarly, for

Arterial Road and Bus stops and metro stations check Checklist – A2

Arterial Road and Educational facilities and Hospitals check Checklist – A3

Collector Road and Midblock/Intersection Checklist – B1

Collector Road and Bus stops and metro stations Checklist – B 2

Collector Road and Educational facilities and Hospitals Checklist – B3

Local Road and Midblock/Intersection Checklist – C1

Local Road and Educational facilities and Hospitals Checklist – C2

- Read carefully before starting reviewing utilizing Checklists

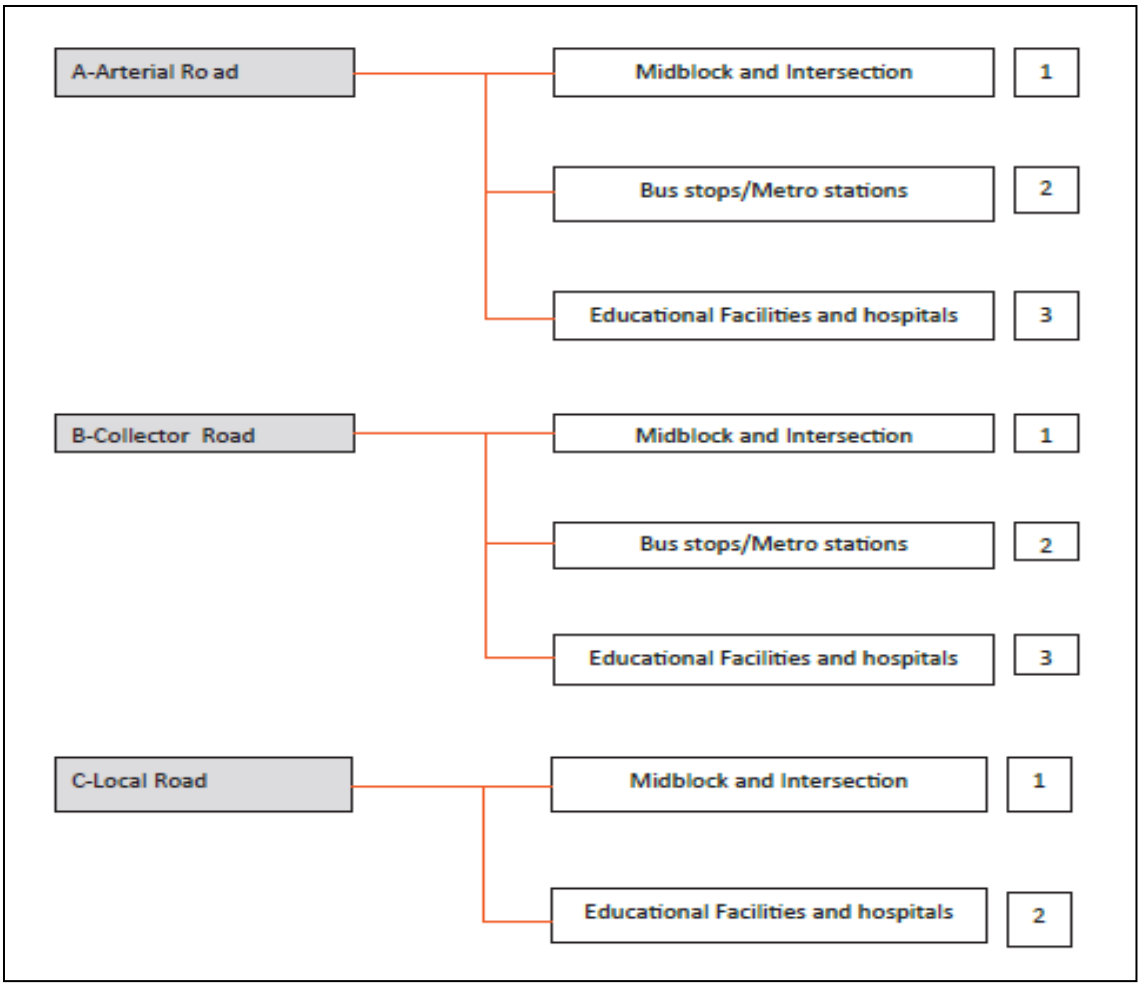


Figure5.1 Facilities to be audited for arterial, collector and local roads

5.3.1 Procedure for checklist preparation

1. Identify the aim of your audit in an arterial, collector or local roads.

2. With the help of indicator list collect the data required for audit.

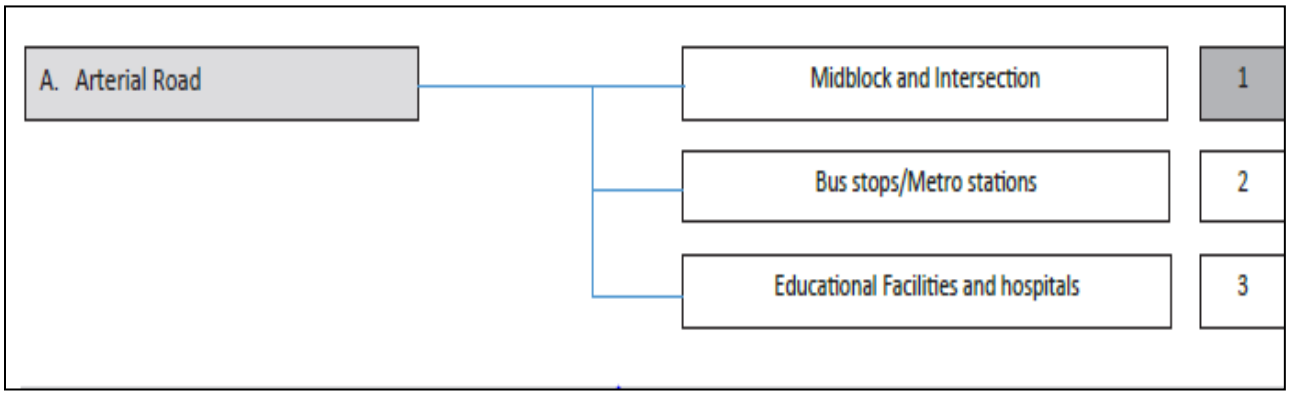
3. Fill the checklist.

4. Start evaluating the Scores based on weight ages.

5. Recognize the problems and suggest recommendations for particular hotspot in that area.

5.3.2 Guide to Arterial Road and Midblock/Intersection Checklist – A1

Checklist A-1



Go to the A-1 for auditing mid-block /intersection.

1. Fill the Checklist A -1.1 – "Speed Measure" of different vehicles at every 10 min interval and then calculate the average speed by averaging all the speed obtained in a particular column.

2. After filling Checklist, A-1.1 fills the Checklist A-1.2 "Footpath and Pedestrian accessibility". In this audit has to be done frequently after every 100 m on a 500 m stretch. Also, an audit has to be conducted in both the directions of the road.

3. Checklist A-1.3 deals with the "Cycle Accessibility". In this audit has to be done frequently after every 300 m on a 1500-meter stretch.

4. Checklist A-1.4 deals with the "Lightning for Pedestrians". Figure shows the visibility to ride at night. Lighting intensity of 40 lux along the road surface whereas across the crossing it is 50 lux.

Figure5. 2 Shows Visibility after Dark in LUX

5. Checklist A-1.5 and Checklist A-1.6 deal with “Signage” and Motorized vehicles Safety”. If they are present then tick on yes opt.ion and assign 1 point to it and if not, then its score is 0.

6. A Checklist A-1.7 deal with “Intersections”. Type of intersection present on site is marked.

7. Score A -1 is the last step. In this score from different checklist calculated are entered and then they are multiplied by some weight-age which is already assigned to them. The total score obtained by this is divided by the total score which is obtained after taking all the items in checklist are present and are in idle condition.

8. The final score of a road section can be calculated by taking the average of the scores obtained from both the sides of road i.e. the left and right side.

9. Average Scores of all road section will give the score for a station.

10. The scoring percentage tell the condition of road section audited

If the score is greater than 80% it is good.

If the score is between 50 to 80% it is fair.

If the score is less than 50% it is poor.

11. The entire checklist has been taken from the code "Urban Road Safety Audit" by Ministry Of Urban Development.

5.4 FORMAT FOR FILLING THE ROAD SAFETY AUDIT OF ARTERIAL ROAD

Location name (Descript.ion) …… Date ……

Names of auditors

1.

2.

3.

4.

5.

Location Map Name and descript.ion of area:

……

Checklist A – 1.1 – Speed Measure

	Truck Multi-Axle	Truck	Bus	LCV	Car /Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30 – 40 min										
40-50 min										
50-60 min										
Hourly Volume										

Indicators			Quality			Total
Speed measures for roads		Present(1 pt.)	Good	Fair	Poor	
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Existing Speed Variation (Total km/hr)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck		< 50 km/h	>50 km/h	> 80 km/h	
	Bus		< 50 km/h	>50 km/h	> 80 km/h	
	LCV		< 50 km/h	>50 km/h	> 90 km/h	
	Car /jeep		< 50 km/h	>50 km/h	> 90 km/h	
	Auto Rickshaw		< 50 km/h	>50 km/h	> 90 km/h	
	Scooter /Motorcycle		< 50 km/h	>50 km/h	> 90 km/h	
Overall						

Score for Speed = Average total score for Speed *100

Checklist A – 1.2 - Footpath and Pedestrian accessibility

Indicators	(A)	(B) Quality			Total
Footpath	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Pavement type		Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	
How wide are the footpaths?		Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	
Height of footpath (standard size is 150 mm)		Arterial Roads: Maximum < 100mm (4")	Arterial Roads: 100mm (4") – 300mm (12")	Very user unfriendly (>300mm)	
Cleanliness and maintenance of		Well maintained footpaths	Need better maintenance	Foot paths are not	

footpath			and cleanliness	maintained	
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)		Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing) Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)		Infrastructure for disabled is present There are no obstructions	Some infrastructure is available Pedestrians has to slow down sometimes	Mostly absent Pedestrian has to slow down most of the time	
Availability of Crossings (frequency of crossings)		Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700 m	Avg. distance of controlled crossings is >700 m	
Type of Crossing		Level/ at grade crossing	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	
Difficulty in crossing /Time taken for crossing		10-20sec	20-30 sec	>30 sec	
Overall					

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

Checklist A-1.4 –Lighting for Pedestrian

Indicators	(A)	(B) Quality			Total	Remark
Footpath	Present (1 pt.)	Good	Fair	Poor	(A) X (B)	
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)		
Light after dark (visibility to walk after dark)		Light poles at every 20 m and lighting intensity of 40 lux along the road and 50 lux at crossing	Light poles at every 20 m and lighting intensity of 20 - 40 lux Or Light poles at every 40 m with lighting intensity of 40 lux	Average distance between light and poles distance is >40 m Or intensity of light less than 20 lux.		
Provision of lighting for pedestrians for crossing		To see motorized vehicles and feel safety	Slightly uncomfortable at late nights	Unsafe		
Overall						

Score for lighting =Average total score for Lighting *100

Checklist A -1.5 –Signage

Signage	Yes	No
	(1 pt.)	(0 pt.)
Signing for Pedestrian		
Signing for bicyclists		
Signing for Cars and 2W and Trucks		
Does the signing make clear the intended use facilities?		
Speed limit signage		
Overall		

Score for Signage= Average total score for Signage *100

Checklist A – 1.6 – Motorized vehicles safety

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		
Does safety measures provided for construction at road sides		
Is the median design safe		
Kerb design safe?		
Is kerb free of vertical hazards?		
Is approach of flyover safe?		
Overall		

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Checklist A – 1.7 – Intersections

Indicators	(A)	(B) Quality			Total	Remark
Type of intersection	Present (1 pt.) / Absent (0 pt.)	Good (1 pt.)	Fair (0.5 pt.)	Poor (0.2 pt.)	(A) X (B)	
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase		
Round about		Single lane approach)	Two lane	more than two lanes)		
Manually controlled		NIL	Police controlling	No Police controlling		
Un-signalized		With traffic calming	With stop sign	None of the above		
Score						

Score for Intersection = Average total score for Intersection *100

Score A -1

Access Mode Type	Score	Weight
Speed		4
Footpath and Pedestrian accessibility		4
Cyclist accessibility		3
Lighting		3
Signage		2
Motorized vehicles safety		1
Intersections and Midblock		1
Total		

Weight age of indicators

The problem can be recognized base on overall scoring of audited section or by the total scoring of the audit.

- The final score of a road section can be calculated by taking the average of the scores obtained from both the sides of road i.e. the left and right side of the road section.
- The score of a junction is calculated by taking the average of all the legs of that intersection.

5.5 SAFETY AUDIT OF BLACK SPOT AREAS AND OTHER AREAS

Road Safety Audit has been performed on the black spot areas obtained above. The score has been calculated for every leg of the intersection and from that overall score of the intersection is obtained. If the score comes out to be less than 50 % then it is characterized as poor, if it is between 50 to 80 % then it is called fair and if above 80 then it is good.

5.5.1 Black Spot 1 Intersection Fountain Chowk

In this intersection, eight safety audit sheets have been filled up as it comprises four leg of the intersection and each leg comprising 2 sides Right and Left side. Surveyor survey by standing on nearly 100 m away from every intersection for doing safety audit. Fig 5.3 gives the location of fountain chowk.

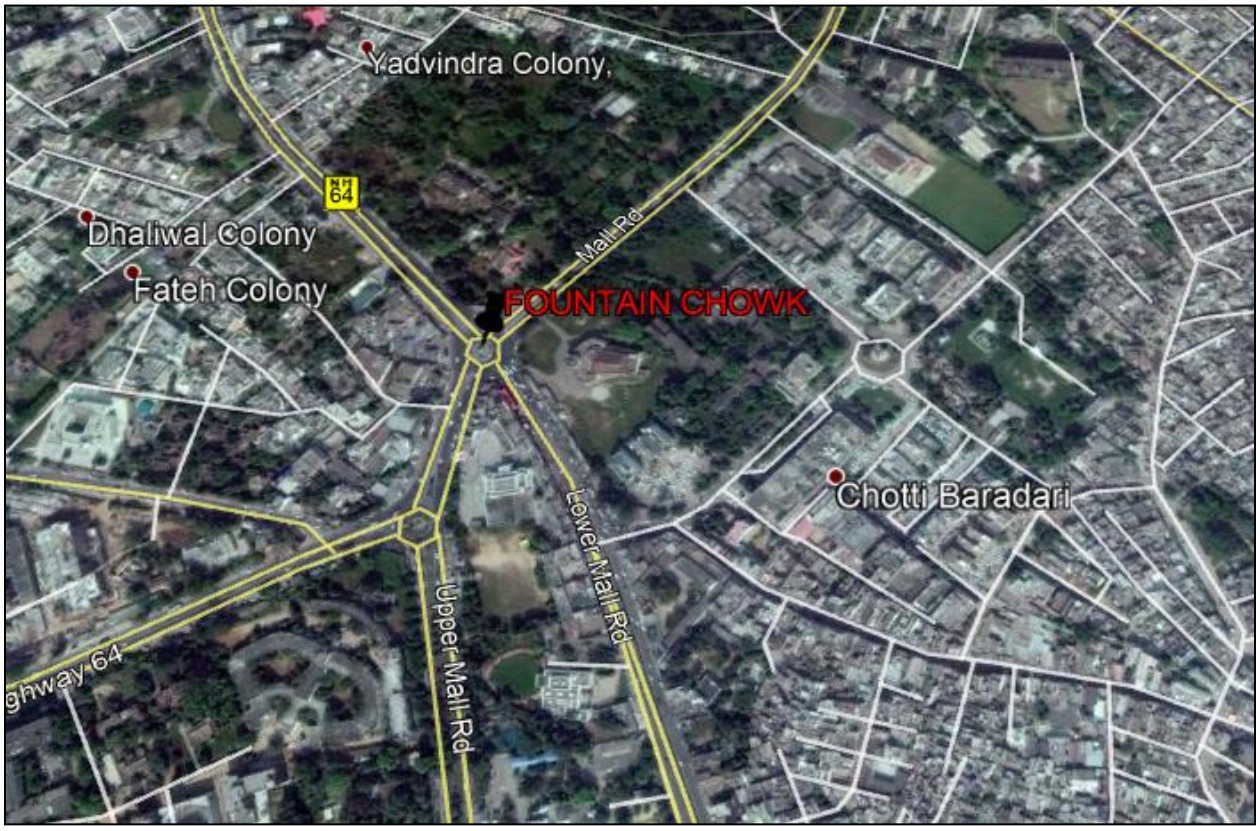


Figure5.3 Location of Fountain Chowk

i) Location name **Fountain Chowk to Leela Bhawan Left**

In this, road going from Leela Bhawan to Fountain Chowk has been audited and the direction left or right was chosen by standing on the median and facing the Chowk. The right hand will give the right-hand side and left hand will be treated as left-hand side. Fig 5.4 shows the road intersection from fountain chowk to Leela Bhawan.

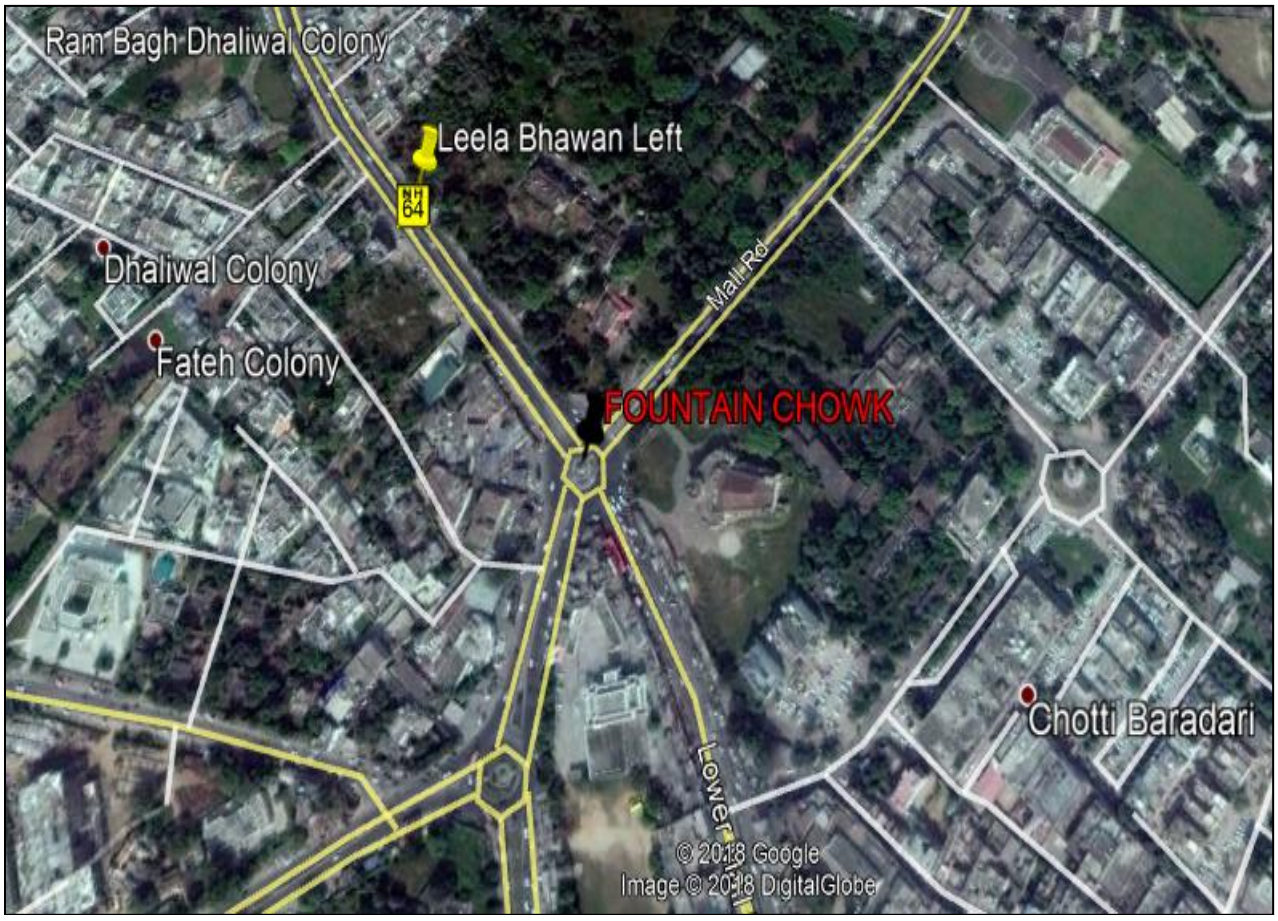


Figure5.4 Road section from Leela Bhawan Left to Fountain Chowk Left

The speeds of different vehicles were measured with the help of radar gun and their readings were noted in Table 5.1 in front of their respective vehicle. Table 5.2 gives the speed quality of fountain chowk to Leela Bhawan. The survey was conducted in 3 slots of 10 minutes each i.e. 0-10 min, 10– 20 min and 20 – 30 min total 30 minutes.

Table5.1 Speed measure for Leela Bhawan to Fountain Chowk Left

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	45,42, 36	43,36,50, 38	35,30,37, 38	42,57,60, 35,60	38,31, 23, 30,	26,25,32 ,44,39	16,19	12,8,9
10-20 min	—	38,25, 35	46,52,38	34	32,36,44, 29,23	37,38, 27,39	46,32,37 , 39	13,18	11,14,13
20-30 min	—	39,41	37,46,41	37,32	49,47,41, 53	28,36, 31	31,36,48 ,42,59	14	13,17
Average Speed (km/hr.)		**38**	**43**	**35**	**44**	**24**	**38**	**16**	**12**

Table5.2 Speed quality of fountain chowk to Leela Bhawan Left

Indicators			Quality			Total
Speed measures for roads		Present (1 pt.)	Good	Fair	Poor	
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6

Score for Speed = Average total score for Speed *100

=(6X100)/6=100

Score for Speed Measures =100

- After consideration of speed of all the different vehicles, it was found that all the vehicles were moving at a speed less than 50 km/hr. which represents the idle speed for arterial roads according to "Urban Road Safety Audit". The final score comes out to be 100 which was the maximum. The visual inspection of footpath and facilities for pedestrians was done and compared it with Table 5.3.

Table5.3 Footpath and Pedestrian accessibility for fountain chowk to Leela Bhawan Left

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	1	**Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt**	Tiles	Unpaved/ non medaled surface	1
How wide are the footpaths?	1	**Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)**	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	1
Height of footpath (standard size is 150 mm)	1	Arterial Roads: Maximum < 100mm (4")	**Arterial Roads: 100mm (4") – 300mm (12")**	Very user unfriendly (>300mm)	0.5
Cleanliness and maintenance of footpath	1	Well maintained footpaths	**Need better maintenance and cleanliness**	Foot paths are not maintained	0.5
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	1	Pedestrians provided some good amenities and feel safe	**Limited number of provisions for pedestrians and slightly uncomfortable at late nights**	No amenities and Unsafe	0.5
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	1	Infrastructure for disabled is present	Some infrastructure is available	**Mostly absent**	0.2
Barrier free footpaths (obstructions such as trees, parking	1	There are no obstructions	**Pedestrians has to slow down**	Pedestrian has to slow down	0.5

vehicles, hawkers and vendors hawkers and vendors etc. should be absent)			**sometimes**	most of the time	
Availability of Crossings (frequency of crossings)	1	**Avg. spacing between controlled crossings is < 500m**	Avg. spacing between controlled crossings is between 500 m – 700 m	Avg. distance of controlled crossings is >700 m	1
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	**20-30 sec**	>30 sec	0.5
Overall	**10**				**6.7/10**

= (6.7X100)/10=67

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

- Score for "Footpath and Pedestrian accessibility" comes out to be 6.7 out of 10 as there was no provision for tactile flooring or railings on footpath. Also, pedestrians have to slow down sometimes while using foot path.
- It was noticed that there were no cycle accessibility, no cycle lane and no lighting for pedestrians was available in Patiala. Therefore, their score will be treated as zero.
- After footpath and pedestrian accessibility ,signage for pedestrians , bicyclists, cars, two wheelers and trucks have been noted in Table 5.4

Table5.4 Signage for fountain chowk to Leela Bhawan Left

Signage	Yes (1 pt.)	No (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**5**	**0**

Score for Signage= Average total score for Signage *100

Score for Signage = 0

- Along the whole left-hand side section there was no signboard available for pedestrians, bicyclists and for cars, 2w and trucks. Even no speed limit signage was there. Therefore, out of 5 criteria nothing was present thus making the score for Signage comes out to be zero.

- After noting signages, Table 5.5 deals with safety of motor vehicles .If they are present score 1 shall be provided otherwise zero.

Table5.5 Motorized vehicle safety for Fountain Chowk to Leela Bhawan Left

For Motorized vehicles	***Yes*** *(1 pt.)*	***No*** *(0 pt.)*
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100
Score for Motorized vehicle safety = 0

After analyzing Score for Motorized Vehicles, it comes out to be zero as no kerb was present on that section. Also speed limit sign for motorized vehicles were also absent. Table 5.6 deals with the type of intersection present on the fountain chowk.

Table5.6 Intersection for fountain chowk to Leela Bhawan Left

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase	
Round about	1	Single lane approach)	Two lanes	**more than two lanes**	0.2
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score	**1**				**0.2**

Score for Intersection = Average total score for Intersection *100

= (0.2x100)/1=20

Score for intersection = 20

- As fountain chowk was found to be round about intersection with more than two phase, therefore, its score was 0.2 out of 1. Table 5.7 gives the total summarized score of all the parameters of Fountain Chowk to Leela Bhawan Left.

Table5.7 Final Score table for fountain chowk to Leela Bhawan Left

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	67	4	268	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total	**187**		**688**	**1800**

= (688/1800) x100=38

- After analyzing all score from every Tables 5.1 to 5 .6 and multiplying their score with their weight age total score of that section will be obtained. So final score comes out to be 38 which represent the road section as poor according to clause 5.3.2 (Point 9).

- The score 38 comes out of Fountain Chowk to Leela Bhawan Left part only. Now calculation has to be done of another side i.e. Fountain Chowk to Leela Bhawan Right in order to get the score of Fountain Chowk to Leela Bhawan Section.

ii) Location name: **Fountain Chowk to Leela Bhawan Right**

After auditing left hand side right hand side have to be audited. Name should be written of all the persons involved in auditing and map location should be there. Fig 5.5 shows the Fountain Chowk to Leela Bhawan Right section.

Location Map

Figure5.5 Road section from Fountain Chowk to Leela Bhawan Right

As earlier speed has been calculated and noted similarly, speed should be measured with radar gun for total time interval of 30 minutes and must be noted in Table 5.8 and speed quality is checked in Table 5.9.

Table5.8 Speed measure for fountain chowk to Leela Bhawan Right

Vehicle	**Truck Multi-Axle**	**Truck**	**Bus**	**LCV**	**Car/Jeep**	**Auto Rikshaw**	**Scooter/ Motor cycle**	**Cycle**	**Hand Driven Rikshaw**
0 – 10 min	—	22	27,20	20,22	23,31,35,28 ,28	25,30,28,22,2 8,25	23,35,30,33 ,41	12	13
10-20 min	—	32	30,28	22,32	35,28,29,35 ,37	28,28,39,32,2 9	28,28,34,32 ,32	15	`15,13
20-30 min	—	38	25,28, 20	32,26, 23,	36,28,37,34 ,39	31,27,34	40,32,28,22 ,30	9	12
Average Speed (km/hr.)		**31**	**26**	**25**	**32**	**29**	**31**	**9**	**13**

Table5.9 Speed quality of fountain chowk to Leela Bhawan Right

Indicators			**Quality**			**Total**
Speed measures for roads		**Present (1 pt.)**	**Good**	**Fair**	**Poor**	
		Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6

Score for Speed = Average total score for Speed *100

=(6X100)/6=100

Score for Speed Measures =100

100 score showing all the vehicles were moving at the desirable speed.

For Footpath and Pedestrian accessibility for fountain chowk to Leela Bhawan Right Table 5.10 has to be inspected.

Table5.10 Footpath and Pedestrian accessibility for fountain chowk to Leela Bhawan Right

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	0	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	0
How wide are the footpaths?	0	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	0
Height of footpath (standard size is 150 mm)	0	Arterial Roads: Maximum < 100mm (4”)	Arterial Roads: 100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	0
Cleanliness and maintenance of footpath	0	Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	0
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	0	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	0
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	0	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	0
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should	0	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	0

be absent)					
Availability of Crossings (frequency of crossings)	0	Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700 m	Avg. distance of controlled crossings is >700 m	0
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	**20-30 sec**	>30 sec	0.5
Overall					**1.5/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

= (1.5X100)/10=15

Score for footpath and pedestrian accessibility = 15

- The score shows there was no footpath for pedestrians. Pedestrians were either moving on road or to the shoulder which further results in increase in pedestrian's accidents.
- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.11 gives the Signage used in fountain chowk to Leela Bhawan right section.

Table5.11 Signage for fountain chowk to Leela Bhawan Right

Signage	**Yes** (1 pt.)	**No** (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks	1	
Does the signing make clear the intended use facilities?	1	
Speed limit signage		0
Overall	**2/5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 40

- Out of 5 points only 2 points it was satisfying i.e. only signage for cars, truck and two-wheeler was there with no bi cycle or pedestrians signs. Table 5.12 gives the Safety for Motorized vehicles for fountain chowk to Leela Bhawan Right.

Table5.12 Motorized vehicle safety for fountain chowk to Leela Bhawan Right

For Motorized vehicles	**Yes** (1 pt.)	**No** (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach to flyover safe?		0
Overall	**6**	**0**

Score for Motorized vehicle safety = 0

- There was no provision for safety of motorizedvehicles on this section. Table 5.13 gives the details about fountain chowk intersection.

Table5.13 Intersection for fountain chowk to Leela Bhawan Right

Indicators	**(A)**	**(B) Quality**			**Total**	**Remark**
Type of intersection	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**	
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**		
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase		
Round about	1	Single lane approach)	Two lane	**more than two lanes**	0.2	
Manually controlled		NIL	Police controlling	No Police controlling		
Un-signalized		With traffic calming	With stop sign	None of the above		
Score					**0.2/1**	

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

- As fountain chowk was found to be roundabout with more than two lanes, therefore, its score is 0.2 out of 1. Table 5.14 gives the final Score for fountain chowk to Leela Bhawan Left section.

Table5.14 Final Score for fountain chowk to Leela Bhawan Left

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	15	4	60	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	40	2	80	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total	**175**		**560**	**1800**

= (560/1800) x100=32

- After analyzing all score from every Tables 5.8 to 5 .13 and multiplying it with their weight age total score of that section was obtained. So final score comes out to be 32 which represent the road section as poor according to clause 5.3.2 (point 9).

- Earlier the score comes to be 38 when we audited Fountain Chowk to Leela Bhawan Left part and after auditing Fountain Chowk to Leela Bhawan Right part the scores come to be 32. Therefore, 35 will be the score of Fountain Chowk to Leela Bhawan Section.

iii) Location name: **Fountain Chowk to Bhagat Petrol pump Left**

After Auditing fountain chowk to Leela Bhawan road, now fountain chowk to Bhagat Singh petrol pump road has been audited. Fig 5.6 shows the Fountain Chowk to Bhagat Singh Petrol Pump Left section.

Figure5.6 Road section from Fountain Chowk to Bhagat Singh Petrol Pump Left

The procedure of performing the audit was same as earlier. Speed of every vehicles going from petrol pump to fountain Chowk has been noted down in Table no 5.15 and speed quality has been checked in Table 5.16.Total survey time is 30 min.

Table5.15 Speed measure for Fountain Chowk to Bhagat Petrol pump Left

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	20,23	27,40, 29,35	19,21	32,22,27,20, 28	20,9,24 ,22,20,21	20,27,38 , 31,29	7,15	10,8
10-20 min	—	19,20	21,20	20	25,34,28,	24,16,22, 14	24,26,22 ,28	11	13,11
20-30 min	—	21,28	24,25, 31	18	35,22,37,33	20,9,16 ,22,32	23,27,25 ,32	14,11	11,9
Average Speed (km/hr.)		**22**	**28**	**20**	**29**	**19**	**27**	**12**	**10**

Table5.16 Speed Quality for Fountain Chowk to Bhagat Petrol pump Left

Indicators			Quality			Total	Remark
Speed measures for roads		Present (1 pt.)	Good	Fair	Poor		
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)		
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h		
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1	
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1	
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1	
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1	
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1	
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1	
Overall		6				6	

Score for Speed Measures =100

It means all the vehicles were running at the speed less than 50 km /hr. Table 5.17 deals with the availability, condition and specification of footpath for pedestrians which is given below.

Table5.17 Footpath and Pedestrian accessibility for Fountain Chowk to Bhagat Petrol pump Left

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	1	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	**Tiles**	Unpaved/ non medaled surface	0.5
How wide are the footpaths?	1	**Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)**	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	1
Height of footpath (standard size is 150 mm)	1	**Arterial Roads: Maximum < 100mm (4")**	Arterial Roads: 100mm (4") – 300mm (12")	Very user unfriendly (>300mm)	1
Cleanliness and maintenance of footpath	1	Well maintained footpaths	Need better maintenance and cleanliness	**Foot paths are not maintained**	0.2
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	1	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortable at late nights	**No amenities and Unsafe**	0.2
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	1	Infrastructure for disabled is present	Some infrastructure is available	**Mostly absent**	0.2
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	1	There are no obstructions	Pedestrians has to slow down sometimes	**Pedestrian has to slow down most of the time**	0.2
Availability of Crossings (frequency of crossings)	1	**Avg. spacing between controlled crossings is < 500m**	Avg. spacing between controlled crossings is between 500 m – 700m	Avg. distance of controlled crossings is >700 m	1

Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing		10-20sec	**20-30 sec**	>30 sec	0.5
Overall	**10**				**5.8**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility

= (5.8X100)/10=**58**

Score for footpath and pedestrian accessibility = 58

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.18 which deal with the signage for pedestrians and bicyclists, cars, two wheelers and trucks.

Table 5.18 Signage for Fountain Chowk to Bhagat Petrol pump Left

Signage	**Yes** (1 pt.)	**No** (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 0

- No signage was available for pedestrians, bi cyclist or cars, two-wheeler and trucks. Table 5.19 deals with the safety of mortised vehicles.

Table 5.19 Motorized vehicle safety for Fountain Chowk to Bhagat Petrol pump Left

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Score for Motorized vehicle safety = 0. Table 5.20 deals with details about the fountain chowk intersection.

Table5.20 Intersection for Fountain Chowk to Bhagat Petrol pump Left

Indicators	(A)	(B) Quality			Total
Type of intersection	**Present (1 pt.) Absent (0 pt.)**	**Good (1 pt.)**	**Fair (0.5 pt.)**	**Poor (0.2 pt.)**	**(A) X (B)**
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase	
Round about	1	Single lane approach)	Two lane	**more than two lanes**	0.2
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

- As fountain chowk was Roundabout intersection with more than two-lane therefore its score is 0.2 out of 1.Table 5.21 will give the overall score for Fountain Chowk to Bhagat Petrol pump Left section.

Table5.21 Final Score Table for Fountain Chowk to Bhagat Petrol pump Left

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	58	4	232	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**652**	**1800**

= (652/1800) x100=**36**

- After analyzing all the Tables from 5. 15 to 5.20, final score comes out to be 36 which will represent the road section as poor according to clause 5.3.2 (point 9).
- The score 36 comes out of Fountain Chowk to Bhagat Petrol Pump Left part only. Now calculation of another side i.e. Fountain Chowk to Bhagat Petrol Pump Right has to be done in order to get the score of Fountain Chowk to Bhagat Petrol Pump Section.

iv) Location name: - **Fountain Chowk to Bhagat Petrol Pump –Right**

After auditing Fountain chowk to Bhagat Petrol Pump Left auditing has to be done on another side of the road i.e. from Fountain chowk to Bhagat Petrol pump Right side .Name of all the persons involved in auditing should be noted down and map location has to be given. Fig 5.7 shows the Fountain Chowk to Bhagat Singh Petrol Pump Right section.

Location Map

Figure 5.7 Road section from Fountain Chowk to Bhagat Singh Petrol Pump Right

Input the speed of vehicles in Table 5.22 and quality can be checked from Table 5.23 after calculating average speed from Table 5.22.

Table 5.22 Speed measure for Fountain Chowk to Bhagat Petrol pump Right

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	25,30, 32,	28, 35, 36	23,21,30	24,36,40,41,38,48	30,27,31,	43,42,34	14,19	15
10-20 min	—	24	32, 21, 35,	30,25,25,32	35,35,42,48	28,35,25, 28,29	48,40,27, 35,38	12,14, 10	15,7
20-30 min	—	30,32, 22,28	32, 30	30,30,38	40,41,47,32	28,21,38, 29	28,35,41, 38	16	8,12
Average Speed (km/hr)		**28**	**31**	**29**	**39**	**29**	**38**	**14**	**14**

Table 5.23 Speed Quality for Fountain Chowk to Bhagat Petrol pump Right

Indicators			Quality			Total
Speed measures for roads		**Present (1 pt.)**	**Good**	**Fair**	**Poor**	
		Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto - Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6

Score for Speed = Average total score for Speed *100

=(6X100)/6=100

Score for Speed Measures =100

It was clearly implies that all the vehicles were moving at desirable speed thus their quality was good.

Table 5.24 deals with the availability, condition and specification of footpath for pedestrians which is given below

Table 5.24 Footpath and Pedestrian accessibility for Fountain Chowk to Bhagat Petrol pump Right

Indicators	(A)	(B) Quality			Total
Footpath	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Pavement type	0	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	0
How wide are the footpaths?	0	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	0
Height of footpath (standard size is 150 mm)	0	Arterial Roads: Maximum < 100mm (4")	Arterial Roads: 100mm (4") – 300mm (12")	Very user unfriendly (>300mm)	0
Cleanliness and maintenance of footpath	0	Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	0
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	0	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	0
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	0	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	0
Barrier free footpaths (obstructions such as trees, parking vehicles, hawkers and vendors hawkers and vendors etc. should be absent)	0	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	0
Availability of Crossings (frequency of crossings)	0	Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700m	Avg. distance of controlled crossings is >700 m	0

Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	**20-30 sec**	>30 sec	0.5
Overall	**10**				**1.5/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

=(1.5X100)/10=15

Score for footpath and pedestrian accessibility = 15

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.25 deals with the signage for pedestrians and bicyclists, cars, two wheelers and trucks.

Table5.25 Signage for Fountain Chowk to Bhagat Petrol pump Right

Signage	**Yes** (1 pt.)	**No** (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks	1	
Does the signing make clear the intended use facilities?	1	
Speed limit signage		0
Overall	**2/5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 40

Out of 5 signs, only two signs for cars, trucks and two-wheeler were present.

Table 5.26 was dealing with motor safety available at Fountain Chowk to Bhagat Petrol pump Right.

Table 5.26 Motorized vehicle safety for Fountain Chowk to Bhagat Petrol pump Right

For Motorized vehicles	**Yes** (1 pt.)	**No** (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**5**	

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Score for Motorized vehicle safety = 0

Table 5.27 deals with details about fountain intersection.

Table 5.27 Intersection for Fountain Chowk to Bhagat Petrol pump Right

Indicators	**(A)**	**(B) Quality**			**Total**	**Remark**
Type of intersection	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**	
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**		
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase		
Round about	1	Single lane approach)	Two lane	**more than two lanes**	0.2	
Manually controlled		NIL	Police controlling	No Police controlling		
Un-signalized		With traffic calming	With stop sign	None of the above		
Score					**0.2/1**	

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

As fountain chowk was found to be Roundabout intersection with more than two lane, therefore, its score was 0.2 out of 1. Table 5.28 will give the overall score for Fountain Chowk to Bhagat Petrol pump Left section.

Table 5.28 Final Score table for Fountain Chowk to Bhagat Petrol pump Right

Score A -1				
Access Mode Type	**Score**	**Weight**	**(A)X(B)**	**Total**
Speed	100	4	400	400
Footpath and Pedestrian accessibility	59	4	236	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	40	2	80	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**736**	**1800**

= (736/1800) x100=41

- After analyzing all the Tables from 5. 22 to 5.27, final score comes out to be 41 which represents the road section as poor according to clause 5.3.2 (point 9).

- Earlier the score comes to be 36 when we audited Fountain Chowk Bhagat Petrol Pump Left part and after auditing Fountain Chowk to Bhagat Petrol Pump Right part the scores comes to be 41. Therefore, 38.5 will be the score of Fountain Chowk to Bhagat Petrol Pump Section.

v) Location name: - **Fountain Chowk to Lower Mall Road Left**

After auditing Fountain Chowk to Bhagat Singh Petrol Pump road now Fountain Chowk to Lower Mall Road has been audited.

First taking Lower Mall Road Left section.

Figure5.8 Road section from Fountain Chowk to Lower Mall Road Left

The procedure of performing the audit was same as earlier. Speed of every vehicles going Lower Mall Road Left side to fountain Chowk has been noted down in Table no 5.29 and speed quality has been checked in Table 5.30. Total survey time was 30 min.

Table5.29 Speed measure for Fountain Chowk to Lower Mall Road Left

Vehicle	Truck Multi -Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	17	18	21,23,	25,17,19 ,22	19,16,16,1 8,25	19,18,25, 28		9,11,
10-20 min	—	16		22	19,20,23	25,17,22,2 4	33,25,23, 32	13,12	9
20-30 min	—	14	21	23,20	22,25,23 ,21	25,17,28, 24,	33,26,28, 27,25	9,15,1 3	10,12
Average Speed (km/hr.)		**16**	**20**	**22**	**22**	**21**	**26**	**12**	**10**

Table 5.30 Speed Quality for Fountain Chowk Lower Mall Road Left

Indicators			Quality			Total
Speed measures for roads		Present (1 pt.)	Good	Fair	Poor	
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6
Score for Speed = Average total score for Speed *100						

Score for Speed Measures =100

It means all the vehicles were running at the speed less than 50 km /hr.

Table 5.31 deals with the availability, condition and specification of footpath for pedestrians which is given below.

Table 5.31 Footpath and Pedestrian accessibility for Fountain Chowk to Lower Mall Road Left

Indicators	(A)	(B) Quality			Total
Footpath	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Pavement type	1	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	**Tiles**	Unpaved/ non medaled surface	0.5
How wide are the footpaths?	1	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	**Badly congested (< 1.5m**	0.2
Height of footpath (standard size is 150 mm)	1	**Arterial Roads: Maximum < 100mm (4")**	Arterial Roads: 100mm (4") – 300mm (12")	Very user unfriendly (>300mm)	1
Cleanliness and maintenance of footpath	1	Well maintained footpaths	Need better maintenance and cleanliness	**Foot paths are not maintained**	0.2
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	1	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortable at late nights	**No amenities and Unsafe**	0.2
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	1	Infrastructure for disabled is present	Some infrastructure is available	**Mostly absent**	0.2

Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	1	There are no obstructions	Pedestrians has to slow down sometimes	**Pedestrian has to slow down most of the time**	0.2
Availability of Crossings (frequency of crossings)	1	**Avg. spacing between controlled crossings is < 500m**	Avg. spacing between controlled crossings is between 500 – 700m	Avg. distance of controlled crossings is >700 m	1
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	**20-30 sec**	>30 sec	0.5
Overall	**10**				**5/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

= (5X100)/10=50

Score for footpath and pedestrian accessibility = 50

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score was considered as zero. Table 5.32 deals with the signage for pedestrians and bicyclists, cars, two wheelers and trucks.

Table 5.32 Signage for Fountain Chowk Lower Mall Road Left

Signage	Yes (1 pt.)	No (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 0

No sign was available for pedestrians, bi cyclist or cars, two-wheeler and trucks. Table 5.33 deals with the safety of motorized vehicle.

Table 5.33 Motorized vehicle safety for Fountain Chowk to Lower Mall Road Left

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Score for Motorized vehicle safety = 0. Table 5.34 gives the details about Fountain Chowk intersection.

Table 5.34 Intersection for Fountain Chowk to Lower Mall Road Left

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.) Absent (0 pt.)	Good (1 pt.)	Fair (0.5 pt.)	Poor (0.2 pt.)	(A) X (B)
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase	
Round about	1	Single lane approach)	**Two lane**	more than two lanes	0.5
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.5/1**

Score for Intersection = Average total score for Intersection *100

Score for intersection = 0

- As fountain Chowk was round about intersection with two-lane therefore its score was 0.5 out of 1.Table 5.35 will give the overall score for Fountain Chowk to Lower Mall Road Left section.

Table 5.35 Final Score table for Fountain Chowk to Lower Mall Road Left

Score A -1				
Access Mode Type	**Score**	**Weight**	**(A)X(B)**	**Total**
Speed	100	4	400	400
Footpath and Pedestrian accessibility	50	4	200	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	50	1	50	100
Total			**650**	**1800**

= (650/1800) x100=36

- After analyzing all the Tables from 5. 29 to 5.34, the final score comes out to be 36 which represents the road section as poor according to clause 5.3.2 (point 9).

- The score 36 comes out of Fountain Chowk to Lower Mall Road Left part only .Now calculate the score of another side i.e. Fountain Chowk to Lower Mall Road Right in order to get the score of Fountain Chowk Lower Mall Road Section.

vi) Location name: - **Fountain Chowk to Lower Mall Road –Right**

After auditing Fountain Chowk to Lower Mall Road Left auditing has been done on another side of the road i.e. from Fountain chowk to Lower Mall Road Right side.Name of all the persons involved in auditing should be noted down and map location has been given. Fig 5.8 shows the fountain chowk to Lower Mall Road Right Section.

Location Map

Figure5.9 Road section from Fountain Chowk to Lower Mall Road Right

Input the speed of vehicles in Table 5.36 and quality can be checked from Table 5.37 after calculating average speed from Table 5.36.

Table 5.36 Speed measure for Fountain Chowk to Lower Mall Road Right

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	37	23, 31, 36	19,30, 20,23	28,16,21,3 5,30	20,21,23 ,27	20,28,26,2 7	10,11	8,11
10-20 min	—	28	34	15,22	34,38,34,2 9,	16,20,30 ,25,	25,25,24,2 8,27,30	13	10
20-30 min	—	27,35	28	29,23, 17,16, 21	23,20,26,2 7	21,22,27 ,24	27,29,24,2 0	16	7
Average Speed (km/hr.)		**32**	**30**	**21**	**28**	**23**	**26**	**10**	**9**

Table 5.37 Speed Quality for Fountain Chowk to Lower Mall Road Right

Indicators			**Quality**			**Total**
Speed measures for roads		**Present (1 pt.)**	**Good**	**Fair**	**Poor**	
		Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6
Score for Speed = Average total score for Speed *100						

=(6X100)/6=100

Score for Speed Measures =100

It clearly implies all the vehicles were moving at desirable speed thus their quality is good.

Table 5.38 deals with the availability, condition and specification of footpath for pedestrians which is given below.

Table 5.38 Footpath and Pedestrian accessibility for Fountain Chowk to Lower Mall Road Right

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	1	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	**Tiles**	Unpaved/ non medaled surface	0.5
How wide are the footpaths?	1	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	**Arterial roads: 1.5 - 1.8m**	Badly congested (< 1.5m	0.5
Height of footpath (standard size is 150 mm)	1	Arterial Roads: Maximum < 100mm (4”)	**Arterial Roads: 100mm (4”) – 300mm (12”)**	Very user unfriendly (>300mm)	0.5
Cleanliness and maintenance of footpath	1	Well maintained footpaths	**Need better maintenanc e and cleanliness**	Foot paths are not maintained	0.5
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	1	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortabl e at late nights	**No amenities and Unsafe**	0.2
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	1	Infrastructure for disabled is present	Some infrastructure is available	**Mostly absent**	0.2
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and	1	There are no obstructions	**Pedestrians has to slow down sometimes**	Pedestrian has to slow down most of	0.5

vendors hawkers and vendors etc. should be absent)				the time	
Availability of Crossings (frequency of crossings)	1	**Avg. spacing between controlled crossings is < 500m**	**Avg. spacing between controlled crossings is between 500 m – 700 m**	**Avg. distance of controlled crossings is >700 m**	**1**
Type of Crossing	1	**Level/ at grade crossing**	**Foot over bridges with elevators or half subways which are well lit.**	**Foot over bridges without elevators or completely covered subways without proper lighting**	**1**
Difficulty in crossing /Time taken for crossing	1	**10-20sec**	**20-30 sec**	**>30 sec**	**1**
Overall	**10**				**5.9/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

=(5.9X100)/10=59

Score for footpath and pedestrian accessibility = 59

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.39 deals with the signage for pedestrians and bicyclists, cars, two-wheelers and trucks.

Table 5.39 Signage for Fountain Chowk to Lower Mall Road Right

Signage	**Yes** (1 pt.)	**No** (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks	1	
Does the signing make clear the intended use facilities?	1	
Speed limit signage		0
Overall	**2/5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 40

Out of 5 signs only two signs for cars, trucks and two-wheeler were present. Table 5.40 deals with the safety of motorized vehicles.

Table 5.40 Motorized vehicle safety for Fountain Chowk to Lower Mall Road Right

For Motorized vehicles	**Yes** (1 pt.)	**No** (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**5**	

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Score for Motorized vehicle safety = 0. Table 5.41 gives the details about fountain chowk intersection.

Table 5.41 Intersection for Fountain Chowk to Lower Mall Road Right

Indicators	**(A)**	**(B) Quality**			**Total**
Type of intersection	**Present (1 pt.) Absent (0 pt.)**	**Good (1 pt.)**	**Fair (0.5 pt.)**	**Poor (0.2 pt.)**	**(A) X (B)**
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase	
Round about	1	Single lane approach)	Two lane	**more than two lanes**	0.2
Manually controlled		NIL	Police controlling	No Police controlling	

Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

- As fountain chowk was Roundabout intersection with more than two lanes, therefore, its score comes out to be 0.2 out of 1. Table 5.42 will give the overall score for Fountain Chowk to Lower Mall Road Right Section.

Table 5.42 Final Score table for Fountain Chowk to Lower Mall Road Right

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	15	4	60	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	40	2	80	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**560**	**1800**

= (736/1800) x100=41

- After analyzing all the Tables from 5. 36 to 5.41, final score comes out to be 41 which represent the road section as poor according to clause 5.3.2 (point 9).

- Earlier the score comes to be 36 when Fountain Chowk to Lower Mall Road Left part has been audited and after auditing Fountain Chowk to Lower Mall Road Right part the scores come to be 41. Therefore, 38.5 will be the score of Fountain Chowk to Lower Mall Road Section.

vii) Location name: - **Fountain Chowk to Mall Road Left**

After auditing Fountain Chowk to Lower Mall Road Now Fountain Chowk to Mall Road has to be audited. Fig 5.10 will show the fountain chowk to mall road left road section.

First starting with Mall Road Left

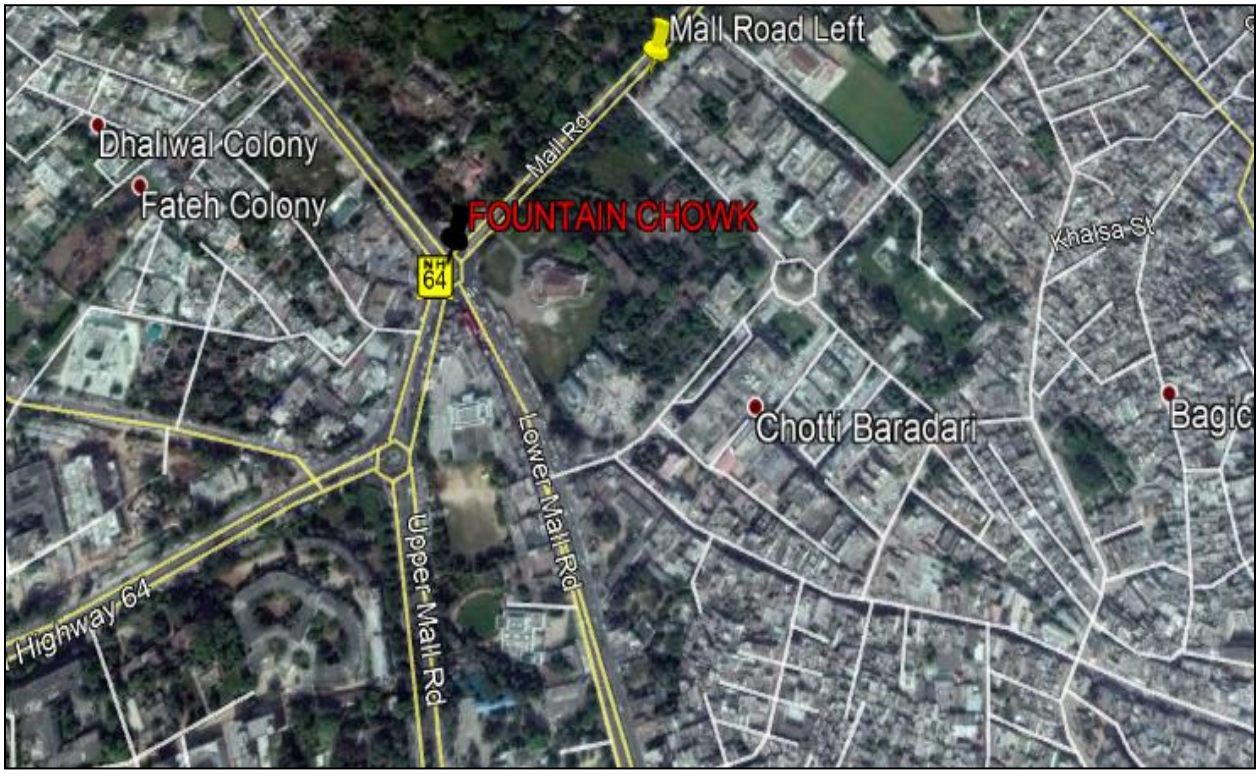


Figure5.10 Road section from Fountain Chowk to Mall Road Left

The procedure of performing the audit was same as earlier. The speed of every vehicle going from Mall Road Left side to fountain Chowk has been noted down in Table no 5.43.and Table 5.44 gives the speed quality. Total survey time is 30 min.

Table5.43 Speed measure for Fountain Chowk to Mall Road Left.

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	—			38,36,42, 48,43	30,40,42,2 9,32	29,34,39, 43,32,41, 38	16,13	11,8,10
10-20 min	—	—		35	48,35,36, 46,38	29,26,27,4 1,24,31	38,25,28, 40,42	12,11 ,13	9,12,
20-30 min	—	—	33	34	24,46,48, 41,39,34	31,38,25,2 7,29,36	21,29,36, 28,25		13,10,13
Average Speed (km/hr.)			**33**	**34.5**	**40.125**	**31.59**	**32.82**	**13**	**10.75**

Table 5.44 Speed Quality for Fountain Chowk to Mall Road Left

Indicators			Quality			Total
Speed measures for roads		Present (1 pt.)	Good	Fair	Poor	
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle	0	< 50 km/h	>50 km/h	> 80 km/h	
	Truck	0	< 50 km/h	>50 km/h	> 80 km/h	
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall						5
Score for Speed = Average total score for Speed *100						

Score for Speed Measures =100

It means all the vehicles were running at the speed less than 50 km /hr.

Table 5.45 deals with the availability, condition and specification of footpath for pedestrians which is given below.

Table 5.45 Footpath and Pedestrian accessibility for Fountain Chowk Mall Road Left

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	1	**Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt**	Tiles	Unpaved/ non medaled surface	1
How wide are the footpaths?	1	**Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)**	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	1
Height of footpath (standard size is 150 mm)	1	Arterial Roads: Maximum < 100mm (4")	**Arterial Roads: 100mm (4") – 300mm (12")**	Very user unfriendly (>300mm)	0.5
Cleanliness and maintenance of footpath	1	Well maintained footpaths	**Need better maintenance and cleanliness**	Foot paths are not maintained	0.5
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	1	Pedestrians provided some good amenities and feel safe	**Limited number of provisions for pedestrians and slightly uncomfortable at late nights**	No amenities and Unsafe	0.5
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	1	Infrastructure for disabled is present	Some infrastructure is available	**Mostly absent**	0.2
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	1	There are no obstructions	**Pedestrians has to slow down sometimes**	Pedestrian has to slow down most of the time	0.5

Availability of Crossings (frequency of crossings)	1	Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700 m	**Avg. distance of controlled crossings is >700 m**	0.2
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	**20-30 sec**	>30 sec	0.5
Overall					5.9/10

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

= (5.9X100)/10=59

Score for footpath and pedestrian accessibility = 59

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.46 deals with the signage for pedestrians and bicyclists, cars, two wheelers and trucks.

Table 5.46 Signage for Fountain Chowk Mall Road Left

Signage	**Yes (1 pt.)**	**No (0 pt.)**
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**5**	**0**
Score for Signage= Average total score for Signage *100		

Score for Signage = 0 as there were no sign available for pedestrians or bicycle or even for trucks and 2 W vehicles. Table 5.47 deals with the safety of Motorized vehicles.

Table 5.47 Motorized vehicle safety for Fountain Chowk to Mall Road Left

For Motorized vehicles	**Yes** (1 pt.)	**No** (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**5**	

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Score for Motorized vehicle safety = 0. Table 5.48 gives the details about fountain chowk intersection.

Table 5.48 Intersection for Fountain Chowk to Mall Road Left

Indicators	**(A)**	**(B) Quality**			**Total**
Type of intersection	**Present (1 pt.)** / **Absent (0 pt.)**	**Good** (1 pt.)	**Fair** (0.5 pt.)	**Poor** (0.2 pt.)	**(A) X (B)**
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase	
Round about	1	Single lane approach)	Two lane	**more than two lanes**	0.2
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**
Score for Intersection = Average total score for Intersection *100					

Score for intersection =20

- As fountain Chowk was round about intersection with more than two lane therefore its score was 0.2 out of 1. Table 5.49 will give the overall score for Fountain Chowk to Mall Road Left section.

Table 5.49 Final Score table for Fountain Chowk to Mall Road Left

Score A -1				
Access Mode Type	**Score (A)**	**Weight (B)**	**(A)X(B)**	**Total**
Speed	100	4	400	400
Footpath and Pedestrian accessibility	59	4	236	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**656**	**1800**

= (656/1800) x100=36.5

- After analyzing all the Tables from 5. 43 to 5.48, the final score comes out to be 36.5 which represent the road section as poor according to clause 5.3.2 (point 9).

- The score 36.5 comes out of Fountain Chowk to Mall Road Left part only. Now ,the score of another side i.e. Fountain Chowk to Mall Road Right has been audited in order to get the score of Fountain Chowk Mall Road Section.

viii) Location name: - **Fountain Chowk to Mall Road –Right**

After auditing Fountain Chowk to Mall Road Left auditing has to be done on another side of the road i.e. from Fountain chowk to Mall Road Right side.Name of all the persons involved in auditing should be noted down and map location has to be given. Fig 5.11 shows the fountain chowk to mall road right section.

Location Map

Table 5.11 Road section from Fountain Chowk to Mall Road Right

Input the speed of vehicles in Table 5.50 and quality can be checked from Table 5.51 after calculating average speed from Table 5.50.

Speed of the vehicles is measured by radar gun as done earlier.

Table 5.50 Speed measure for Fountain Chowk to Mall Road Right

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	—			38,25,37, 23,42,40, 41	31,24,28 ,26,28	30,26,28,60, 37	11,13	11,9
10-20 min	—	—	26	29	36,60,42, 38,43,35	25,32,40 ,31,30	35,36,40,47, 44,46	12,10 ,	7,5
20-30 min	—	—	20		43,36,38, 34,42,49	28,35,33 ,23	39,34,36,39	11	16
Average Speed (km/hr.)			**23**	**29**	**39**	**30**	**39**	**11**	**10**

Table 5.51 Speed Quality for Fountain Chowk to Mall Road Right

Indicators			**Quality**			**Total**
Speed measures for roads		**Present (1 pt.)**	**Good**	**Fair**	**Poor**	
		Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6
Score for Speed = Average total score for Speed *100						

=(6X100)/6=100

Score for Speed Measures =100

It clearly implies all the vehicles were moving at a desirable speed thus their quality is good.

Table 5.52 deals with the availability, condition, and specification of footpath for pedestrians which is given below.

Table 5.52 Footpath and Pedestrian accessibility for Fountain Chowk to Mall Road Right

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	1	**Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt**	Tiles	Unpaved/ non medaled surface	1
How wide are the footpaths?	1	**Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)**	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	1
Height of footpath (standard size is 150 mm)	1	Arterial Roads: Maximum < 100mm (4")	**Arterial Roads: 100mm (4") – 300mm (12")**	Very user unfriendly (>300mm)	0.5
Cleanliness and maintenance of footpath	1	**Well maintained footpaths**	Need better maintenance and cleanliness	Foot paths are not maintained	1
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	1	Pedestrians provided some good amenities and feel safe	**Limited number of provisions for pedestrians and slightly uncomfortabl e at late nights**	No amenities and Unsafe	0.5
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	1	Infrastructure for disabled is present	Some infrastructure is available	**Mostly absent**	0.2
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	1	There are no obstructions	**Pedestrians has to slow down sometimes**	Pedestrian has to slow down most of the time	0.5

Availability of Crossings (frequency of crossings)	1	Avg. spacing between controlled crossings is < 500m	**Avg. spacing between controlled crossings is between 500 m – 700 m**	Avg. distance of controlled crossings is >700 m	0.5
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	**10-20sec**	20-30 sec	>30 sec	1
Overall	**10**				**7.2**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

= (7.2X100)/10=72

Score for footpath and pedestrian accessibility = 72

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.53 deals with the signage for pedestrians and bicyclists, cars, two wheelers and trucks.

Table 5.53 Signage for Fountain Chowk to Mall Road Right

Signage	**Yes**	**No**
	(1 pt.)	**(0 pt.)**
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**5**	
Score for Signage= Average total score for Signage *100		

Score for Signage = 0

Out of 5 signs no signage for cars, trucks and two-wheeler was present. Table 5.54 deals with the safety of motorizes vehicles.

Table 5.54 Motorized vehicle safety for Fountain Chowk to Mall Road Right

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	

- Score for Motorized vehicle safety = 0. Table 5.55 gives the details of fountain chowk intersection.

Table 5.55 Intersection for Fountain Chowk to Mall Road Right

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.) Absent (0 pt.)	Good (1 pt.)	Fair (0.5 pt.)	Poor (0.2 pt.)	(A) X (B)
Signalized		With Pedestrian phase	NIL	Without Pedestrian phase	
Round about	1	Single lane approach)	Two lane	**more than two lanes**	0.2
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

- As fountain chowk was Roundabout intersection with more than two lanes therefore its score was 0.2 out of 1. Table 5.56 will give the overall score for Fountain Chowk to Mall Road Right Section.

Table 5.56 Final Score table for Fountain Chowk to Lower Mall Road Right

Score A -1				
Access Mode Type	**Score**	**Weight**	**(A)X(B)**	**Total**
Speed	100	4	400	400
Footpath and Pedestrian accessibility	72	4	288	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**708**	**1800**

= (708/1800) x100=39

- After analyzing all the Tables from 5. 50 to 5.55, so final score comes out to be 39 which represent the road section as poor according to clause 5.3.2 (point 9).

- Earlier the score comes to be 36.5 when Fountain Chowk to Mall Road Left part was audited and after auditing Fountain Chowk to Lower Mall Road Right part the scores come to be 39. Therefore, 37.25 will be the score of Fountain Chowk to Lower Mall Road Section.

- Now total score of fountain chowk comes out to be the average of all the legged of that intersection i.e. (35+33.5+38.5+37.75)/4 = 36.19. This score shows the fountain chowk intersection belong to poor category clause 5.3.2 (point 9).

5.5.2 Black SPOT 2 Intersection Dukh Nivaran Chowk

It is the T -intersection which is also a major black spot area of Patiala. In this, two roads has been audited .Therefore four sheets are filled up.

One road has been left because there was too much rush on that road as well as there was also a turn due to which speed of the vehicle can't be determined. Fig 5.12 gives the location of the Dukh Nivaran Chowk.

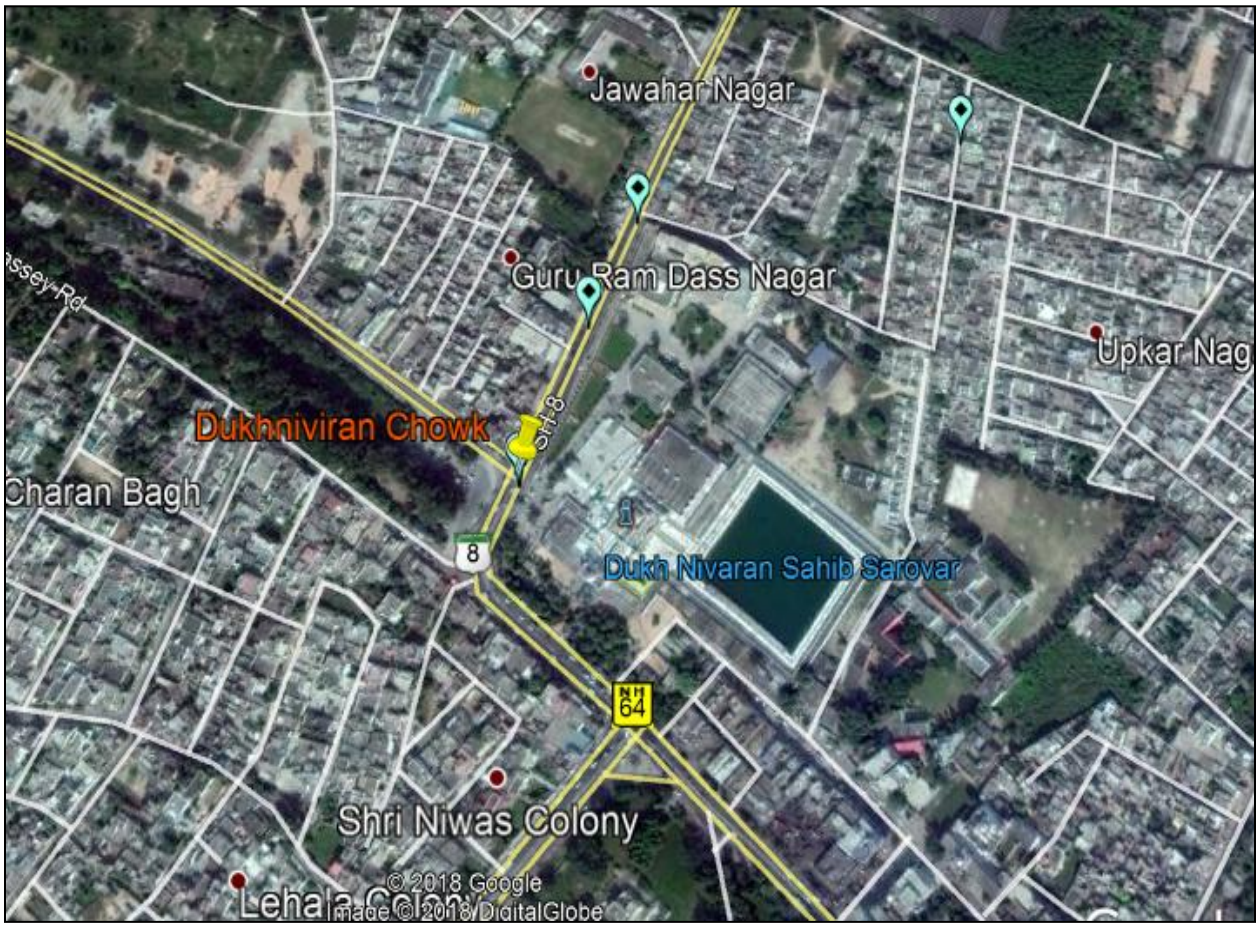


Figure5.12 Location of Dukh Nivaran Chowk

i) Location name:- **Dukh Nivaran Chowk Towards Thapar Right**

In this, road going from Dukh Nivaran Chowk to Thapar has been audited and the direction left or right was chosen as it was chosen earlier.

Firstly, Dukh Nivaran Chowk to Thapar Right section was audited.

Name of all the persons involved in auditing should be noted down and map location has to be given. Fig 5.13 shows the section from Dukh Nivaran towards Thapar right.

Location Map

Figure5.13 Road section from Dukh Nivaran Chowk towards Thapar Right

Speed of the vehicles were noted in Table 5.57 and quality can be checked from Table 5.58 after calculating average speed from Table 5.57.

Table 5.57 Speed measure for from Dukh Nivaran Chowk to Thapar Right

Vehicle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	28	24,25, 21,28	32,30,21, 32,28	35,36,42,2 8,38	20,25,22, 28	25,34,24, 27,37,25	11,15	5,10,13
10-20 min	32	28	28,26,32, 29	33,31,35,2 9,32,36	25,20	33,37,51, 40,31	11,13	10,11
20-30 min	25,26	25,34, 24,	28,25,26, 28,25	30,28,34,2 6,45,41,52	25,18,22	32,33,36, 28	12,8, 13	18,7
Average Speed (km/hr.)	**28**	**32**	**28**	**36**	**23**	**33**		

Table 5.58 Speed Quality for Dukh Nivaran Chowk to Thapar Right

Indicators			Quality			Total
Speed measures for roads		Present (1 pt.)	Good	Fair	Poor	
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle	NA	< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6
Score for Speed = Average total score for Speed *100						

Score for Speed Measures =100

It clearly implies all the vehicles were moving at desirable speed thus their quality was good.

Table 5.59 deals with the availability, condition and specification of footpath for pedestrians which is given below

Table 5.59 Footpath and Pedestrian accessibility for Dukh Nivaran Chowk to Thapar Right

Indicators	(A)	(B) Quality			Total
Footpath	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Pavement type	0	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	0
How wide are the footpaths?	0	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	0
Height of footpath (standard size is 150 mm)	0	Arterial Roads: Maximum < 100mm (4”)	Arterial Roads: 100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	0
Cleanliness and maintenance of footpath	0	Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	0
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	0	Pedestrians provided some good amenities and feel safe	A limited number of provisions for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	0
Provision of Disability-friendly Infrastructure (tactile flooring, audible signals, railing)	0	Infrastructur e for disabled is present	Some infrastructure is available	Mostly absent	0
Barrier-free footpaths (obstructions such as trees, parking vehicles,hawkers	0	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	0

and vendors hawkers and vendors etc. should be absent)					
Availability of Crossings (frequency of crossings)	1	Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700 m	**Avg. distance of controlled crossings is >700 m**	0.2
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	20-30 sec	>**30 sec**	0.2
Overall	**10**				**1.4/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

= (1.4X100)/10=14

Score for footpath and pedestrian accessibility = 14

- No footpath was present for pedestrians on this section. Peoples were using the main road for walking.
- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.60 which deal with the signage for pedestrians and bicyclists, cars, two wheelers and trucks.

Table 5.60 Signage for Dukh Nivaran Chowk to Thapar Right

Signage	Yes (1 pt.)	No (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks	1	
Does the signing make clear the intended use facilities?	1	
Speed limit signage		0
Overall	**2/5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 40

Out of 5 signs only two signs for cars, trucks and two-wheeler were present. Table 5.61 gives the safety for motorized vehicle.

Table 5.61 Motorized vehicle safety for Dukh Nivaran Chowk to Thapar Right

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		
Does safety measures provided for construction at road sides		
Is the median design safe		
Kerb design safe?		
Is kerb free of vertical hazards?		
Is approach of flyover safe?		
Overall		

Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100

Score for Motorized vehicle safety = 0 Table 5.62 gives the details for Dukh Nivaran Chowk.

Table 5.62 Intersection for Dukh Nivaran Chowk to Thapar Right

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Signalized	1	With Pedestrian phase	NIL	**Without Pedestrian phase**	0.2
Round about		Single lane approach)	Two lane	more than two lanes)	
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

As Dukh Nivaran Chowk was Signalized intersection without any pedestrian phase therefore its score was 0.2 out of 1. Table 5.63 gives the final score for Dukh Nivaran Chowk to Thapar Right.

Table 5.63 Final Score table for Dukh Nivaran Chowk to Thapar Right

Score A -1				
Access Mode Type	**Score**	**Weight**	**(A)X(B)**	**Total**
Speed	100	4	400	400
Footpath and Pedestrian accessibility	14	4	56	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**476**	**1800**

= (476/1800) x100=**26.5**

- After analyzing all the Tables from 5. 57 to 5.62, the final score comes out to be 26.5 which represents the road section as poor according to clause 5.3.2 (point 9).

- Now Dukh Nivaran Chowk to Thapar Left score has been calculated in order to get the total score of Dukh Nivaran Chowk to Thapar section.

ii) Location name:- **Dukh Nivaran Chowk Towards Thapar Left**

After auditing Dukh Nivaran Chowk to Thapar, Right, another side of the road i.e. from Dukh Nivaran Chowk to Thapar Left side has been audited.

Name of all the persons involved in auditing should be noted down and map location has been given . Fig 5.14 shows the Dukh Nivaran chowk towards Thapar left section.

Location Map

Figure5.14 Road section from Dukh Nivaran Chowk towards Thapar Left

Speeds of the vehicles are noted in Table 5.64 and quality can be checked from Table 5.65 after calculating average speed from Table 5.64.

Table 5.64 Speed measure for from Dukh Nivaran Chowk to Thapar Left

Vehicle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	—	33	30,28,41,36	20,29,19	30,24,21,28	14,12	6,9
10-20 min	18	38,32,35,25	28	36,35,45,34	31,22,32,27	22,28,35,32,45	17	8
20-30 min	—	—	33,25	32,36,48	28,35	31,28,36,34	11	—
Average Speed (km/hr.)	**18**	**32**	**29**	**36**	**27**	**30**		

Table 5.65 Speed Quality for Dukh Nivaran Chowk to Thapar Left

Indicators			Quality			Total
Speed measures for roads		Present (1 pt.)	Good	Fair	Poor	
		Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle	NA	< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6

Score for Speed = Average total score for Speed *100

=(6X100)/6=100

Score for Speed Measures =100

- It shows all the vehicles were moving with the speed less than 50 km/hr. Table 5.66 deals with the availability, condition and specification of footpath for pedestrians which is given below

Table 5.66 Footpath and Pedestrian accessibility for Dukh Nivaran Chowk to Thapar Left

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	0	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	0
How wide are the footpaths?	0	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	0
Height of footpath (standard size is 150 mm)	0	Arterial Roads: Maximum < 100mm (4”)	Arterial Roads: 100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	0
Cleanliness and maintenance of footpath	0	Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	0
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	0	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	0
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	0	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	0

Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	0	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	0
Availability of Crossings (frequency of crossings)	1	**Avg. spacing between controlled crossings is < 500m**	Avg. spacing between controlled crossings is between 500 m – 700m	Avg. distance of controlled crossings is >700 m	1
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	**10-20sec**	20-30 sec	>30 sec	1
Overall					**3/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

=(3X100)/10=**30**

Score for footpath and pedestrian accessibility = 30

- No footpath was present for pedestrians on this section. Peoples were using main road for walking.

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.67 deals with the signage for pedestrians and bicyclists, cars, two-wheelers and trucks.

Table 5.67 Signage for Dukh Nivaran Chowk to Thapar Left

Signage	Yes (1 pt.)	No (0 pt.)
Signing for Pedestrian		0
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**5**	

Score for Signage= Average total score for Signage *100

Score for Signage = 0

No signage is found on this section. Table 5.68 gives the safety for motorized vehicle.

Table 5.68 Motorized vehicle safety for Dukh Nivaran Chowk to Thapar Left

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	
Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100		

Score for Motorized vehicle safety = 0

Table 5.69 gives the details for Dukh Nivaran Chowk.

Table 5.69 Intersection for Dukh Nivaran Chowk to Thapar Left

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Signalized	1	With Pedestrian phase	NIL	**Without Pedestrian phase**	0.2
Round about		Single lane approach)	Two lane	more than two lanes)	
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**
Score for Intersection = Average total score for Intersection *100					

Score for intersection = 20

As Dukh Nivaran Chowk was Signalized intersection without any pedestrian phase therefore its score was 0.2 out of 1. Table 5.70 gives the final score for Dukh Nivaran Chowk to Thapar Left

Table 5.70 Final Score table for Dukh Nivaran Chowk to Thapar Left

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	30	4	120	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	0	2	0	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**540**	**1800**

= (540/1800) x100=30

- After analyzing all the Tables from 5. 64 to 5.69, the final score comes out to be 30 which represent the road section as poor according to clause 5.3.2 (point 9).

- Earlier the score comes to be 26.5 when Dukh Nivaran Chowk to Thapar Right part was audited and after auditing Dukh Nivaran Chowk to Thapar Left part the scores come to be 30. Therefore, 28.25 will be the score of Dukh Nivaran Chowk to Thapar Road Section.

iii. Location name:- **Dukh Nivaran Chowk Towards Sirhind Right**

In this, road going from Dukh Nivaran Chowk towards Sirhind has been audited and the direction left or right is chosen as it is chosen earlier. Firstly, Dukh Nivaran Chowk towards Sirhind Right section has been audited. Name of all the persons involved in auditing should be noted down and map location has to be given.

Map Location:-

Figure5.15 Road section from Dukh Nivaran Chowk towards Sirhind Right

The speed of the vehicles were noted in Table 5.71 and quality can be checked from Table 5.72 after calculating average speed from Table 5.71.

Table 5.71 Speed measure for from Dukh Nivaran Chowk towards Sirhind Right

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	19,24,	—	26,22	20,16,19,11,16	22,44,44,29,28,44,36,37,42	28,33,28,18	24,31,37,37,44,30,24	11,12,9	8 ,12
10-20 min	32,21,15,20,10,	28,22	7,25	30	30,30,37,33,27,20	22	38,41,18,22,	10	16
20-30 min	20,24	—	20,12	33,28	38,38,34,41,35,38,43,36	20,26,17	28,28,44,38,47,30	14,7	—
Average Speed (km/hr.)	**21**	**25**	**19**	**22**	**35**	**22**	**33**		

Table 5.72 Speed Quality for Dukh Nivaran Chowk to towards Sirhind Right

Indicators			**Quality**			**Total**
Speed measures for roads		**Present (1 pt.)**	**Good**	**Fair**	**Poor**	
		Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6

Score for Speed Measures =100

It clearly implies all the vehicles were moving at desirable speed thus their quality was good. Table 5.73 deals with the availability, condition and specification of footpath for pedestrians which is given below.

Table 5.73 Footpath and Pedestrian accessibility for Dukh Nivaran Chowk towards Sirhind Right

Indicators	**(A)**	**(B) Quality**			**Total**
Footpath	**Present (1 pt.)**	**Good**	**Fair**	**Poor**	**(A) X (B)**
	Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Pavement type	0	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	0
How wide are the footpaths?	0	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	0
Height of footpath (standard size is 150 mm)	0	Arterial Roads: Maximum < 100mm (4”)	Arterial Roads: 100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	0
Cleanliness and maintenance of footpath	0	Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	0	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortabl e at late nights	No amenities and Unsafe	0

Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	0	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	0
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	0	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	0
Availability of Crossings (frequency of crossings)	1	Avg. spacing between controlled crossings is < 500m	Avg. spacing between controlled crossings is between 500 m – 700 m	**Avg. distance of controlled crossings is >700 m**	0.2
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	10-20sec	**20-30 sec**	>30 sec	0.5
Overall	**10**				**1.7/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

(1.7X100)/10=17

Score for footpath and pedestrian accessibility = 17

- No footpath was present for pedestrians on this section. Peoples were using the main road for walking.

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians were available. Therefore, their score will be treated as zero. Table 5.74 deals with the signage for pedestrians and bicyclists, cars, two-wheelers and trucks.

Table 5.74 Signage for Dukh Nivaran Chowk towards Sirhind Right

Signage	Yes (1 pt.)	No (0 pt.)
Signing for Pedestrian	1	
Signing for bicyclists		0
Signing for Cars and 2W and Trucks	1	
Does the signing make clear the intended use facilities?	1	
Speed limit signage		0
Overall	**3/5**	
Score for Signage= Average total score for Signage *100		

Score for Signage = 60

Out of 5 signs three signs for pedestrians, cars, trucks and two-wheeler were present. Table 5.75 gives the safety for motorized vehicle.

Table 5.75 Motorized vehicle safety for Dukh Nivaran Chowk to towards Sirhind Right

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	
Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100		

Score for Motorized vehicle safety = 0. Table 5.76 gives the details for Dukh Nivaran Chowk.

Table 5.76 Intersection for Dukh Nivaran Chowk towards Sirhind Right

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.)	Good	Fair	Poor	(A) X (B)
	Absent (0 pt.)	(1 pt.)	(0.5 pt.)	(0.2 pt.)	
Signalized	1	With Pedestrian phase	NIL	**Without Pedestrian phase**	0.2
Round about		Single lane approach)	Two lane	more than two lanes)	
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2/1**
Score for Intersection = Average total score for Intersection *100					

Score for intersection = 20

As Dukh Nivaran Chowk was Signalized intersection without any pedestrian phase therefore its score was 0.2 out of 1. Table 5.77 gives the final score for Dukh Nivaran Chowk towards Sirhind Right.

Table 5.77 Final Score table for Dukh Nivaran Chowk towards Sirhind Right

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	42	4	168	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	60	2	120	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**708**	**1800**

= (708/1800) x100=39

- After analyzing all the Tables from 5. 70 to 5.76, the final score comes out to be 39 which represents the road section as poor according to clause 5.3.2 (point 9).

- Now Dukh Nivaran Chowk towards Sirhind left score has been calculated in order to get the total score of Dukh Nivaran Chowk towards Sirhind section.

iv. Location name:- **Dukh Nivaran Chowk Towards Sirhind Left**

After auditing Dukh Nivaran Chowk towards Sirhind Right auditing has to be done on another side of the road i.e. from Dukh Nivaran Chowk to Sirhind Left side. Name of all the persons involved in auditing should be noted down and map location has to be given. Fig 5.16 gives the Section from Dukh Nivaran chowk towards Sirhind Left.

Location Map

Figure5.16 Road section from Dukh Nivaran Chowk towards Sirhind Left

Speed of the vehicles were noted in Table 5.78 and quality can be checked from Table 5.79 after calculating average speed from Table 5.78.

Table 5.78 Speed measure for from Dukh Nivaran Chowk towards Sirhind Left

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rikshaw	Scooter/ Motor cycle	Cycle	Hand Driven Rikshaw
0 – 10 min	—	37,32,	28,34, 37,23	39, 37	27,46,45,36, 36,47	32,27,29,30	25,26,29,48,26,36	10,7	9,9,
10-20 min	—	23,26 ,31	30,40, 35,20	37	38,39,32,39, 36	25,28,31	33,42,28,33,39	6	8,15
20-30 min	—	24,31	28	30	36,38.47,34	32,35,38	31,26,22,27,37	13,12	13,12
Average Speed (km/hr.)		**29**	**29**	**36**	**38**	**31**	**32**		

Table 5.79 Speed Quality for Dukh Nivaran Chowk towards Sirhind Left

Indicators			**Quality**			**Total**
Speed measures for roads		**Present (1 pt.)**	**Good**	**Fair**	**Poor**	
		Absent (0 pt.)	**(1 pt.)**	**(0.5 pt.)**	**(0.2 pt.)**	
Existing Speed Variation (Total km/hr.)	Truck Multi Axle		< 50 km/h	>50 km/h	> 80 km/h	
	Truck	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	Bus	1	**< 50 km/h**	>50 km/h	> 80 km/h	1
	LCV	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Car /jeep	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Auto Rikshaw	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
	Scooter /Motorcycle	1	**< 50 km/h**	>50 km/h	> 90 km/h	1
Overall		6				6

Score for Speed = Average total score for Speed *100

Score for Speed Measures =100. It shows all the vehicles were moving with the speed less than 50 km/hr. Table 5.80 deals with the availability, condition and specification of footpath for pedestrians which is given below

Table 5.80 Footpath and Pedestrian accessibility for Dukh Nivaran Chowk towards Sirhind Left

Footpath	Present (1 pt.) Absent (0 pt.)	Good (1 pt.)	Fair (0.5 pt.)	Poor (0.2 pt.)	(A) X (B)
Pavement type	0	Concrete/ Interlockin block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	0
How wide are the footpaths?	0	Arterial and Sub arterial roads: 1.8 to 5.0m (including curbs)	Arterial roads: 1.5 - 1.8m	Badly congested (< 1.5m	0
Height of footpath (standard size is 150 mm)	0	Arterial Roads: Maximum < 100mm (4”)	Arterial Roads: 100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	0
Cleanliness and maintenance of footpath	0	Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintaine d	0
Provision of amenities for pedestrians for path way (Hawkers exclusive zone, cover from sun and rain, etc.)	0	Pedestrians provided some good amenities and feel safe	Limited number of provisions for pedestrians and slightly uncomfortabl e at late nights	No amenities and Unsafe	0
Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing)	0	Infrastructur e for disabled is present	Some infrastructure is available	Mostly absent	0
Barrier free footpaths (obstructions such as trees, parking vehicles,hawkers and vendors hawkers and vendors etc. should be absent)	0	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	0

Availability of Crossings (frequency of crossings)	1	**Avg. spacing between controlled crossings is < 500m**	Avg. spacing between controlled crossings is between 500 m – 700 m	Avg. distance of controlled crossings is >700 m	1
Type of Crossing	1	**Level/ at grade crossing**	Foot over bridges with elevators or half subways which are well lit.	Foot over bridges without elevators or completely covered subways without proper lighting	1
Difficulty in crossing /Time taken for crossing	1	**10-20sec**	20-30 sec	>30 sec	1
Overall					**3/10**

Score for Footpath and Pedestrian accessibility = Average total score for Footpath and Pedestrian accessibility *100

=(3X100)/10=30

Score for footpath and pedestrian accessibility =30

- No footpath was present for pedestrians on this section. Peoples were using the main road for walking.

- No cycle accessibility i.e. no cycle lane and no lighting for pedestrians was available. Therefore, their score will be treated as zero. Table 5.81 which deals with the signage for pedestrians and bicyclists, cars, two-wheelers and trucks.

Table 5.81 Signage for Dukh Nivaran Chowk towards Sirhind Left

Signage	Yes (1 pt.)	No (0 pt.)
Signing for Pedestrian	1	
Signing for bicyclists		0
Signing for Cars and 2W and Trucks		0
Does the signing make clear the intended use facilities?		0
Speed limit signage		0
Overall	**1/5**	
Score for Signage= Average total score for Signage *100		

Score for Signage = 20. Only one sign for pedestrian was present. Table 5.82 gives the safety for motorized vehicle.

Table 5.82 Motorized vehicle safety for Dukh Nivaran Chowk towards Sirhind Left

For Motorized vehicles	Yes (1 pt.)	No (0 pt.)
Speed limits sign is provided		0
Does safety measures provided for construction at road sides		0
Is the median design safe		0
Kerb design safe?		0
Is kerb free of vertical hazards?		0
Is approach of flyover safe?		0
Overall	**6**	
Score for Motorized vehicle safety = Average total score for Motorized vehicle safety *100		

Score for Motorized vehicle safety = 0. Table 5.83 gives the details for Dukh Nivaran Chowk.

Table 5.83 Intersection for Dukh Nivaran Chowk towards Sirhind Left

Indicators	(A)	(B) Quality			Total
Type of intersection	Present (1 pt.) Absent (0 pt.)	Good (1 pt.)	Fair (0.5 pt.)	Poor (0.2 pt.)	(A) X (B)
Signalized	1	With Pedestrian phase	NIL	**Without Pedestrian phase**	0.2
Round about		Single lane approach)	Two lane	more than two lanes)	
Manually controlled		NIL	Police controlling	No Police controlling	
Un-signalized		With traffic calming	With stop sign	None of the above	
Score					**0.2**

Score for Intersection = Average total score for Intersection *100

Score for intersection = 20

As Dukh Nivaran Chowk was Signalized intersection without any pedestrian phase therefore its score was 0.2 out of 1. Table 5.84 gives the final score for Dukh Nivaran Chowk to Sirhind Left

Table 5.84 Final Score table for Dukh Nivaran Chowk towards Sirhind Left

Access Mode Type	Score	Weight	(A)X(B)	Total
Speed	100	4	400	400
Footpath and Pedestrian accessibility	30	4	120	400
Cyclist accessibility	0	3	0	300
Lighting	0	3	0	300
Signage	20	2	40	200
Motorized vehicles safety	0	1	0	100
Intersections and Midblock	20	1	20	100
Total			**580**	**1800**

= (580/1800) x100=30

- After analyzing all the Tables from 5.78 to 5.83, the final score comes out to be 30 which represent the road section as poor according to clause 5.3.2 (point 9).
- Earlier the score comes to be 39 when we audited Dukh Nivaran Chowk towards Sirhind Right part and after auditing Dukh Nivaran Chowk towards Sirhind Left part the scores comes to be 35.5. Therefore, 35.5 will be the score of Dukh Nivaran Chowk towards Sirhind section.
- Now total score of Dukh Nivaran chowk comes out to be the average of all the legged of that intersection i.e. (28.25+35.5)/2 = 31.87.
- This score shows the fountain chowk intersection belong to poor category clause 5.3.2 (point 9). Fig 5.17 shows the safety at intersection of Dukh Nivaran.

Figure 5.17 Safety at intersection of Dukh Nivaran

Similarly, other sections have been audited whose scores are mention in Table 5.88, Table 5.89, Table 5.90, Table 5.91 and Table 5.92. Table 5.85, Table 5.86 and Table 5.87 gives the number represented on map and their location.

Road Safety Audit has been performed on 92 locations covering nearly 15% of major roads of Patiala. Safety Audit includes mid blocks of a stretch and all legs on an intersection. Figure5.17 will show the map of Patiala district where Road Safety Audit has been performed.

5.6 LOCATIONS OF ROAD SAFETY AUDIT IN PATIALA

The locations have been marked on the map where safety audit has been performed. Fig 5.18 denotes all the audited locations.

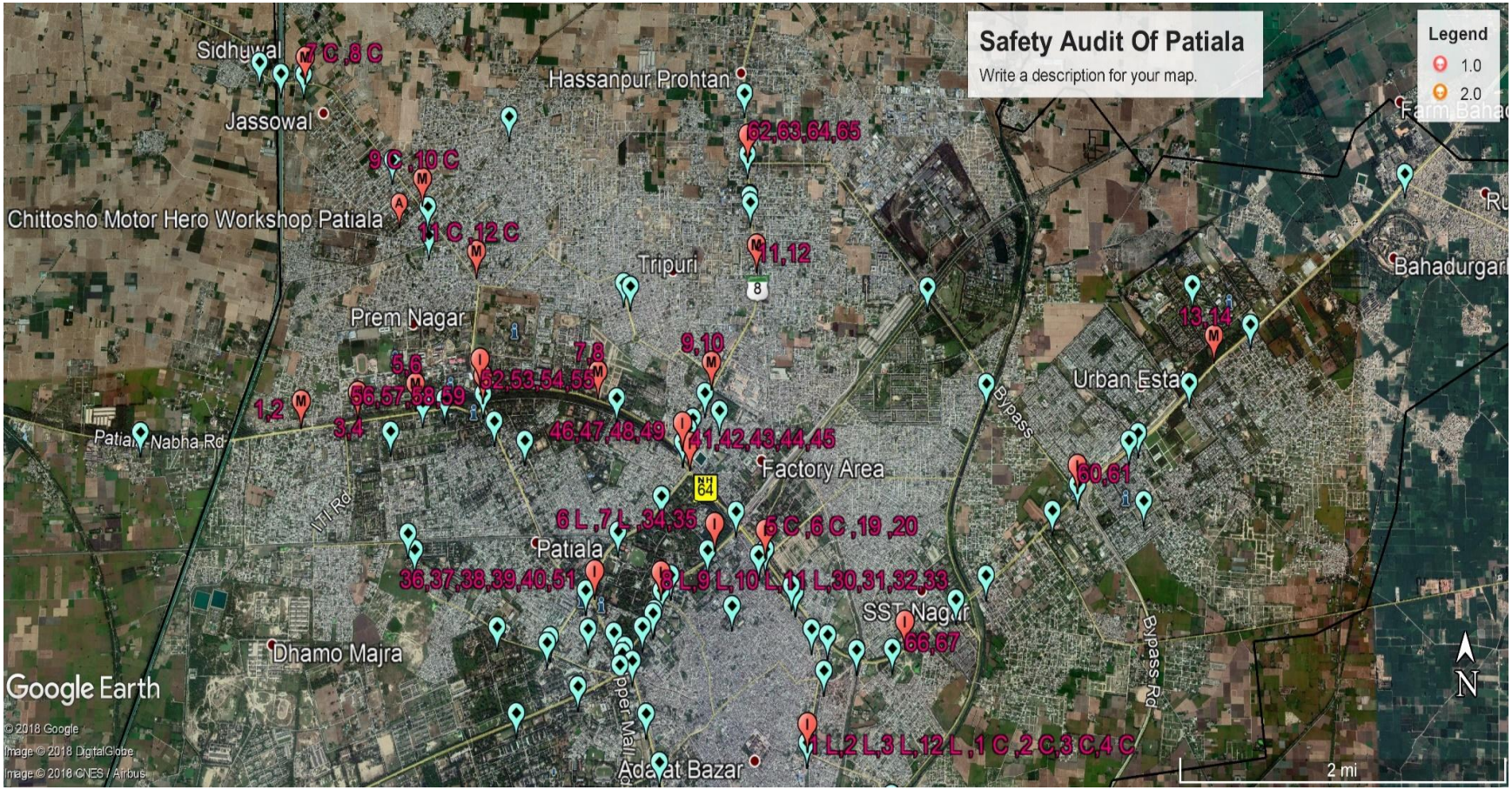


Figure 5.18 Patiala district where Road Safety Audit has been performed

Where I – Intersection

M – Mid block

Numbering represented on the map showing the following locations.

Table 5.85 Arterial roads with their number on map

ARTERIAL ROADS	
No On MAP	**LOCATION**
1	PHULL NEURO & MULTISPECTALITY HOSPITAL TOWARDS THAPAR
2	PHULL NEURO & MULTISPECTALITY HOSPITAL TO THAPAR POLICE STN.
3	OPP ITI NABHA ROAD WORKSHOP BUS STOP TOWARDS THAPAR
4	ITI WORKSHOP
5	PWD NABHA ROAD TOWARDS THAPAR
6	NABHA PWD
7	POLICE LINE TOWARDS DUKHNIVARAN
8	POLICE LINE TO THAPAR
9	BANK OF INDIA NEW PATIALA AREA BRANCH TOWARDS DUKHNIVARAN
10	BANK OF INDIA NEW PATIALA AREA BRANCH TOWARDS SIRHIND
11	CLARION INN SIRHIND ROAD TOWARDS SIRHIND
12	CLARION INN HOTEL SIRHIND ROAD TOWARDS DUKHNIVARAN
13	PUNJABI UNIVERSITY FLYOVER TOWARDS RAJPURA
14	PUNJABI UNIVERSITY FLYOVER TOWARDS PATIALA
15	SANTOSHI MATA MANDIR RAAJPURA ROAD TOWARDS BUS STAND
16	SANTOSHI MATA MANDIR RAAJPURA ROAD TOWARDS RAJPURA
17	HOTEL LOCHAN TOWARDS BUS STAND
18	HOTEL LOCHAN TOWARDS RAJPURA
19	NEHRU PARK RAJPURA ROAD
20	NEHRU PARK RAJPURA ROAD
21	LEELA BHAWAN TOWARDS THAPAR
22	BHAGAT FORD MALL ROAD
23	MALL ROAD FOUNTAIN CHOWK
24	LOWER MALL ROAD POLO GROUND
25	MALL ROAD INFRONT OF MASJID
26	FOUNTAIN CHOWK
27	FOUNTAIN CHOWK
28	FOUNTAIN CHOWK
29	FOUNTAIN CHOWK
30	MALL ROAD NEAR MANDIR
31	SHERAWALLA GATE

32	OPP HIGH COURT CENTRAL LIBRARY MALL ROAD
33	SHERAWALLA GATE
34	CAPITAL CINEMA
35	CAPITAL CINEMA PETROL PUMP TOWARDS BUS STAND
36	SHERAWALLA GATE
37	LEELA BHAWAN CHOWK ,OFFICE OF CIVIL SURGEON TOWARDS FOUNTAIN
38	LEELA BHAWAN TOWARDS NEEMRANA BARADARI PALACE
39	LEELA BHAWAN TOWARDS DUKHNIVARAN FLYOVER
40	LEEL TO DUKH NIVARAN
41	DUKH NIVARAN TO by PASS
42	DUKH NIVARAN TO LEELA BHAWAN
43	DUKH NIVARAN JUNCTION ,TOWARDS LEELA BHAVAN RAJPURA ROAD
44	DUKH NIVARAN JUNCTION ,TOWARDS DUKHNIVARAN
45	DUKH NIVARAN MAIN GATE TOWARDS BUS STAND
46	DUKH NIVARAN THAPAR
47	DUKH NIVARAN TOWARDS SIRHIND
48	DUKH NIVARAN JUNCTION (MINI SECRETARIAT TOWARDS THAPAR
49	DUKH NIVARAN KABIR DASH PETROL PUMP TOWARDS NH1 SIRHIND ROAD
50	TOWARDS BUS STAND
51	LEELA TO FOUNTAIN
52	THAPAR to BHADSON
53	TOWARDS CANAL THAPAR CHOWK
54	THAPAR TO DUKHNIWARAN CHOWK
55	THAPAR CHOWK TOWARDS DUKHNIVARAN
56	BHUPINDRA ROAD TO THAPAR POLICE CHOWKI
57	BHUPINDRA ROAD CHOWK NEAR THAPAR
58	BHUPINDRA ROAD CHOWK TO 22 NO
59	BHUPINDRA ROAD CHOWK NEAR THAPAR TO 22 NO
60	BYPASS JNCTN TOWARDS RAJPURA
61	BYPASS JNCTN TOWARDS BUS STAND
62	V S BAJAJ SIRHIND ROAD TOWARDS DUKHNIVARAN
63	V S BAJAJ SIRHIND ROAD TOWARDS SIRHIND
64	SIRHIND ROAD SRI BALAJI TRADING COMPANY TOWARDS DUKHNIVIRAN
65	SRI BALAJI TRADING COMPANY TOWARDS SIRHIND
66	IQBAL INTERSECTION TOWARDS BUS STAND
67	IQBAL INTERSECTION TOWARDS RAJPURA

Table 5.86 Representing the collector roads with their number on map

COLLECTOR ROAD	
No On MAP	**LOCATION**
1 C	BANSAL PUMP AND PIPES
2 C	BANSAL PUMP AND PIPES Sanari Bus Adda
3 C	HANUMAN MANDIR CHOWK SAFABADI ROAD
4 C	HANUMAN MANDIR CHOWK SAFABADI ROAD
5 C	CITY DENTAL CARE CENTRE
6 C	CITY DENTAL CARE CENTRE
7 C	CHUNGI BHADSON ROAD
8 C	HOTEL LAZEEZ
9 C	HERO MOTOR BHADSON ROAD
10 C	HERO MOTOR BHADSON ROAD CHITTOSHO HERO TOWARDS THAPAR
11 C	CHUNGI BHADSON ROAD
12 C	AXIS BANK BHADSON ROAD BRANCH TOWARD THAPAR

Table 5.87 Representing the local roads with their number on map

LOCAL ROAD	
No On MAP	**LOCATION**
1 L	PREET CEMENT STORE towards Sanauri Bus Adda
2 L	PREET CEMENT STORE towards Sanauri Bus Adda
3 L	HANUMAN MANDIR CHOWK SAFABADI ROAD TOWARDS BUS STAND
4 L	SAFABADI ROAD BEHIND PRTC BUS STAND
5 L	Leela TO BARADARI
6 L	DIST COURT GATE
7 L	DIST COURT GATE CAPITOL CINEMA
8 L	SHERANWALA
9 L	SHERANWALA GATE - BAZAR ENTRY
10 L	SHERANWALA GATE - TOWARDS PALACE
11 L	SHERANWALA GATE - TOWARDS PALACE
12 L	HANUMAN CHOWK TOWARDS MATA MANDIR
13 L	SAFABADI ROAD BEHIND PRTC WORKSHOP TOWARDS MATA MANDIR

The result of following audit has been summarized in Table 5.32 .Table 5.33, Table 5.34 ,Table 5.35 and Table 5.36 .The criteria for their judgment of score is 0 - 50 is consider as poor ,50 -80 average and above 80 it comes in the category of good .

0-50	50-80	80 above
Poor	Average	Good

5.7 SCORE OF ROAD SAFETY AUDIT

The score of all the 92 locations are given in Table No .5.88 .These locations are accident prone locations where frequency of accidents are frequently occurring. Safety Audit is done on arterial, collector and local roads .

Table 5.88 Score of Safety Audit performed on Arterial Intersection

ARTERIAL INTERSECTION										
Sr. No	**Location**	**Speed**	**Footpath and Pedestrian Accessibility**	**Cyclist Accessibility**	**Lighting for Pedestrian**	**Signage**	**Motorized Vehicles Safety**	**Intersections**	**Score**	**Final Score**
	FOUNTAIN CHOWK									
1	Fountain Chowk To Leela Bhawan Left	100	67	0	0	0	0	20	38	36.18
	Fountain Chowk To Leela Bhawan Right	100	15	0	0	40	0	20	32	
	Fountain Chowk To Bhagat Petrol Pump –L	100	58	0	0	0	0	20	36	
	Fountain Chowk To Bhagat Petrol Pump –R	100	15	0	0	40	0	20	31	
	Fountain Chowk To Lower Mall Road Left	100	50	0	0	0	0	50	36	
	Fountain Chowk To Mall Road Left	100	59	0	0	40	0	20	41	
	Fountain Chowk To Mall Road Left	100	59	0	0	0	0	20	36.5	

	Fountain Chowk to Mall Road Right	100	72	0	0	0	0	20	39	
2	DUKHNIVARAN CHOWK									
	Dukhniviran Chowk Towards Thapar Right	100	14	0	0	0	0	20	26.5	31.87
	Dukhniviran Chowk Towards Thapar Left	100	30	0	0	0	0	20	30	
	Dukhniviran Chowk Towards Sirhind R	100	42	0	0	60	0	20	39	
	Dukhniviran Chowk Towards Sirhind Left	100	30	0	0	20	0	20	32	
3	RAJPURA ROAD & LAKKADMAND ROAD INTERSECTION									
	Santoshi Mata Mandir Towards Bus Stand	100	30	0	0	0	0	20	30	28
	Santoshi Mata Mandir Towards Rajpura	100	30	0	0	0	0	20	30	
	Hotel Lochan Towards Bus Stand	100	25	0	0	0	0	20	29	
	Hotel Lochan Towards Rajpura	75	25	0	0	0	0	20	23	
4	BUS STAND CHOWK									
	Bus Stand Chowk to City Dental Care Left	50	25	0	0	0	0	20	21	25.75
	Bus Stand Chowk to City Dental Care Right	67	25	0	0	0	0	20	26	
	Bus Stand Chowk to Nehru Park Rajpura L	92	30	0	0	0	0	20	28	
	Bus Stand Chowk To Nehru Park Rajpura R	100	20	0	0	0	0	20	28	
5	RAJPURA ROAD & NEW BYPASS JUNCTION									

	By Pass Junction Towards Rajpura	75	25	0	0	0	0	100	28	30.5
	By Pass Junction Towards Bus Stand –Left	100	25	0	0	0	0	100	33	
6	IQBAL INN CHOWK									
	Iqbal Intersection Towards Bus Stand	92	0	0	0	0	0	20	21.5	22.25
	Iqbal Intersection Towards Rajpura	100	0	0	0	0	0	20	23	
7	CAPITAL CINEMA CHOWK									
	Dist. Court Gate	87.5	0	0	0	0	0	20	25	30
	Dist. Court Gate Capitol Cinema	87.5	0	0	0	0	0	20	25	
	Capital Cinema	100	45	0	0	0	0	20	33	
	Capital Cinema Petrol Pump Towards Bus Stand	100	63	0	0	0	0	20	37	
8	SHERA WALLA GATE CHOWK									
	Sheranwala	50	45	0	0	0	0	20	27	30.87
	Sheranwala Gate - Bazar Entry	83	0	0	0	0	0	20	23.5	
	Sheranwala Gate - Towards Palace	87.5	0	0	0	0	0	20	25	
	Sheranwala Gate - Towards Palace	67	0	0	0	0	0	20	19	
	Mall Road Near Mandir	100	50	0	0	0	0	20	34.5	
	Sherawalla Gate	100	48	0	0	0	0	20	34	

	Sherawalla Gate	100	80	0	0	0	0	20	47	
	Sherawalla Gate	100	61	0	0	0	0	20	37	
9	LEELA BHAWAN CHOWK									
	Sherawalla Gate	100	42	0	0	0	0	20	33	39
	Leela Bhawan Chowk, Office of Civil Surgeon Towards Fountain Chowk	100	77	0	75	0	0	20	53	
	Leela Bhawan Towards Neemrana Baradari Palace	100	77	0	0	20	0	20	43	
	Leela Bhawan Towards Dukhnivaran Flyover	92	66	0	0	0	0	20	36	
	Leela To Dukh Nivaran	100	20	0	0	40	0	20	32	
	Leela To Fountain	100	42	0	0	40	0	20	37	
10	DUKHNIVARAN CHOWK 2 NEAR GTB MARKET									
	Dukh Nivaran to By Pass	100	25	0	0	0	0	20	29	30.6
	Dukh Nivaran To Leela Bhawan	100	25	0	0	80	0	20	33	
	Dukh Nivaran Junction ,Towards Leela Bhavan Rajpura Road	100	44	0	0	0	0	20	33	
	Dukh Nivaran Junction, Towards Dukh Nivaran	100	17	0	0	0	0	20	26	
	Dukh Nivaran Main Gate Towards Bus Stand	100	25	0	0	0	0	20	32	

11	BHUPINDRA ROAD CHOWK NEAR HOTEL GRAND PARK									
	Bhupindra Road To Thapar Police Chowki	100	30	0	0	60	0	20	37	29.37
	Bhupindra Road Chowk Near Thapar	83	30	0	0	0	0	20	26	
	Bhupindra Road Chowk To 22 No	100	30	0	0	0	0	20	30	
	Bhupindra Road Chowk Near Thapar To 22 No	75	30	0	0	0	0	20	24.5	
12	THAPAR CHOWK									
	Thapar To Bhadson	87.5	0	0	0	40	0	20	25	31
	Towards Canal Thapar Chowk	83	25	0	0	20	0	20	27	
	Thapar To Dukhniwaran Chowk	100	25	0	0	60	20	20	37	
	Thapar Chowk Towards Dukhnivaran	92	25	0	0	20	20	100	35	
13	OLD BYPASS CHOWK SIRHIND ROAD									
	V S Bajaj Sirhind Road Towards Dukhnivaran	83	0	0	0	0	0	20	19.5	21.12
	V S Bajaj Sirhind Road Towards Sirhind	100	0	0	0	20	0	20	25.5	
	Sri Balaji Trading Company Towards Dukhniviran	92	0	0	0	0	0	20	21.5	
	Sri Balaji Trading Company Towards Sirhind	75	0	0	0	0	0	20	18	

14	HANUMAN CHOWK NEAR SAFABADI ROAD									
	Bansal Pump And Pipes	67	0	0	0	0	0	20	19	19.81
	Bansal Pump And Pipes Sanari Bus Adda	83	0	0	0	0	0	20	23.5	
	Hanuman Mandir Chowk Safabadi Road	83	0	0	0	0	0	20	23.5	
	Hanuman Mandir Chowk Safabadi Road	83	0	0	0	0	0	20	23.5	
	Preet Cement Store Towards Sanauri Bus Adda -R	50	0	0	0	0	0	20	15	
	Preet Cement Store Towards Sanauri Bus Adda-L	42	0	0	0	0	0	20	12.5	
	Hanuman Mandir Chowk Safabadi Road Towards Bus Stand	58	0	0	0	0	0	20	17	
	Hanuman Chowk Towards Mata Mandir	92	0	0	0	0	0	0	24.5	
15	SAFABADI ROAD BEHIND PRTC									
	Safabadi Road Behind PRTC towards Bus Stand	42	48	0	0	0	0	0	24	27.75
	Towards Mata Mandir	50	63	0	0	0	0	20	31.5	
	OVERALL	**88.78**	28.39	0	0	8.69	0.6	25.6	30.3	

From Table 5.88 it has been concluded that Patiala Arterial intersections conditions are very worse.On maximum roads, footpath was not present.Their score comes out to be only 28.39 out of 100 which is a matter for concern and which ultimate results in accidents of

pedestrian. Since arterial roads are the busiest roads in an area then also there are no sign boards on arterial roads.There score comes out to be only 8.69 out of 100.Motorised vehicle safety is also almost 0.

Table 5.89 Score of Safety Audit performed on Arterial Mid Blocks

Arterial Mid blocks										
Sr No	**Location**	**Speed**	**Footpath and Pedestrian Accessibility**	**Cyclist Accessibility**	**Lighting for Pedestrian**	**Signage**	**Motorized Vehicles Safety**	**Intersections**	**Total Score**	**Final Score**
1	Phull Neuro & Multispectality Hospital Towards Thapar	92	0	0	0	0	0	0	20.5	22.75
2	Phull Neuro & Multispectality Hospital to Thapar Police Stn..	92	0	0	0	40	0	0	25	
3	Opp Iti Nabha Road Workshop Bus Stop Towards Thapar	100	0	0	0	0	0	20	23	25.50
4	ITI Workshop	100	0	0	0	40	0	20	28	
5	PWD Nabha Road Towards Thapar	92	0	0	0	0	0	20	21.5	21
6	Nabha PWD	92	0	0	0	0	0	0	20.5	
7	Police Line Towards Dukhnivaran	92	57	0	0	0	0	20	34	30
8	Police Line To Thapar	92	0	0	0	40	0	20	26	
9	BOI New Patiala Area Branch Towards Dukhnivaran	100	0	0	0	20	20	20	27	28.5

10	Bank Of India New Patiala Area Branch Towards Sirhind	100	0	0	0	60	0	20	30	
11	Clarion Inn Sirhind Road Towards Sirhind	100	0	0	0	0	0	20	23	22.25
12	Clarion Inn Hotel Sirhind Road Towards Dukhnivaran	92	0	0	0	0	0	20	21.5	
13	Punjabi University Flyover Towards Rajpura	83	0	0	20	20	33	0	26	23.5
14	Punjabi University Flyover Towards Patiala	67	0	0	0	40	33	0	21	
	OVERALL	92	4	0	1.42	18.5	6.14	12.8	24.8	

From Table 5.89 it has summarized that Patiala Arterial Mid blocks conditions are worse than their intersections conditions. No footpath was present on any of the roads.Their score is only 4out of 100 which clearly shows pedestrians are using main roads for walking. Since arterial roads are the busiest roads in an area then also there are no sign boards on arterial roads.There score comes out to be only 8.69 out of 100. Motorised vehicle safety is also almost 0.

Table 5.90 Score of Safety Audit performed on Local Road Intersections

Local Roads - Intersections									
Scores (Out of 100)									
Sr. No.	**Location**	**Speed**	**Footpath and Pedestrian Accessibility**	**Lighting for Pedestrian**	**Signage**	**Motorized Vehicles Safety**	**Intersections**	**Score**	**Final Score**
1	Preet Cement Store Towards Sanauri Bus Adda L	50	0	0	0	0	20	15	13.75

2	Preet Cement Store Towards Sanauri Bus Adda R	42	0	0	0	0	20	12.5	
3	Hanuman Mandir Chowk Safabadi Road Towards Bus Stand	58	0	0	0	0	20	17	20.75
4	Hanuman Chowk Towards Mata Mandir	92	0	0	0	0	0	24.5	
5	Dist Court Gate	87.5	0	0	0	0	20	25	25
6	Dist Court Gate Capitol Cinema	87.5	0	0	0	0	20	25	
7	Sheranwala	50	45	0	0	0	20	27	25.25
8	Sheranwala Gate - Bazar Entry	83	0	0	0	0	20	23.5	
9	Sheranwala Gate - Towards Palace L	87.5	0	0	0	0	20	25	22
10	Sheranwala Gate - Towards Palace R	67	0	0	0	0	20	19	
11	Safabadi Road Behind PRTC Bus Stand	42	48	0	0	0	0	24	27.75
12	Behind PRTC Workshop Towards Mata Mandir	50	63	0	0	0	20	31.5	
	OVERALL	65.11	14.3	0	3.84	0	16.92	23.0	

Table 5.90 gives Patiala Local roads intersection conditions.The condition of every roads is almost same no sign boards, no foot path. Their average score is 23 out of 100 which shows their worst condition.

Table 5.91 Score of Safety Audit performed on Collector Road Intersections

Collector Roads – Intersections									
Scores (Out of 100)									
Sr. No.	Location	Speed	Footpath and Pedestrian Accessibility	Lighting for Pedestrian	Signage	Motorized Vehicles Safety	Intersections	Total Score	Final Score
1	Bansal Pump And Pipes L	67	0	0	0	0	20	19	21.25
2	Bansal Pump And Pipes Sanari Bus Adda R	83	0	0	0	0	20	23.5	
3	Hanuman Mandir Chowk Safabadi Road L	83	0	0	0	0	20	23.5	23.5
4	Hanuman Mandir Chowk Safabadi Road R	83	0	0	0	0	20	23.5	
5	City Dental Care Centre L	50	0	0	0	0	20	15	17
6	City Dental Care Centre R	67	0	0	0	0	20	19	
	OVERALL	72.16	0	0	0	0	20	20.58	

Table 5.91 gives the Patiala Collector roads intersection condition. The condition of every road was almost same no signboards, no footpath, no motorized vehicle safety.In this, Speed was also coming in fair category.Earlier at least speed was in good category. Their average score was 20.58 out of 100.

Table 5.92 Score of Safety Audit performed on Collector Road Mid block

Collector Roads - Mid block									
Sr. No.	Location	Speed	Footpath and Pedestrian Accessibility	Lighting for Pedestrian	Signage	Motorized Vehicles Safety	Intersections	Total Score	Final Score
1	Chungi Bhadson Road	27	0	0	50	0	0	14	19
2	Hotel Lazeez	35	0	0	100	20	0	24	
3	Hero Motor Bhadson Road	37	0	0	0	0	0	10	9.5
4	Hero Motor Bhadson Road Chittosho Hero Towards Thapar	35	0	0	0	0	0	9	
5	Chungi Bhadson Road	67	0	0	0	0	0	18	25.5
6	Axis Bank Bhadson Road Branch Toward Thapar	83	0	0	75	20	0	33	
	OVERALL	47.33	0	0	37.5	6.66	0	18	

From Table 5.92 it was concluded that Collector Mid-block conditions are worst of all. Even the speed criteria of vehicles are also coming in bad categorization. Vehicles were moving at speed greater than their permissible speed.Rest is same no signboards , no footpathno motorized vehicle safety.Their average score is lowest of all i.e. 18 out of 100.

The average score has been also calculated for different roads given in Table 5.93. These scores are obtained averaging from Table 5.88 for the arterial intersection, Table 5.83 for arterial mid-block, Table 5.90 for local intersection, Table 5.91 for collector intersection and Table 5.92 for collector mid-block.

Table 5.93 Average Score obtained by different roads in different measures

Measure	Scores for Type of Roads (out of 100)				
	Arterial		Collector		Local
	Midblock	Intersection	Midblock	Intersection	Intersection
Speed	92	89	47.3	72	65.1
Footpath and Pedestrian Accessibility	4	28.39	0	0	14.3
Cyclist Accessibility	0	0	NA	NA	NA
Lighting for Pedestrians	1	0	0	0	0.76
Signage	18.5	8.7	37.5	0	3.8
Motorized Vehicle Safety	6	0	6.67	0	0
Intersections	12.8	25.6	0	20	16.9
Total Scores	24.78	30.3	18	20.5	23
	Poor (0-50)				
	Fair (50-80)				
	Good (80 and above)				

The outcomes obtained from Table5.93 has been discussed below

- All category of roads scored poor.
- Poor pedestrian infrastructure (lighting, footpaths, crossings etc.) makes them even more vulnerable to accidents.
- No cycle accessibility is there for cyclists.
- Parking facility is not provided resulting in congestion of roads.

Figure5.19 Pedestrian infrastructure

Figure5.20 Hawkers encroachment on foot paths

Figure5.21 Parking encroachment on footpaths of Mall Road

5.8 SPEED ANALYSIS

Speed analysis was also done in all the audited locations as it was also the part of the Safety Audit indicating the percentage of different vehicles that were exceeding the permissible speed limit and giving the average vehicle speed in the city. Average speed of various vehicles was measured by radar gun as shown in Fig.5.22.

The speed of different vehicles on different types of roads with their permissible speed limit is given in Appendix B .The resulting average speed is shown in Table No 5.94 and percentage of the vehicles exceeding the permissible speed limit is given in Table No 5.95.

Table5.94 Average speed of different vehicles

Type of Vehicle	Type of Road				
	Arterial (Speed limit = 50)		Collector (Speed limit = 30)		Local (Speed limit =20)
	Midblock	Intersection	Midblock	Intersection	Intersection
M4W	55	41	53	26	24
M2W	43	37	43	29	27
Bus	42	34	52.5	29	23
Truck	40	29	36	19	14
Auto Rickshaw	33	28.5	32	21	19
LCV	41	32	35	24	21

Table5.95 Percentage of vehicles exceeding the Speed limits for a different type of roads

Type of Vehicle	Type of Road				
	Arterial		Collector		Local
	Midblock	Intersection	Midblock	Intersection	Intersection
M4W	**59%**	23%	**90%**	25 %	62%
M2W	22%	12%	**80%**	39 %	**80%**
Bus	17%	11%	**100%**	50 %	**81%**
Truck	17%	0.03%	57%	0%	0%
Auto Rickshaw	0.004%	0%	53%	10%	23%
LCV	15%	0.03%	**52%**	10%	47%

Following points can be summarized from Table 5.94 and Table 5.95: -

1. At the mid-block, the average speed of the collector road is above 30 km /hr. for every type of vehicles which further results in fatal accidents as on these roads medians or dividers are not generally present and thus such speed can lead to major injury especially buses and cars with an average speed above 50. On mid-block, more than half of the vehicles are exceeding the permissible speeds in which cars and two-wheeler shares are 90% and 80% respectively. Thus, one of the main reasons for two-wheelers to be most victims as per Figure 4.9 is their speed, which should be slow down at first.

2. On the arterial roads the average speed at mid-block of cars is above 50km/hr. Cars were mostly the impacting vehicles in the fatal accidents during 2013-16 as per Figure 4.8. Also, 59% of the cars at the midblock on arterial roads were above the prescribed speed limit. This indicates a probable reason for such fatal accidents and thus some intervention is required to slow down the cars.

3. On the local roads the average speed of maximum vehicles is above the permissible limit. 80 % of the motorized two-wheeler vehicles and cars are exceeding their speed limit. This is also dangerous as local roads pass mostly through residential areas with frequent pedestrian movement from one side to another side of the road without any crossings.

Figure 5.22 Speed Test of Vehicles by Radar Gun

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 GENERAL

The analysis of accidents has been done to understand the various causes of accidents and their location and their frequency can be determined so that black spots can be located and later on Road Safety Audit can be done on that. The accident data is collected for four years of Patiala region from the various police station whichever the area belongs to. The data was collected from the year 2013 to 2016.

6.2 CONCLUSION AND RECOMMENDATIONS

Conclusion and various recommendations have been suggested for accidents and road safety audit which are summarized below.

6.2.1 Conclusion for Analysis of Accidents

On the basis of accident data collected for the years 2013 to 2016 of Patiala following conclusion can be drawn: -

- In Patiala 29 % of fatal, 26 % grevious and 45 % minor accidents take place out of which mainly males were the victims. They alone account for 87 % of total accidents.
- 11 % of fatal accidents take place in the month of June, July and December respectively followed by 9 % in April and October. Tuesday and Wednesday consisted of 16 % of accidents respectively followed by 15% on Sunday and Friday. Maximum accidents take place between 7:00 to 8:00 P.M and 9:00 to 10:00 P.M.
- 32 % of fatal accidents take place due to a vehicle hitting from the back and 24 % fatal accidents are of pedestrians followed by 16 % due to vehicle head-on.
- 38% of fatal accidents were occurred due to cars/van /jeep, 18% due to 2 Axle Heavy Goods Vehicle, 11% due to bus, 14% was occurring due to unknown vehicles that hit and run away

from there. 48 % victims vehicles were those who were using 2-wheeler like Motorcycle /Scooter /Moped followed by cycles 11 % and 29 % were pedestrians.

- Dukhniviran Chowk,Rajpura Road & New Bypass Intersection, Rajpura road & Lakkad Mandi road intersection and bus stand chowk comes out to be a black spot of Patiala.

6.2.2 Main reasons for accidents in Patiala:

- Traffic Issues: city has mixed traffic. Non-segregation of traffic leads to several problems. City's approach is "reactive" (reacting to solve the problems), proactive approach is completely missing.
- The city has poor record of traffic safety and congestion. City lacks technical inputs
- Old city area has several bottlenecks.
- No pedestrian facilities in the new areas of Patiala.
- Parking issues across the city.
- Footpaths are not present on maximum roads. If present then they are fully occupied or they are not well maintained. Footpaths are not disabled friendly.
- Synchronization of traffic lights is required to facilitate platoon movement.
- Drunk driving (enforcement issue), overloaded three-wheelers and helmet laws are poorly enforced.
- The requirement of base parking has not been very effective, poor enforcement.
- Patiala needs more parking with pedestrian paths.

6.2.3 Recommendations for accidents : -

1. Road signs and pavement markings should be regularly maintained to serve its purpose.
2. Slow moving road users should not mix with fast traffic vehicles where ever possible.

3. There should be an infrastructure for non-motorized vehicles like pedestrians and cyclists as they are the most vulnerable to accidents.
4. As the growth of motorized three-wheeler and two-wheeler is increasing in medium and low-income groups therefore proper planning of growth of these vehicles results in increase of pedestrians and cyclists.
5. Provision of proper safety measurements for youth drivers as they are the major group in road accidents.
6. Speed limit signs should be posted where the existing road geometry of the road alignment are poor.
7. At frequent accident spots physical measures such as speed breakers, rumble strips should be provided with proper warning signs.
8. Proper land use and its planning as it influence mode of travel and the length of the trip.
9. Proper monitoring of road user behavior and characteristics of the road e.g. frequency of drunk drivers, driving speed, seat belt wearing etc.
10. Enforcing the strict laws by various state governments to improve the quality of laws and proper implementations of safety laws.
11. Efforts to raise the awareness about the different aspects of road safety, the economic and social implications of road accidents.
12. Providing knowledge and awareness among the peoples through training, education and public camp.
13. Proper Urban Road Safety measures should be followed.

For Pedestrians -

1 Safe crossing facility for pedestrians.

2 Driver awareness of vulnerable road users.

3 Crossovers for pedestrians.

4 The pedestrian crossing should be provided with provisions of movement of disabled persons.

5 The width of footpaths should be 1.8 m to 5 m and height of footpath should not be less than 100mm.

At Junction or intersections:-

1 For improvement in visibility factor of pedestrians, the vehicle stop line can be shifted 15 to 30 ft back from the pedestrian crossing at the mid-block or signalized intersection.

2 Modified T intersections can be used where traffic volume is low and where there is need to decrease the moving speed of vehicles. It involves a bulb at the top of the T resulting in slight deflection of moving vehicles as they pass straight through the intersection. This helps to reduce the speed in the intersection.

3 On Junction of rural roads with main roads rumble strips can be provided on rural roads just ahead of their meeting point with the main road would also help in reducing the speed and thus helps in preventing the fatal accidents.

6.2.4 Conclusion for Road safety Audit

- All category of roads scored poor.
    - The scores for the speed parameter comes in good category for almost all the roads ,except at mid-block of the collector road where it comes in poor category and at intersection where its value is average .These scores are combinations of speeds of different types of vehicles.
- Poor pedestrian infrastructure (lighting, footpaths, crossings etc.) makes them even more vulnerable to accidents.
    - The accessibility for foot path and pedestrian belongs to poor category for all the types of roads. Footpath was absent on almost all types of roads .Similarly for the accessibility for cyclists which is zero for arterial roads and for, collector and local roads that was not

taken into account .This was considered as the main reason for pedestrian accidents in Patiala .

- The lighting available for the pedestrians movement is also almost zero on every road. It is a very serious concern for pedestrian's life.

- M4W were the impacting vehicles in the majority of road accidents of Patiala – speeds of M4W observed above the limit at majority roads.

- Signage and motorized vehicle safety at intersections also scored in the poor category as they score very less on all categories of road.

- Zero cyclist accessibility. No individual lane is provided for cyclists on any of the road.

- After combining all the parameters and analyzing the final audit score, it comes out to be below 25 for almost all types of roads which indicate very bad sign.

6.2.5 Recommendations for Road Safety Audit

On the basis of experience and results obtained from the audit, the following measures are proposed so as to improve the present level of Patiala in terms of road safety:-

1 Restricting the speed of motorized four wheeler from going at higher speed from their permissible speed.

2 Improving the lighting for the pedestrians as the lighting division has got almost zero score on all the audited roads .The lighting will also ensure the security among the pedestrians.

3 Improving the signage system throughout the city road network ,as they are most important for safety of other road users .Speed limit sign was absent on almost every road section ,if present they are in worst conditions .This with pedestrian crossing signage can led to big difference in the improvement of road safety .

4 Pedestrian infrastructure need to be improved to the current present standards and it should be provided at places where they are completely absent. They should be disabled friendly with crossing at junctions wherever it is possible. A minimum width of 1.8 m and minimum height of 150 mm for arterial road is likely to be used.

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APPENDIX A

Accident Summery of 2013, 2014, 2015 & 2016

SR No	FIR No	City/Town/Village Name	Time of Accident	Date of Accident	Hit and Run	Collision Type	Police Station	Victim Vehicle	Impact Vehicle	Landmark	Note
1	10	PATIALA	4:00:00 PM	1/6/2013	1	10	Kotwali Patiala	16	6	Village bahand chota rai majra petrol pump	A two wheeler hit by an alto car and he fell from 2 wheeler . Another car from behind the car ran over the motorcyclist and he died on the spot.
2	6	PATIALA	6:30:00 PM	1/12/2013	1	1	Civil lines Patiala	24	6	Opposite grewal market	A pedestrian on prtc workshop nabha road Patiala was hit by a car from behind while going straight and he died on the spot.
3	12	PATIALA	1:00:00 PM	1/17/2013	1	3	Urban Estate	11	5	Gupta nursey opposite sadar police station	Athela driver was hit by a bus from behind on rajpura road opposite sadar thana and he died on the spot and bus ran away.
4	14	PATIALA	9:15:00 PM	1/20/2013	0	3	Urban Estate	16	6	Opposite punjabi university	A car hit a scooter and the scooter driver died on the spot. The scooter was turning lest towards punjabi university and the car was heading straight.
5	36	PATIALA	1:00:00 PM	1/25/2013	0	3	Tripri town	16	5	Opposite more showroom	A scooter was hit by a bus from behind. The person sitting behind died in the hospital and the person driving sustained injuries. The bus driver ran on the spot from bhadson road Patiala.
6	18	PATIALA	11:00:00 PM	2/9/2013	0	3	Sadar Patiala	16	6	Turning from shekhpura village	A motorcycle turning was hit by a car. The 2 occupants died on the spot . The car hit from the back and he ran off.
7	48	PATIALA		2/11/2013	0	99	Tripri Patiala	18	6	Opposite hnumann mandir	A bycyclist was hit by a car while the bicycle was turning at a junction. The bycyclist died on the spot. The car ran away.
8	20	PATIALA	1:30:00 PM	2/19/2013	0	1	Civil lines Patiala	24	6	Opposite gallery memorial public school	A child coming out of the school was hit by a car. He was taken to hospital where he died later. The car ran away.
9	66	PATIALA	8:00:00 PM	2/24/2013	0	3	Tripri	16	2		A motorcycle was hit by a truck from behind and he died.
10	44	PATIALA	8:30:00 PM	2/27/2013	0	3	Kotwali	16	2	Shiv mandir and nadi	A motorcycle was hit by a truck from behind
11	47	PATIALA	10:00:00 PM	3/2/2013	1	99	Kotwali	16	99	Opposite iqubal inn hotel	A scooty was hit by an unknown vehicle in Patiala near hotel iqubal inn.
12	38	PATIALA	6:30:00 AM	3/21/2013	0	99	Urban Estate	18	6	Phase 3 turning opposite punjabi uni	A cyclist was hit by a car and he died on the spot.
13	128	PATIALA	4:30:00 PM	4/6/2013	0	3	Tripri town	16	2	Opposite dukhnewaran gurudwara chowk	A scooter hit by truck from behind and lady sitting behind died and driver was discharged after treatment.

14	151	PATIALA	2:30:00 AM	4/21/2013	0	2	Tripri	16	16	Neae peer baba samadh	A motorcycle was hit by another motorcycle by head on collision at 2.30 am in the morning. One person died on the spot.
15	59	PATIALA	12:15:00 PM	4/23/2013	0	3	Urban Estate	16	2	Near punjabi university towards urban Estate	A scooter was hit by a truck from behind. One person was killed and the other was injured.
16	90	PATIALA	9:05:00 AM	4/24/2013	0	3	Kotwali Patiala	16	2	Near hira bagh truck union	A motorcycle was hit by a truck from behind and he died on the spot
17	60	PATIALA	10:00:00 AM	4/24/2013	0	3	Urban Estate	16	6	Village chog junction	A car hit a motorcycle whil bike was tutning.
18	82	PATIALA	1:00:00 PM	4/29/2013	0	2	Civil lines Patiala	16	5	Army school junction	A bus hita a motorcycle head on by crossing the divider so maneuver of bus is others as it had crossed the divider.
19	66	PATIALA	7:00:00 PM	5/13/2013	0	99	Sadar Patiala	14	6	Near majal adda	A car hit a tractor trailer and one person of car died and the other injured.
20	50	PATIALA	10:45:00 AM	5/19/2013	0	3	Lahori gate	18	6	Near bus stop ahead of lights towards urban Estate	A cyclist was hit by a car and the bus ran over him and he died on the spot. For bus the impacting vehicle is other
21	118	PATIALA	6:00:00 PM	6/1/2013	0	3	Civil lines	16	6	Military helicopter station	A bicyclist was hit by a car from behind. The bicycle hit another bicycle in front of him who died on the spot. This middle biclist was injured.
22	236	PATIALA	11:40:00 AM	6/3/2013	0	6	Tripri town	16	5	Jassowal	A bus hit a motorcycle with opposite sideswipe and the diver died on the spot anh his wife was admitted to the hospital near malwa colony main road.
23	242	PATIALA	3:40:00 PM	6/4/2013	0	2	Tripri town	6	5	Village bahran	A car was hit by a bus from opposite side and the women died in the car and the driver was in jured.
24	136	PATIALA	7:30:00 PM	6/18/2013	0	3	Civil lines Patiala	18	6	Grewal market	A bicycle was hit from behind by a car and he died on the spot.
25	99	PATIALA	9:30:00 AM	6/24/2013	0	3	Sadar Patiala	16	5	Patiala cheeka road	A standing motorcycle was hit by a bus from behind and the women died on the spot.
26	140	PATIALA		6/27/2013	0	5	Civil lines	18	2	Khanda chowk opposite gurudwara dukhniwaran sahib	A truck crushed a bicyclist from sideswipe while the cycle was standing.
27	112	PATIALA	6:30:00 AM	7/4/2013	0	4	Sadar Patiala	9	6	Bhadurgarh chowk	A three wheeler was hit by a car while turning at the bhadurgarh chowk and he died later.
28	107	PATIALA	4:00:00 AM	7/4/2013	0	7	Sadar Patiala	24	6	Near comando complex	A car while going overturned and 1 died and he injured.
29	318	PATIALA	5:00:00 PM	7/13/2013	0	3	Tripri town	16	2	Bus stop village kasiaane	A motorcycle was hit by a canter from behind and he died and the lady was admitted to the hospital
30	123	PATIALA	7:30:00 PM	7/14/2013	0	1	Sadar Patiala	16	14	After crossing bahadurgarh towards kolli side	A motorcycle was hit by a tractor trailer from behind and one person died and the other injured.
31	162	PATIALA	3:30:00 PM	7/18/2013	0	2	Civil lines Patiala	16	5	Entry to malwa enclave	A scooter was hit by a bus coming from opposite direction and 3 pedestrians were standing on the side. 2 were killed and 2 were injured

32	126	PATIALA	6:50:00 AM	7/19/2013	1	99	Sadar Patiala	24	99	Bus stand village saneharraadi	A pedestrian was hit by an unknown vehicle and he was found dead.
33	127	PATIALA	2:00:00 PM	7/19/2013	0	4	Sadar Patiala	18	2	Hira automobile Patiala	A bycycle was hit by a truck from side at right angle and the girl died on the spot.
34	133	PATIALA	9:30:00 AM	7/27/2013	0	1	Sadar Patiala	24	6	On the road atshekpura village turnin	A pedestrian was hit by a car while crossing the road.
35	135	PATIALA	5:30:00 AM	7/30/2013	0	99	Sadar Patiala	24	99	Beer century tunharhadi	Hit and run case when a dead body was found.
36	187	PATIALA	8:00:00 AM	8/7/2013	0	8	Cicil lines Patiala	24	5		A person riding a bus fell off the bus when the encounterd a bump in the road. The door of the bus had opened and he died.
37	149	PATIALA	4:00:00 PM	8/12/2013	0	2	Sadar Patiala	16	14	T point at kakepur	A motorcycle striked a tractor trailor head on and the person died.
38	164	PATIALA	1:00:00 PM	8/27/2013	0	10	Sadar Patiala	24	5	Bus stand bhunarhadi	Bus ran over the pasenger while getting down from the bus
39	426	PATIALA	10:15:00 AM	9/18/2013	0	3	Tripri town	16	6	B.n. khalsa school	A motorcycle was hit by a car from behind and the person died.
40	244	PATIALA		6/8/2013	0	3	Civil lines Patiala	18	9	Opposite city heart patila	A cycle was hit by a three wheeler from behind and he died in the hospital.
41	256	PATIALA	11:30:00 AM	9/30/2013	0	6	Civil lines Patiala	16	14	Before petrol pump	A motorcycle collided with tractor trailor coming wrong way on the side. One person died 1 was in jured.
42	78	PATIALA	12:30:00 PM	10/9/2013	0	3	Rajpura	16	6	9 gja peer	A motorcycle was hit by a car from behind and he died.
43	205	PATIALA	7:30:00 PM	10/9/2013	0	2	Sadar Patiala	9	6		A passenger sitting in the front of three wheeler was hit by a car head on and he died.
44	135	PATIALA	6:30:00 PM	10/11/2013	0	4	Sarhandi gate patial	16	8		A motorcycle was hit by a fire fighting vhicle at the junction and 1 died and 1 was injured.
45	273	PATIALA	3:00:00 PM	10/15/2013	0	2	Civil lines Patiala	16	5	Near badungar	A motorcycle was hit by a bus coming wrong way and he died.
46	311	PATIALA	1:40:00 PM	10/18/2013	0	1	Kotwali Patiala	24	6		A pedestrian was hit by a bus and he died.
47	161	PATIALA	6:30:00 AM	10/19/2013	0	4	Urban Estate Patiala	16	2	Opposite ravi hospital junction	A activa was hit by a car coming from Patiala side at the ravi hospital jnction while the activa was crossing the junction. 1 died and the other was injured.
48	476	PATIALA	6:45:00 AM	10/26/2013	0	2	Tripri town	16	6	Service station dera karamgar	A motorcycle riding 3 people was hit by a truck head on. 1 person died 2 were injured.
49	500	PATIALA	10:00:00 PM	11/8/2013	0	3	Tripri town	16	6	Opposite mini secretriate Patiala	A motorcycle was hit by a car from behind at the mini secretriate road Patiala.

50	229	PATIALA	7:30:00 PM	11/18/2013	0	6	Sadar Patiala	9	5	Village maradapur	A three wheeler was hit by a bus coming from opposite direction and he died later.
51	237	PATIALA	8:00:00 PM	11/24/2013	0	1	Sadar Patiala	24	16		A pedestrian was hit by a motorcycle and he died later.
52	194	PATIALA		12/10/2013	0	4	Urban Estate Patiala	18	2		A bicycle was hit by a truck while turning at sirhind road towards bypass. And the person died.
53	330	PATIALA	11:00:00 AM	12/16/2013	0	6	Civil lines Patiala	16	7	T point before moti mahal Patiala	An activa hit an ambulance comin wrong way at the t point near moti mahal Patiala.
54	249	PATIALA	8:00:00 PM	12/26/2013	0	6	Sadar Patiala	6	6	Bosco school kohli	A car was hit by another car cominf from opposite direction. 1 person died and 2 were injured.
55	563	PATIALA	9:15:00 PM	12/25/2013	0	4	Tripri town	16	6		A motorcycle was hit by a car and he died.
56	73	PATIALA	9:30:00 PM	11/7/2015	0	1	Lahori gate Patiala	24	9	Corner chowk	A pedestrian was walking from railway station towards bus stand Patiala. Near corner hotel chowk a three wheeler hit him from back side. Driver ran away. Pedestrian fell down later died at hospital.
57	87	PATIALA	10:30:00 AM	7/26/2015	0	1	Lahori gate	24	5	Bus stand junction	A lady was crossing road near bus stand Patiala junction. A bus came from bus stand and hit the lady. Lady died at hospital.
58	251	PATIALA	1:30:00 PM	9/8/2015	0	3	Tripuri town	6	5	Baran bus stand	A car was going from sirhind side towards Patiala. Near baran bus stand a bus hit it from back side. Car driver and front seat passenger died. Back seat two passengers got injuries. Bus driver ran away leaving his bus at site.
59	102	PATIALA	5:30:00 PM	12/8/2015	0	2	Urban Estate Patiala	16	16	Ugc staff college	An activa driver was going towards ugc staff college. A motorcycle hit it from front. Activa driver died at hospital.
60	146	PATIALA	9:15:00 PM	8/13/2015	0	10	Patiala	6	2	National nursery	A car was going from Patiala towards rajpura. A truck came from opposite side and hit the car while coming to wrong side lane. Car driver died. Truck driver ran away after leaving his truck at site.
61	258	PATIALA	3:30:00 PM	8/16/2015	0	10	Tripuri town	16	6	Jassowal turn	Scooty driver was going on Patiala bhadson road from bhadson side towards Patiala. A car came from Patiala side and hit it near jassowal turn. Scooty driver and passenger fell on the road and died before reaching hospital. Car driver ran away.
62	150	PATIALA		8/23/2015	1	99	Sadar Patiala	16	99	Unknown	A motorcycle driver was going on the road. An unknown driver with unknown vehicle hit. Motorcycle driver died at hospital.
63	111	PATIALA	2:15:00 PM	2/9/2015	1	1	Urban Estate	24	6	Radha swami satsang bhawan	A lady was crossing road from urban Estate side towards radha swami satsang bhawan. A car came from Patiala side. Hit her and ran away. Lady died while reaching hospital.
64	110	PATIALA	8:05:00 AM	10/9/2015	1	1	Lahori gate	24	6	Dargah peer baba rode shah	A pedetrian was stopped on the road side. A car came in fast speed and hit him. He fell down on the road. And car ran away. Pedestrian died.

65	164	PATIALA	9:30:00 PM	11/9/2015	1	3	Sadar Patiala	16	99	Casba resort	Three men were going from Patiala towards rajpura. Near casba resort an unknown vehicle came from Patiala side and hit them from back. All fell down. Driver and one other died. One passenger got injuries. Unknown vehicle ran away.
66	121	PATIALA	1:10:00 PM	9/16/2015	0	3	Urban Estate	16	2	Urban Estate traffic light junction	Two boys were going from punjabi uni towards mehmadpur via rajpura road. Near urban Estate light junction, a truck hit them from back. Ran over driver and m.cycle driver died. Passenger got injuries. Truck driver ran away.
67	203	PATIALA	8:30:00 PM	9/24/2015	0	7	Civil lines Patiala	24	9	Harpal tiwana turn	A three wheeler driver was driving rashly from Patiala to nabha road. Near harpal tiwana turn, the three wheeler overturned and one passenger fell on the road and three wheeler fell over him. That passenger died.
68	176	PATIALA	9:30:00 AM	9/30/2015	0	2	Sadar Patiala	16	16	Near singla petrol pump	A motorcycle driver was going from pehowa side towards Patiala. Other motercycle coming from singla petrol pump hit him. The first motorcycle driver fell on the road. Got injuries and later died after reaching at hospital. First m.cycle driver ran away.
69	99	PATIALA	5:00:00 PM	2/10/2015	0	2	Urban Estate Patiala	18	6	Water tank park	A cycle driver was going from vc residence towards gol market. Near water tank park, a car hit him from front. He got injuries. Died after reaching hospital.
70	100	PATIALA	2:00:00 PM	6/10/2015	0	1	Kotwali Patiala	24	5	Truck union junction	A bus coming from bahadurgarh side stopped at truck union junction lights. A lady stepped out of it and was crossing road. Bus driver suddenly started moving. Ran over the lady. Lady died before reaching hospital. Bus driver ran away after leaving his bus
71	1	PATIALA	7:30:00 PM	12/31/2013	0	5	Civil lines Patiala	16	5	Bhagat singh petrol pump	A govt. Bus stopped near bhagat singh petrol pump. Motorcycle was moving along its right side. Bus driver turned bus without seeing. Ran over motorcycle. Driver of motorcycle died and passenger got injuries. Bus driver ran away.
72	10	PATIALA	10:00:00 PM	5/1/2014	1	3	Sadar Patiala	16	99	Gurudwara shri teg bahadur sahib bahadurgarh	Motorcycle was moving on the road at 10.00 pm at night. Unknown vehicle hit from back side in fast speed near gurudwara shri guru teg bahadur sahib bahadurgarh. Motorcycle driver fell on the road. Got head injury& died on the spot. Vehicle driver ran away
73	7	PATIALA		6/1/2014	1	2	Civil lines Patiala	16	6	Pwd rest house chowk	Mtrcle driver was coming from leela bhawan side with one passenger. Turned at pwd rest house chowk. A car coming from other side hit mtrcle on its left side while it was turning. Mtrcle driver died and passenger got serious injuries. Car driver ran away.
74	19	PATIALA		1/14/2014	1	2	Sadar Patiala	16	6	Near pingalwara ashram	Motocycle driver was going towards sanaur from Patiala. Car came from opposite direction in fast speed. Hit motorcycle from front. Motorcycle driver fell on the road & got head injury. Doctor declared him dead at hospital. Car driver ran away.
75	20	PATIALA		1/18/2014	1	99	Sadar Patiala	24	6	Near bus stand dhareri jattan	At 6.00am village chowkidar saw a dead body on the nh64 at 200m near the bus stand of village. Dead body was of unknown person got hit by unknown vehical's unknown driver.
76	22	PATIALA	3:00:00 PM	1/24/2014	1	1	Sadar Patiala	24	6	Near govt. Primary school panjola	An eight year old girl was walking on unmetteled road from school towards her home. An unknown driver of alto car

											hit her from front. Girl fell down on the road. Driver ran away. Girl died after reaching hospital.
77	15	PATIALA	7:30:00 PM	1/27/2014	1	4	Urban Estate	16	6	Junction phase 3	A man was turning at nh 64 on motorcycle. On junction a car from Patiala side hit him. Motorcycle driver fell on car then on the road. Had a lot of blood loss. Car driver ran away. Motorcycle driver died after reaching hospital.
78	27	PATIALA	7:00:00 PM	1/30/2014	1	3	Sadar Patiala	14	6	Junction akalgarh	A jeep was moving from cheeka road towards Patiala preceeded by a tractor trolly. The jeep driver hit into tractor trolley from side. A person sitting on left side of jeep got injuries and died after reaching hospital. Tractor trolley driver ran away.
79	33	PATIALA	3:15:00 PM	2/15/2014	0	2	Tripuri town	16	6	Near jassowal stand	A motorcycle was moving from bakshiwala to Patiala. From Patiala side a jeep hit it from front near jassowal village bus stand and dragged the motorcycle driver. Motorcycle driver died after reaching hospital.
80	47	PATIALA	3:30:00 PM	2/25/2014	0	1	Tripuri town	24	6	Near village chalaila	A girl student was going on the road after her school. A tractor trolley driver came from backside. Hit her and the girl died.
81	37	PATIALA	7:00:00 PM	1/3/2014	1	2	Sadar Patiala	16	6	Wine shop near village panjola	Two boys on motorcycle were going from balberra side towards Patiala side. A car coming from Patiala side hit them from front. Both fell down. Car driver ran away. One boy died at site. Other boy got injuries admitted to hospital.
82	38	PATIALA	10:00:00 AM	4/3/2014	0	3	Sadar Patiala	16	6	Chamarheri village	A motorcycle driver was going on rajpura Patiala nh. A car came from back side. Hit him near village chamarheri. Motorcycle driver fell down on road and got injuries. Died after reaching hospital.
83	42	PATIALA	2:15:00 AM	8/3/2014	9	2	Sadar Patiala	6	2	Near skoda agency	A car was going from Patiala towards ambala from Patiala rajpura nh. A truck came from rajpura side. Hit the car from front. Car driver got injuries. One passenger died. Other passenger got injuries.
84	75	PATIALA		11/3/2014	1	3	Tripuri town	16	2	Shops	Two persons were coming from sanaur towards Patiala on scooty. A truck came from Patiala side and hit them from front. Both fell on the road. Truck ran over head of pessenger. Scooty driver got injuries. Paseenger died.
85	63	PATIALA	3:00:00 PM	3/19/2014	1	3	Civil lines Patiala	16	2	Rakhra cinema	A scooter driver was going from fowhara chowk towards lehel colony. A truck came in fast speed from back side. Hit the scooter. Man fell on road and hit into divider. After reaching hospital, he died. Truck driver ran away.
86	48	PATIALA	11:30:00 PM	3/20/2014	1	2	Sadar Patiala	6	99	Near village kauli	A car driver was coming from rajpura side with one passenger. An unknown vehicle came from Patiala side. Hit in the car and ran away. Passenger died. Car driver got injuries and got admitted in the hospital.
87	96	PATIALA	12:00:00 PM	3/25/2014	1	3	Tripuri town	16	6	Sugar cane crusher	A motorcycle driver was going from Patiala to scholar field school with two children sitting on backside. A car came from back side. Hit them and they fell on the road. Car driver ran away with car. All three got injuries & admitted in hospital. Girl died
88	69	PATIALA	9:30:00 PM	3/26/2014	1	4	Civil lines Patiala	16	2	Lehel colony chowk	A person was driving motorcycle from khanda chowk towards leela bhawan chowk. He turned right towards lehel colony on green lights. A truck driver came from leela bhawan chowk side hit the mcycle. Ran over him. Truck driver ran away. Mcycle driver died.

89	110	PATIALA	6:00:00 PM	8/4/2014	0	3	Tripuri town	16	6	Hanuman mandir	A man was driving scooter from 22 no. Phatak towards ghumman nagar on jail road near hanuman mandir. A car hit him from back side. Scooter driver fell down. Car driver ran away with car. Scooter driver died after reaching hospital.
90	38	PATIALA	3:30:00 PM	4/13/2014	0	3	Lahori gate	15	6	Pal petrol pump	A person was driving cycle rickshaw from bahadurgarh side towards safabadi gate with 1passenger. Near pal petrol pump a car hit from backside. Both c.rickshaw driver and passenger fell on road. Got injuries. Car driver ran away. Passenger died.
91	39	PATIALA	2:00:00 PM	4/16/2014	9	2	Lahori gate	16	14	Gurudwara jhal sahib	A person was going on activa from safabadi gate towards bus stand. Near jhal sahib gurudwara a tractor trolley hit from front. Activa driver fell on road. Tractor ran over him. Activa driver died after reaching hospital.
92	87	PATIALA	5:40:00 PM	4/24/2014	0	3	Civil lines Patiala	16	2	Lehel colony chowk	A m.cycle driver was going with 1 passenger from fowhara chowk towards khanda chowk. Near lehel colony chowk a truck hit from back side. Both m.cycle riders fell on road. Both got injuries. Truck ran over stomach of passenger and ran away. Passenger died.
93	45	PATIALA		4/30/2014	0	1	Lahori gate	24	6	Pal petrol pump	A pedestrian was standing on road side near pal petrol pump on the way to rajpura to Patiala nh. A car came. Hit him. Car and pedestrian fell into road side valley. Pedestrian died. Car driver got injuries.
94	137	PATIALA	6:00:00 PM	6/5/2014	0	3	Tripuri town	16	2	Kabir das petrol pump	A activa driver was going towards ghumman nagar from Patiala with one passenger girl. A truck hit them from back. Both fell on the road. Truck tyre ran over girl. She died. Truck driver ran away without truck.
95	97	PATIALA	8:00:00 AM	11/5/2014	9	2	Kotwali Patiala	16	16	Liberty show room	A man was driving motorcycle from sherawala gate towards village randhawa. A car hit him from tawakli more side. M.cycle driver fell on the road. Died after reaching the hospital.
96	94	PATIALA	1:00:00 PM	5/27/2014	0	1	Sadar Patiala	24	2	Taxi stand bahadurgarh	A pedestrian was standing on road side near bahadurgarh taxi stand. A truck came and hit him. Pedestrian fell. Truck driver ran away. Pedestrian died.
97	179	PATIALA		5/28/2014	1	99	Tripuri town	16	99	Chitosho motorcycle agency	Two boys were going on motorcycle from Patiala towards sidhuwal on bhadson road. Unknown vehicle with unknown driver hit them. Both boys died.
98	100	PATIALA	10:00:00 PM	5/31/2014	0	3	Sadar Patiala	16	1		A motor cycle driver was going from Patiala towards baran. A truck hit him from back side. M.cycle driver fell on the road. Truck driver ran away. M.cycle driver died at hospital.
99	326	PATIALA		10/6/2014	1	1	Tripuri town	24	6	Kashmirian	Victim was Going to Gurdwara sahib kasmirian a car coming from front hits victim and victim died on the spot.
100	1	PATIALA	10:30:00 AM	1/1/2015	0	4	Urban Estate	16	6	Near dushara ground	A motorcycle was hit by a car from side at right angle and he died on the spot.
101	3	PATIALA	10:00:00 AM	1/7/2015	0	99	Civil lines Patiala	16	6		A motorcycle was hit by a car and he died.

102	1	PATIALA	3:10:00 PM	1/8/2015	0	6	Lahori gate Patiala	16	2	Opposite lane og kuldeep opticals	A activa was hit by a truck from side and he died on the spot.
103	15	PATIALA	5:20:00 AM	1/31/2015	0	3	Urban Estate	15	6	Opposite jas palace.	A car hit a cycle rikshaw from side near jass palace.
104	9	PATIALA	11:30:00 AM	2/17/2015	0	3	Lahori gate	16	13	Red cross society	A motorcycle was hit by a tractor trailor from behind on a straight road near red cross society office.
105	23	PATIALA	8:00:00 PM	2/25/2015	0	1	Urban Estate	24	6	Junction hira bagh	A pedestrian was hit by a car.
106	41	PATIALA	6:30:00 PM	3/3/2015	0	2	Sadar Patiala	18	16		A scooter hit a bycycle on a local street. The bicyclist died on the spot.
107	44	PATIALA	7:30:00 AM	3/6/2015	0	1	Sadar Patiala	24	16	Shekpura	A motorcycle hit a pedestrian while cropssing the road.
108	71	PATIALA	9:00:00 PM	3/21/2015	1	99	Tripri town	16	99	Monday vegetable market	A scooty was hit by an unknown vehicle and he died.
109	44	PATIALA	9:00:00 PM	3/21/2015	1	1	Urban Estate	24	99	Btw phase 1 and phase 2 mod	A pedestrian was hit by an unknown vehicle .
110	60	PATIALA	12:30:00 PM	3/30/2015	0	6	Sadar Patiala	16	6	Near petrol pump safara	A motorcycle was hit by a car in opposite sideswipe. 1 was injured and 1 was killed.
111	64	PATIALA	4:30:00 PM	4/6/2015	0	3	Sadar Patiala	6	2	Opposite kasba palace	A bicycle was hit by a car from behind.
112	49	PATIALA	2:20:00 PM	4/6/2015	0	3	Urban Estate Patiala	16	2	Flyover connecting dukhiwaran sahib and bus stand	A truck hit an activa from behind on the flyover.
113	85	PATIALA	9:30:00 AM	4/11/2015	0	10	Kotwali Patiala	24	99		A women on top of the bus fell don wen the bus started moving suddenly. She fell off the bus and died.
114	99	PATIALA		4/24/2015	0	6	Tripri town	6	2	Baba peer de samadh	A car was hit by a combine and 1 person died.
115	113	PATIALA	2:30:00 PM	5/7/2015	0	2	Tripri town	6	6		A car hit another car coming from opposite direction and then hit another car coming from opposite direction too. 1 person died and 1 was killed.
116	116	PATIALA		4/24/2015	0	2	Tripri town	18	6		A cycle was hit head on by a car in the morning hours.
117	41	PATIALA	2:55:00 PM	5/13/2015	0	1	Lahori gate	24	14	Aurbindo school	A tractor railor ran over a pedestrian
118	111	PATIALA	5:10:00 PM	5/23/2015	0	3	Kotwali Patiala	16	2	Hotel iqbal inn	A motorcycle was hit by a truck from behind and 1 persons died.

120	169	PATIALA		11/28/2014	1	88	119	77	PATIALA	4:00:00 PM	11/19/2013	1
121	132	PATIALA	4:00:00 PM	6/4/2015	0	8	Kotwali Patiala	24	16	Gurudwara	A person on the ladder . The activa hit the ladder and the person on it fell and died.	
122	172	PATIALA		6/11/2015	0	3	Tripri town	16	6	Hp petrol pump	A motorcycle was hit by a car from behind and 1 person died and 1 was injured.	
123	118	PATIALA	3:00:00 AM	6/23/2015	0	3	Sadar Patiala	6	6	Patiala rajpura road	A car hit a tractor with trailor. The trailor overturned and 1 person sitting on the tractor died by coming under the tractor.	
124	181	PATIALA	1:40:00 PM	7/10/2015	0	3	Sadar Patiala	16	2	Bahadurgarh	A motorcycle driver was going from rajpura side towards Patiala. Before reaching bahadurgarh, a truck hit him from backside. M.cycle driver fell on the road. Later died.	
125	238	PATIALA	7:00:00 PM	10/17/2015	0	3	Kotwali Patiala	18	6	Mohindera college gate	A cycle driver was going from nis chowk towards samania gate. Near mohindera college main gate, a car hit him from back side. Cycle driver fell on the road. Later died. Car driver ran away with his car.	
126	198	PATIALA	6:00:00 PM	7/11/2015	1	5	Sadar Patiala	16	14	Punjab polytechnic college	A motorcycle was going from urban Estate Patiala towards village baggra via Patiala rajpura road. Near punjab polytechnic college, while overtaking a tractor trailer it got sideswaped. Driver died. Passenger got injuries.	
127	234	PATIALA	7:30:00 PM	12/11/2015	1	2	Civil lines Patiala	16	99	Khalsa college	A boy was going from samana chungi towards partap nagar through khalsa college road. Near khalsa college an unknown vehicle came from front. Hit him. Boy fell on the road and died after reaching hospital. Unknown vehicle driver ran away.	
128	364	PATIALA	9:00:00 AM	11/15/2015	0	1	Tripuri town	24	14	Phirni village lang	A three year old child was playing in the phirni of village of seona. A tractor trolley driver came from canal side. Hit him and ran away. The boy died on the spot.	
129	357	PATIALA	2:00:00 PM	9/11/2015	1	3	Tripuri town	15	5	Street no. 1 kamal colony	A person was going on cycle rehri from Patiala to kamal colony via Patiala sirhind road. Near street no. 1 of kamal colony a bus hit him from back side. He fell down and later died at hospital. Bus driver ran away.	
130	249	PATIALA	6:30:00 PM	7/11/2015	1	1	Kotwali Patiala	24	6	Main gate kali mata mandir	A lady was walking ffrom kali mata mandir gate towards pstcl office. A came came from main gate side. Hit her from back. Lady got injuries. The car driver ran away.	
131	250	PATIALA	12:30:00 AM	9/11/2015	1	1	Kotwali Patiala	24	99	Rajiv gandhi law university Patiala	A man found dead in front of gate of rajiv ghandhi law university Patiala. He had head injuries due to hitting by unknown vehicle.	
132	221	PATIALA		9/21/2015	0	1	Kotwali Patiala	24	14	Ps sadar	A child was playing outside the ps sadar sanjh kender. A tractor trolley driver ran over him. Child got injuries. Driver ran away.	
133	368	PATIALA	9:00:00 AM	11/24/2015	1	1	Tripuri town Patiala	24	5	Baran	Two pedestrian were crossing road from baran village on Patiala sirhind road. A unknown bus coming from Patiala hit them. One died at site. Other died after reaching hospital.	

134	371	PATIALA	3:50:00 PM	11/29/2015	0	2	Tripuri town Patiala	16	6	Environment park gate	An activa driver was going on wrong side from passi road turn towards thapar college. A car came in fast speed from mini sectriate side. Hit him. Later activa driver died after reaching hospital. Car driver ran away.
135	388	PATIALA	3:35:00 PM	12/17/2015	0	2	Tripuri town Patiala	16	6	Kassiana adda	A motorcycle driver was going from fagan majra towards Patiala on Patiala sirhind road. Near kassiana adda a car came from Patiala side. Hit m.cycle and both driver and passenger fell on the road. Driver died. Passenger got injuries.
136	219	PATIALA		12/22/2015	0	3	Sadar Patiala	16	2	Balberra turn	A m.cycle driver was going from karhali sahib towards balberra via Patiala cheeka road. From cheeka side a truck came and hit them. All fell down. M.cycle driver, one passenger got injuries and one passenger died.
137	59	PATIALA		2/3/2015	0	8	Tripuri town Patiala	16	2	Hardaspur village	A motorcycle driver was going from Patiala to nalini village via Patiala sirhind road. At far side of hardaspur village it hit into a stopped truck from back. The motorcycle driver died.
138	396	PATIALA	11:30:00 PM	12/23/2015	1	2	Tripuri town pataiala	6	2	Hardaspur	A car was going from sirhind to Patiala. Near hardaspur village, due to stopped tractor trolley the car changed lane and a truck came from front. Got hit by it. Car driver and front passenger got injuries. Two back seat passengers died.
139	192	PATIALA	10:00:00 PM	6/4/2014	0	1	Tripri town	24	6		A pedestrian was hit by a jeep from behind.
140	188	PATIALA	7:30:00 PM	5/30/2014	1	1	Tripuri town	24	16	Near petrol pump	A person was going from baran towards petrol pump sirhind side on Patiala sirhind road. An unknown motorcycle hit him from back side. Victim died.
141	106	PATIALA		6/5/2014	1	3	Sadar Patiala	18	6	Bus stand hussainpur johlan	Two person on cycle got hit by a car. Cycle driver died. Passenger got injuries. Car ran away.
142	107	PATIALA	6:30:00 PM	6/6/2014	0	3	Sadar Patiala	16	2	Alipur chownk	A motorcycle driver was going from alipur arayian towards sirhind road. Near alipur chownk a truck hit from backside. Motorcycle driver died. Truck driver ran away.
143	74	PATIALA		6/20/2014	0	3	Urban Estate	16	2	Bus stand light chowk	A scooty driver was standing at bus stand lights. A truck came from dukhniwaran sahib side. Hit scooty from backside. Scooty driver died at site.
144	226	PATIALA		6/26/2014	1	1	Tripuri town	24	99	Near fagan majra	A pedestrian was found dead near fagan majra village on Patiala sirhind road. Expected to be hit by unknown vehicle.
145	70	PATIALA	10:00:00 AM	6/29/2014	0	3	Lahori gate	16	2	Sirhindi gate chownk	A motorcycle driver was going from rajpura to Patiala. After crossing sirhindi gate chownk, a truck hit from back. M.cycle driver died. Truck driver ran away.
146	128	PATIALA		6/28/2014	1	99	Sadar Patiala	16	99	Village behal	An unknown vehicle hit the m.cycle driver near village behal on Patiala pehowa road. M.cycle driver died.
147	132	PATIALA	1:15:00 PM	7/2/2014	0	3	Sadar Patiala	16	14	Budh ram flour mill	A motorcycle driver was going from bahadugarh to gurudwara sahib on Patiala seel road. A tractor trolley hit from backside. M.cycle driver died.
148	248	PATIALA		7/18/2014	1	1	Tripuri town	24	99	Near fci godowns	A pedestrian was walking. An unknown vehicle hit him. Pedestrian died on spot.

149	147	PATIALA	11:00:00 AM	7/21/2014	0	2	Sadar Patiala	16	6	Bus stand puli	A car hit motorcycle from front by coming to wrong side. M.cycle driver got injuries. Passenger died.
150	150	PATIALA	7:45:00 AM	7/27/2014	0	1	Sadar Patiala	24	6	Mardaheri	A lady was standing on road side. A car hit her. She died.
151	164	PATIALA	9:30:00 AM	7/30/2014	0	1	Kotwali Patiala	24	9	Malwa cinema	A pedestrian was crossing road. Got hit by three wheeler. Pedestrian died.
152	101	PATIALA	12:10:00 PM	7/20/2014	1	3	Urban Estate	18	6	Bypass junction	A bicycle driver was hit by an unknown car. He later died.
153	266	PATIALA		8/6/2014	0	1	Tripuri town Patiala	24	2	Zila parishad office	A pedestrian was sitting on road side. A canter hit him. Pedestrian died.
154	157	PATIALA		8/4/2014	1	3	Adar Patiala	18	6	Sabji mandi sanaur road	A bicycle driver was hit by a car. Bicycle driver died.
155	112	PATIALA	5:45:00 AM	8/15/2014	1	10	Urban Estate Patiala	16	9	Cement store	A motorcycle driver fell on the road. A three wheeler ran over him. M.cycle driver died.
156	282	PATIALA		8/26/2014	1	3	Tripuri town	18	6	Dharam kanda	A cycle rickshaw was hit by a car from behind. Cycle rickshaw driver and passenger lady fell on the road. Both later died.
157	177	PATIALA	10:30:00 AM	8/22/2014	1	1	Kotwali Patiala	24	99	Kali mata mandir	A man was found injured outside kali mata mandir. An unknown vehicle hit him. Later he died.
158	169	PATIALA	9:15:00 PM	8/25/2014	1	3	Sadar Patiala	9	99	Super market	A three wheeler was moving on road with passengers. An unknown vehicle hit from back side. Three wheeler turned over and one passenger died.
159	298	PATIALA		9/5/2014	0	2	Tripuri town	16	5	Half km towards chalaila	A bus hit motorcycle from front on chalaila to khalifewala link road. Motorcycle driver got injuries and passenger died.
160	193	PATIALA		9/25/2014	1	9	Sadar Patiala	16	99	Balberra	Victim was coming back after attending a marriage from sassi village . A unknown vehicle hits him and victim got injured badly . He was admitted to the hospital where he died.
161	387	PATIALA	10:15:00 PM	11/27/2014	0	3	Tripuri town	16	6	Tripuri turn	A car hit a scooty on thapar to dukhniwaran sahib road at tripuri turn. Scooty driver died.
162	403	PATIALA		12/12/2014	0	1	Tripuri town	24	2	Railway warehouse	A pedestrian was hit by a turning truck on dukhniwaran sahib to bus stand road near railway warehouse. Pedestrian died.
163	249	PATIALA	1:00:00 PM	12/16/2014	0	3	Sadar Patiala	16	6	Balberra	A motorcycle was hit by a car. M.cycle driver died.
164	242	PATIALA	10:15:00 PM	12/6/2014	0	2	Sadar Patiala	16	6	Chaman hospital	A motorcycle driver hit by a car. Motorcycle driver died.
165	180	PATIALA	6:45:00 AM	12/24/2014	0	2	Urban Estate	18	6	Hira colony	A cycle was turning towards hira colony. Car coming from rajpura side hit it. Cycle driver later died.

166	188	PATIALA	6:40:00 PM	9/25/2014	1	2	Sadar Patiala	18	99		A bicycle was hit by an unknown vehicle.
167	141	PATIALA	3:20:00 PM	10/1/2014	0	3	Urban Estate phase 2	16	2		A motorcycle was hit by a canter at the bypass lights
168	195	PATIALA	12:00:00 PM	10/13/2014	0	1	Civil lines Patiala	24	6	Turning of dhaliwal colony	A lady was hit by a jeep at the dhaliwal colony.
169	198	PATIALA	8:30:00 PM	10/14/2014	0	3	Civil lines Patiala	18	6	Main gate grid	A car hit a bycycle from backside. Bycycle driver died
170	212	PATIALA	9:00:00 AM	10/30/2014	0	1	Sadar Patiala	24	5	Akal acadmy	A lady was hit by a bus on a straight road near akal acadmy balberra. She died.
171	353	PATIALA		10/31/2014	0	1	Tripuri town	24	16	Jashan palace	A lady was walking from Patiala towards bhadson side. Near jashan palace a motorcycle hit her from back. Lady died.
172	173	PATIALA	6:00:00 PM	2/11/2014	0	3	Sadar Patiala	18	6	Kauli bus stand	A cycle driver was hit by a car from back on the Patiala rajpura road near kauli bus stand. Cycle driver died.
173	221	PATIALA	6:00:00 PM	7/11/2014	1	3	Sadar Patiala	15	6	Commando complex	A cycle rehri was hit by an unknown car. Cycle rehri driver died.
174	365	PATIALA		9/11/2014	0	3	Tripuri town	16	14	Virk colony	A motorcycle was hit by a tractor trolly from back at sirhind rajpura bypass near virk colony. Lady passenger died. Driver and his son got injuries.
175	104	PATIALA	11:00:00 AM	4/11/2014	0	4	Lahori gate	16	5	Old chungi rajpura Patiala	A bus hit a scooter at Patiala rajpura road near old chungi rajpura Patiala. Scooter driver died.
176	250	PATIALA	10:40:00 PM	11/23/2014	0	1	Kotwali Patiala	24	6	Santoshi mata mandir	A pedestrian was hit by a car in front of santoshi mata mandir at Patiala rajpura road. Pedestrian died.
177	232	PATIALA	5:30:00 PM	11/26/2014	0	1	Sadar Patiala	24	6	Kauli bus stand	A lady was standing at bus stand kauli with a girl child. A car hit her. Lady died. Child got injuries.
178	229	PATIALA	7:00:00 PM	12/27/2014	0	1	Civil lines Patiala	24	6	Bazigar basti	A pedestrian was hit by a car on Patiala nabha road near bazigar basti. Pedestrian died before reaching hospital.
179	253	PATIALA	4:15:00 PM	12/26/2014	0	5	Sadar Patiala	16	14	Panjeta bus stand	A motorcycle driver was hit by a tractor trolly. M/cycle driver died. Passenger got injuries.
180	228	PATIALA		12/24/2014	0	3	Civil lines Patiala	16	6	Prtc workshop	A scooty was hit by a car at Patiala nabha road near prtc workshop. Scooty driver got injuries. Girl sitting behind died.
181	1	PATIALA	11:30:00 PM	12/31/2014	1	99	Kotwali Patiala	16	99		A motorcycle was hit by an unknown vehicle and he died.

Sr. No	FIR No	City/Town/ Village Name	Time of Accident	Date of Accident	Hit and Run	Collision Type	Police Station	**Victim Vehicle**	**Impact Vehicle**		Note
182	127	PATIALA	4:00:00 PM	23-Jan-16	0	3	Civil Line	16	16		Bike was going on straight track at leela bhawan chowk and it was hit by a over speed activa from behind and ran .person on bike dead.
183	10	PATIALA	8:59:00 AM	24-Jan-16	1	3	Division 4	16	99		Activa hit by unknown vehicle from back and unknown vehicle passes over the activa driver .
184	96	PATIALA	5:30:00 PM	05-Feb-16	0	3	Kotwali	15	2		Rikshewalla hit by a over speeding heavy vehicle truck from behind near vaddi nadi overbridge .
185	85	PATIALA	8:30:00 PM	09-Feb-16	0	3	Bakshiwala	18	6		Cycle is hit by speeding car from behind at Nabha to Patiala Highway .
186	235	PATIALA	12:30:00 PM	11-Feb-16	0	6	Civil Line	16	6		Activa hit on standing car due to its door was opened suddenly and there after swaraj mazda passes over the activa driver ad he died .
187	63	PATIALA	9:30:00 PM	04-Mar-16	0	1	Civil line	24	6		Cyclist was crossing the road by walking only and near manchanda sweets it was hit by a over speed car .
188	53	PATIALA	3:30:00 PM	15-Mar-16	0	3	Kotwali	16	2		A over speed truck hit the scooty from behind near choti nadi and then passes over the scooty driver .
189	39	PATIALA	4:00:00 PM	04-Mar-16	0	1	Urban Estate	24	16		A standing female pedestrian was hit by an fast moving activa near DPI Elementary school .
190	104	PATIALA	12:00:00 AM	28-Mar-16	1	1	Civil line	24	99		A unknown fast moving vehicle hit the pedestrian and the vehicle is unknown.
191	118	PATIALA	2:30:00 PM	12-Apr-16	0	3	Division 4	16	5		Bus hit the back side of motor cycle at leela bhawan junction and ladies behind died .
192	95	PATIALA	2:00:00 AM	15-Apr-16	0	2	Tripri	6	2		A combined harvestor collide from bolero and head on collision takes place .
193	105	PATIALA	6:40:00 AM	21-Apr-16	0	1	Tripri	24	16		Standing Pedestrian hit by a fast moving tipper .
194	12	PATIALA	8:00:00 PM	02-May-16	0	3	Bakshiwala	16	6		At bakhsiwala bike is hit by car from back side and bike person died .
195	55	PATIALA	12:00:00 AM	13-May-16	0	1	Urban Estate	24	6		A man was repairing his truck near Punjabi university and a fast moving car hit him .
196	117	PATIALA	8:00:00 PM	06-Jun-16	0	1	Kotwali	24	99		A unknown vehicle hit the pedestrian near Goyal Motar R ajpura road.
197	93	PATIALA	5:40:00 PM	10-Jun-16	0	4	Bakshiwala	16	3		In order to over take the bike a mini truck collide with bike near chanda petrol pump bharsa road resulting in death of bike passenger.

198	131	PATIALA	10:30:00 AM	19-Jun-16	0	1	Kotwali	24	14		A pedestrian was crossing road and a tractor passes over him near sheetal hotel fountain chawk.
199	152	PATIALA	6:05:00 PM	30-Jun-16	0	4	Civil Line	18	2		A fast moving & care less truck driver hit a cyclist near leela bhawan chowk and passes truck over him .
200	81	PATIALA	12:00:00 PM	18-Jul-16	0	4	Urban Estate	16	3		Activa was standing near lal batti (Dukhnivaran over bridge crossed) as signal was red as signal become green one canter side collide with activa.
201	227	PATIALA	5:00:00 PM	19-Jul-16	0	4	Tripri	24	16		Scoter driver and passenger was going by Sirhand Road by pass (Omax city) and was taking turn and very fast moving and neglegent car driver hit him .
202	237	PATIALA	5:00:00 AM	24-Jul-17	0	9	Tripri	6	2		A truck collide with car driver near kasiyna bus stand resulting in death of car driver .
203	238	PATIALA	9:30:00 PM	24-Jul-16	1	99	Tripri	24	99		A unknwn vehicle hit the pedestrian near Patiala Sirhind Road .
204	80	PATIALA	5:00:00 PM	26-Jul-16	0	4	Lahori Gate	16	2		A moving truck hit the stopped activa from behind near Sirhind Gate.
205	246	PATIALA	6:30:00 PM	29-Jul-16	0	4	Tripri	10	5		Three wheeler was taking the turn at sirhind Patiala road (chalaila village) and very fast moving bus collide with it.
206	120	PATIALA	4:30:00 PM	06-Aug-16	0	1	Kotwali	24	6		A speed up car hit a standing woman who was standing on side of road near vaddi nadi walli kacchi side .
207	257	PATIALA	12:00:00 PM	08-Aug-16	0	1	Tripri	24	6		A female was crossing road near fagan majra bus stand and was hit by fast moving car .
208	175	PATIALA	5:30:00 AM	09-Aug-16	0	3	Kotwali	16	5		A scooter is hit by a bus from back side on mall road near court and bus passes over him .
209	124	PATIALA	12:00:00 AM	12-Sep-16	1	1	Urban Estate	24	99		A unknown vehicle hit the pedestrian at night due to fog.
210	298	PATIALA	5:00:00 AM	13-Sep-16	1	1	Tripri	24	99		A Unknown vehicle hit the pedestian near Dhindsa petrol pump Bharsa road .
211	197	PATIALA	9:15:00 PM	19-Sep-16	1	3	Civil Line	16	99		A unknown vehicle hit the bike from side near KV1 military school .
212	186	PATIALA	5:03:00 PM	24-Sep-16	0	4		16	2		Truck collide with motorcycle near koli transport chowk .Truck hit bike by coming on wrong side.
213	107	PATIALA	11:10:00 AM	27-Sep-16	0	3	Urban Estate	16	2		Truck was taking turn and bike was going straight and bike was hit from back near Patiala rajpura road .
214	206	PATIALA	10:35:00 PM	30-Sep-16	0	4	Civil Line	16	6		Car was going straight to main road and bike was coming from another way to join main road and hit the car from side .

215	6	PATIALA	9:00:00 PM	01-Oct-16	0	2	Civil line Patiala	10	6		A three wheller was hit by a car who was coming from wrong side near 23 no railway fatak resulting in death of 3 wheller driver .
216	102	PATIALA	1:00:00 PM	05-Oct-16	0	2	Kotwali	16	16		A tvs hit by one bullet bike near fountain chown junction .
217	224	PATIALA	6:30:00 PM	19-Oct-16	0	1	Civil Line	24	16		A female pdestrian hit by a motorcycle near Gyani hospital.Bike was on wrong way .
218	333	PATIALA	11:00:00 PM	20-Oct-16	0	2	Tripri	16	3		A drunken driver canter hit the motorcycle near petrol pump hardaspur .
219	111	PATIALA	7:00:00 PM	21-Oct-16	1	1	Lahori Gate	24	99		A female pedestrain hit by unknown vehicle near sirhind gate Patiala.
220	342	PATIALA	9:15:00 PM	28-Oct-16	0	4	Tripri	18	2		A cyclist hit by a truck driver who was taking turn near dukh nivaran gurudwara .
221	32	PATIALA	11:15:00 AM	03-Nov-16	0	4	Division 4	18	5		A cyclist hit by a fast moving bus near sirhind gate .
222	119	PATIALA		15-Nov-16	0	1	Urban Estate	24	3		A female pedestrian died while crossing the road hit by a tanker near sirhind road .
223	360	PATIALA	9:30:00 PM	19-Nov-16	0	2	Tripri	6	6		A four wheeler hit another four wheeler who was overtaking resulting in death of passenger.
224	363	PATIALA	9:30:00 AM	22-Nov-16	0	4	Tripri	16	14		Activa hit by Tractor near tripri (near tailor sukhchain).
225	73	PATIALA	10:30:00 PM	07-Dec-16	1	99	Lahori Gate	16	99		A motorcycle hit unknown vehicle at sirhind gate .
226	110	PATIALA	8:30:00 PM	10-Dec-16	1	1	Lahori Gate	24	2		Pedestrian hit by truck from back side on the Rajpura road .
227	385	PATIALA	12:00:00 PM	14-Dec-16	0	3	Tripri	16	5		Bus hit the bike from back side near khanda chowk flyover .
228	274	PATIALA	12:00:00 AM	28-Dec-16	0	3	Civil Line	16	6		Scooty was hit by car near excise department .Car was crossing the chowk .
229	133	PATIALA	12:00:00 AM	30-Dec-16	0	4	Urban Estate	16	16		Two wheeler (scooter) and two wheeler (bike) collide while scotter was taking the turn at Rajoura road near radio station phase 3 .
230	134	PATIALA	12:00:00 AM	30-Dec-16	0	4	Urban Estate	14	14		Two tractor in order to overtake collide with each other resulting in death of one near truck union Patiala.

APPENDIX B

SPEED ANALYSIS

1. Arterial Roads (Mid blocks) - 50 km/h

Speed								
Motorized vehicles							Non-Motorized Vehicles	
Motorized four wheeler = 55	Motorized two wheeler = 43	Bus = 42	Truck = 40	Auto Rickshaw = 33	Light Commercial Vehicle = 41		Bicycle = 14	Hand driven rickshaw = 10
22	13	17	19	9	17		14	7
24	15	19	22	12	18		12	12
25	18	22	25	18	19		16	13
29	19	24	25	19	23		13	11
30	24	25	25	20	25		12	13
30	24	25	25	20	25		16	7
33	24	25	25	20	25		20	9
35	24	26	27	20	25		15	9
35	24	27	27	20	26		13	12
36	25	30	28	20	27		12	5
36	25	30	29	21	27		11	6
38	26	30	30	21	27		8	11
38	26	31	30	21	28		16	9
38	26	31	30	22	28		12	14
39	27	31	30	22	30		17	9
39	27	31	30	22	30		14	6
40	28	32	31	22	30		10	7
40	28	32	31	23	30		15	19
40	28	32	33	23	30		18	5
40	29	32	33	24	30		12	10
40	29	33	33	24	30		14	11
40	29	33	33	24	31		22	5
41	30	34	33	24	31		15	11
41	30	34	34	24	32		14	13
41	30	34	34	24	32		17	14
42	30	34	34	25	32		13	12
42	30	35	34	25	33		15	7
42	30	35	34	25	33		12	9
42	30	35	34	25	33		11	13
42	30	35	34	25	33		18	8
42	30	36	35	25	33		19	9
42	31	36	35	25	33		14	11
43	31	36	35	25	33		20	10
43	31	36	36	26	34		16	6
43	31	37	36	26	34		15	10
43	31	38	36	26	34		13	8
43	31	38	36	26	35		20	10
43	32	38	36	26	35		13	15
43	32	38	36	26	35		11	12
44	32	39	37	26	35		12	14
44	32	39	38	26	35		15	12
44	32	39	38	26	35		14	6
44	32	39	38	27	36		12	12
44	32	39	38	27	36		13	11
44	32	40	38	27	36		8	3
44	33	40	39	27	36		11	5
44	33	40	39	27	36		6	13
45	33	40	40	27	36		13	12
45	33	40	40	27	37		15	15

45	33	40	40	27	37			10	11
45	34	40	40	28	37			17	8
45	34	41	40	28	37			12	20
45	35	41	40	28	38			10	
45	35	41	41	28	38			17	
45	35	41	41	28	38			12	
45	35	41	42	28	38			16	
45	35	41	42	28	38			17	
45	35	41	42	28	39			16	
45	35	41	43	28	39			18	
46	35	41	43	29	40			13	
46	36	42	43	29	40			14	
46	36	42	43	29	40			16	
46	36	42	43	29	40			16	
46	36	42	43	30	40			10	
46	36	42	44	30	40			16	
46	36	42	44	30	40			10	
46	36	42	44	30	40			14	
46	36	42	45	30	40			12	
47	36	44	46	30	41			15	
47	36	44	46	30	41			12	
47	37	44	47	30	41			14	
47	37	44	47	30	41			15	
47	37	44	49	30	41			16	
47	37	44	50	30	41			10	
47	37	45	50	30	42			12	
47	38	45	51	30	42			11	
48	38	45	52	30	42			11	
48	38	45	52	31	42			8	
48	38	45	52	31	42			25	
48	38	45	54	31	42			16	
48	38	45	54	31	42			15	
48	39	45	55	31	42			15	
48	39	45	56	31	42			22	
48	39	45	57	31	42			16	
48	40	46	57	32	42			20	
48	40	46	58	32	43			16	
48	40	46	59	32	43			14	
48	40	46	64	32	43				
48	40	46	67	32	44				
48	40	46	70	32	44				
48	40	47		32	44				
48	40	47		32	44				
49	40	47		32	44				
49	40	47		32	45				
49	40	47		32	45				
49	40	47		32	45				
49	40	48		33	45				
49	40	48		33	45				
49	40	48		33	45				
49	40	48		33	46				
49	41	48		33	46				
49	41	48		33	46				
50	41	48		33	46				
50	41	49		33	46				
50	41	50		34	46				
50	41	50		34	47				
50	41	50		34	47				
50	41	50		34	47				
50	41	50		34	48				
50	42	50		34	48				
50	42	50		34	49				

50	42	50	—	34	49			—	—
50	42	51	—	34	50			—	—
50	42	51	—	34	50			—	—
50	42	52	—	34	50			—	—
51	42	52	—	34	51			—	—
51	42	52	—	35	51			—	—
51	42	52	—	35	52			—	—
51	42	52	—	35	53			—	—
51	42	54	—	35	54			—	—
52	43	54	—	35	54			—	—
52	43	54	—	35	54			—	—
52	43	54	—	35	55			—	—
52	43	55	—	35	55			—	—
52	43	56	—	35	55			—	—
52	43	56	—	35	56			—	—
52	43	57	—	35	56			—	—
52	43	58	—	35	60			—	—
53	43	59	—	36	64			—	—
53	44	59	—	36	65			—	—
53	44	60	—	36	68			—	—
53	44	61	—	36	70			—	—
53	44	61	—	36	70			—	—
53	44	65	—	36	72			—	—
53	44	68	—	36	73			—	—
53	44	—	—	36	83			—	—
53	45	—	—	36	—			—	—
54	45	—	—	36	—			—	—
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54	45	—	—	37	—			—	—
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54	45	—	—	37	—			—	—
54	45	—	—	37	—			—	—
54	45	—	—	37	—			—	—
54	45	—	—	37	—			—	—
55	45	—	—	37	—			—	—
55	45	—	—	37	—			—	—
55	45	—	—	37	—			—	—
55	45	—	—	37	—			—	—
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55	45	—	—	37	—			—	—
55	45	—	—	37	—			—	—
55	45	—	—	38	—			—	—
55	45	—	—	38	—			—	—
56	45	—	—	38	—			—	—
56	46	—	—	38	—			—	—
56	46	—	—	38	—			—	—
56	46	—	—	38	—			—	—
56	46	—	—	38	—			—	—
56	46	—	—	38	—			—	—
57	46	—	—	38	—			—	—
57	46	—	—	38	—			—	—
57	46	—	—	38	—			—	—
57	47	—	—	39	—			—	—
57	47	—	—	39	—			—	—
58	47	—	—	39	—			—	—
58	47	—	—	39	—			—	—
58	47	—	—	39	—			—	—
58	47	—	—	40	—			—	—
58	47	—	—	40	—			—	—
58	48	—	—	40	—			—	—
58	48	—	—	40	—			—	—
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58	48	—	—	40	—			—	—
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59	48	—	—	40	—			—	—
59	48	—	—	40	—			—	—
60	49	—	—	40	—			—	—
60	49	—	—	40	—			—	—
60	49	—	—	41	—			—	—
60	49	—	—	41	—			—	—
60	49	—	—	41	—			—	—
60	49	—	—	42	—			—	—
60	50	—	—	42	—			—	—
60	50	—	—	42	—			—	—
60	50	—	—	43	—			—	—
60	50	—	—	44	—			—	—
60	50	—	—	44	—			—	—
60	50	—	—	44	—			—	—
60	50	—	—	45	—			—	—
60	50	—	—	45	—			—	—
61	50	—	—	45	—			—	—
61	50	—	—	45	—			—	—
61	50	—	—	46	—			—	—
61	50	—	—	46	—			—	—
62	50	—	—	46	—			—	—
62	51	—	—	47	—			—	—
62	51	—	—	47	—			—	—
62	51	—	—	48	—			—	—
62	51	—	—	48	—			—	—
62	51	—	—	48	—			—	—
62	51	—	—	50	—			—	—
62	52	—	—	52	—			—	—
62	52	—	—	—	—			—	—
62	52	—	—	—	—			—	—
63	52	—	—	—	—			—	—
63	53	—	—	—	—			—	—
63	53	—	—	—	—			—	—
63	54	—	—	—	—			—	—
63	54	—	—	—	—			—	—
63	54	—	—	—	—			—	—
64	54	—	—	—	—			—	—
64	54	—	—	—	—			—	—
64	54	—	—	—	—			—	—
64	55	—	—	—	—			—	—
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64	55	—	—	—	—			—	—
64	55	—	—	—	—			—	—
64	55	—	—	—	—			—	—
64	55	—	—	—	—			—	—
65	55	—	—	—	—			—	—
65	56	—	—	—	—			—	—
65	56	—	—	—	—			—	—
65	56	—	—	—	—			—	—
65	56	—	—	—	—			—	—
65	56	—	—	—	—			—	—
65	57	—	—	—	—			—	—
65	58	—	—	—	—			—	—
66	58	—	—	—	—			—	—
66	59	—	—	—	—			—	—
66	60	—	—	—	—			—	—
66	60	—	—	—	—			—	—
67	60	—	—	—	—			—	—

67	60	—	—	—	—			—	—
68	60	—	—	—	—			—	—
68	61	—	—	—	—			—	—
68	62	—	—	—	—			—	—
68	63	—	—	—	—			—	—
69	63	—	—	—	—			—	—
69	64	—	—	—	—			—	—
70	64	—	—	—	—			—	—
70	64	—	—	—	—			—	—
70	66	—	—	—	—			—	—
70	66	—	—	—	—			—	—
70	68	—	—	—	—			—	—
70	70	—	—	—	—			—	—
70	70	—	—	—	—			—	—
71	73	—	—	—	—			—	—
72	73	—	—	—	—			—	—
73	74	—	—	—	—			—	—
73	76	—	—	—	—			—	—
73	78	—	—	—	—			—	—
73	—	—	—	—	—			—	—
73	—	—	—	—	—			—	—
73	—	—	—	—	—			—	—
75	—	—	—	—	—			—	—
75	—	—	—	—	—			—	—
76	—	—	—	—	—			—	—
78	—	—	—	—	—			—	—
78	—	—	—	—	—			—	—
78	—	—	—	—	—			—	—
78	—	—	—	—	—			—	—
79	—	—	—	—	—			—	—
80	—	—	—	—	—			—	—
80	—	—	—	—	—			—	—
80	—	—	—	—	—			—	—
82	—	—	—	—	—			—	—
82	—	—	—	—	—			—	—
82	—	—	—	—	—			—	—
84	—	—	—	—	—			—	—
84	—	—	—	—	—			—	—
87	—	—	—	—	—			—	—
90	—	—	—	—	—			—	—
91	—	—	—	—	—			—	—
92	—	—	—	—	—			—	—
94	—	—	—		—			—	—
95	—	—	—		—			—	—
100	—	—	—		—			—	—
55.57	**43.47**	**42.64**	**39.93**	**32.88**	**41.19**			**14.2**	**10.19**

2. Arterial Roads (Intersection) - 50 km/h

Speed									
Motorized vehicles							Non-Motorized Vehicles		
Motorized four-wheeler = 41	**Motorized two-wheeler = 37**	**Bus = 34**	**Truck = 29**	**Auto Rickshaw = 28.5**	**Light Commercial Vehicle = 32**		**Bicycle = 13**	**Hand driven rickshaw = 11**	**E-rickshaw = 18**
12	10	7	8	2	10		16	15	23
15	12	10	10	9	11		13	9	20
16	13	10	10	9	15		15	10	20
17	14	12	10	11	16		14	12	24

17	15	12	12	13	16		14	11	15
17	15	12	12	13	16		15	7	12
17	16	13	12	13	16		15	11	16
18	16	13	12	14	17		15	11	14
18	16	14	14	14	17		11	9	20
18	16	15	15	14	17		13	12	22
18	17	15	15	14	17		14	7	25
19	18	15	16	15	18		22	8	11
19	18	16	16	15	18		12	11	17
19	18	16	17	16	18		28	13	14
19	18	16	17	16	19		20	14	19
20	18	17	18	16	19		16	13	18
20	19	17	18	16	19		17	13	20
20	19	17	18	16	19		11	17	15
20	20	17	19	16	19		16	10	18
20	20	17	19	16	19		19	8	25
20	20	18	19	16	20		13	13	22
20	20	18	20	16	20		8	11	11
20	20	18	20	16	20		21	8	24
20	20	18	20	17	20		14	12	20
21	20	18	20	17	20		7	10	13
21	20	19	20	17	20		15	11	10
21	21	19	20	17	20		11	8	16
21	21	20	20	17	20		14	9	15
21	22	20	20	17	20		11	11	15
21	22	20	20	18	20		16	8	16
21	22	20	20	18	20		13	10	10
21	22	20	20	18	21		12	9	10
21	22	20	21	18	21		11	12	13
22	22	20	21	18	21		13	13	26
22	22	20	21	18	21		14	10	22
22	22	20	22	18	21		12	13	14
22	22	20	22	18	21		11	9	14
22	22	20	22	18	21		13	11	24
22	22	20	22	18	21		12	9	25
22	22	20	23	18	21		9	10	30
22	22	21	23	18	22		15	12	16
22	22	21	23	18	22		13	11	24
22	22	21	23	19	22		12	13	
22	22	21	23	19	22		13	8	
23	23	21	23	19	22		14	11	
23	23	21	24	19	22		15	6	
23	23	21	24	19	22		16	11	
23	23	21	24	19	22		13	16	
23	23	21	24	19	22		13	8	
23	23	22	24	19	23		20	11	
23	23	22	24	20	23		13	10	
23	23	22	25	20	23		14	7	
23	23	22	25	20	23		12	10	
23	23	22	25	20	23		10	13	
23	23	22	25	20	23		11	13	
23	23	23	25	20	23		10	15	
23	23	23	25	20	23		11	12	
23	24	23	25	20	23		10	10	
23	24	24	26	20	24		4	12	
24	24	24	26	20	24		12	15	
24	24	24	26	20	24		15	15	
24	24	24	26	20	24		14	7	
24	24	25	26	20	25		14	8	
24	24	25	26	20	25		12	12	
24	24	25	28	20	25		14	9	
24	24	25	28	20	25		10	15	

24	24	25	28	20	25		16	9	
24	24	25	28	20	25		10	9	
24	24	25	28	20	25		16	12	
25	24	25	28	20	25		15	10	
25	24	25	28	20	25		16	10	
25	24	25	29	20	25		14	10	
25	24	25	30	21	25		20	10	
25	24	25	30	21	25		15	7	
25	24	26	30	21	26		14	13	
25	24	26	30	21	26		10	12	
25	24	26	30	21	26		16	10	
25	24	26	30	21	26		12	10	
25	24	26	30	21	26		15	9	
25	24	26	30	21	26		10	11	
25	25	27	31	21	26		13	14	
25	25	27	31	21	26		12	8	
26	25	28	31	21	27		10	13	
26	25	28	31	21	27		14	12	
26	25	28	31	21	27		11	8	
26	25	28	32	22	28		12	5	
26	25	28	32	22	28		13	9	
26	25	28	32	22	28		10	11	
26	25	28	32	22	28		18	8	
26	25	28	32	22	28		15	10	
26	25	28	32	22	28		13	8	
27	25	28	32	22	28		12	10	
27	25	28	32	22	29		11	17	
27	25	29	32	22	29		10	11	
27	25	29	32	22	29		12	10	
27	25	29	32	22	29		12	8	
27	25	30	32	22	29		11	10	
27	26	30	33	22	29		15	10	
27	26	30	34	22	30		12	12	
27	26	30	34	22	30		14	12	
27	26	30	35	22	30		14	10	
27	26	30	35	22	30		16	9	
28	26	30	35	22	30		13	10	
28	26	30	35	22	30		11	11	
28	26	30	35	22	30		12	13	
28	26	30	35	22	30		12	20	
28	26	30	35	22	30		13	8	
28	26	30	35	22	30		12	13	
28	26	30	35	22	30		13	13	
28	26	31	36	22	30		11	7	
28	26	31	36	22	30		10	15	
28	26	31	37	22	30		13	12	
28	26	31	37	23	30		14	8	
28	26	32	37	23	30		12	15	
28	26	32	38	23	30		11	12	
28	26	32	38	23	30		9	11	
28	26	32	38	23	30		11	9	
28	26	32	38	23	30		12	8	
28	26	32	38	23	30		7	10	
28	26	32	38	23	30		10	12	
28	27	32	38	23	30		11	11	
29	27	32	39	23	30		9	9	
29	27	32	39	23	30		14	7	
29	27	32	39	23	30		10	8	
29	27	33	39	23	30		17	9	
29	27	33	40	24	30		12	12	
29	27	33	40	24	30		9	17	
29	27	33	42	24	30		16	5	

29	27	33	42	24	31		12	10	
29	27	33	43	24	31		13	13	
30	27	33	43	24	31		16	10	
30	27	33	45	24	31		12	11	
30	27	34	45	24	31		15	18	
30	27	34	46	24	31		13	7	
30	27	34	46	24	31		15	7	
30	27	34	48	24	31		12	9	
30	27	34	49	24	31		13	13	
30	27	34	50	24	31		7	10	
30	27	34	50	24	32		17	14	
30	27	35	52	24	32		11	6	
30	27	35	52	24	32		13	6	
30	27	35	54	25	32		12	9	
30	27	35	55	25	32		12	6	
30	28	35	62	25	32		13	12	
30	28	35		25	32		10	9	
30	28	35		25	32		10	9	
30	28	35		25	32		9	8	
30	28	35		25	32		15	15	
30	28	35		25	32		10	13	
30	28	35		25	32		7	12	
30	28	35		25	32		11	8	
30	28	36		25	32		18	11	
30	28	36		25	32		28	9	
30	28	36		25	33		14	9	
30	28	36		25	33		17	8	
31	28	36		25	33		12	11	
31	28	36		25	33		13	11	
31	28	37		25	33		14	9	
31	28	37		25	33		18	12	
31	28	37		25	33		12	15	
31	28	37		25	33		11	19	
31	28	37		25	33		8	16	
31	28	37		25	33		19	18	
31	28	37		25	33		22	9	
31	28	37		25	34		10	15	
31	28	37		25	34		14	17	
32	28	38		25	34		11	14	
32	28	38		25	34		15	13	
32	28	38		25	34		11	20	
32	28	38		25	34		13	15	
32	28	38		25	34		12	11	
32	28	38		25	34		8	23	
32	28	38		25	34		13	26	
32	28	38		25	34		11	12	
32	28	39		25	34		12	13	
32	29	39		25	34		10	14	
32	29	40		25	35		14	7	
32	29	40		25	35		12	10	
32	29	40		25	35		17	11	
32	29	40		25	35		11	20	
32	29	40		25	35		10	9	
32	29	40		25	35		7	9	
32	29	40		25	35		6	14	
32	29	41		25	35		13	11	
32	29	41		26	35		13	8	
32	29	41		26	35		10	10	
32	29	41		26	35		11	11	
32	29	41		26	35		10	7	
33	29	41		26	35		11	6	
33	29	41		26	35		8	11	

33	30	42		26	35		15	12	
33	30	42		26	35		14	8	
33	30	42		26	35		13	12	
33	30	43		26	36		11	8	
33	30	43		26	36		12	10	
33	30	43		26	36		12		
33	30	43		26	36		13		
33	30	43		26	36		15		
33	30	43		26	36		15		
33	30	44		26	36		17		
33	30	44		26	37		16		
34	30	44		26	37		15		
34	30	45		26	37		18		
34	30	45		26	37		16		
34	30	45		26	37		17		
34	30	45		26	37		37		
34	30	45		26	37		14		
34	30	45		26	37		13		
34	30	45		26	37		12		
34	30	45		27	38		12		
34	30	45		27	38		13		
34	30	46		27	38		12		
34	30	46		27	38		15		
34	31	46		27	38		11		
34	31	48		27	38		12		
34	31	48		27	38		12		
34	31	49		27	39		16		
34	31	49		27	39		18		
34	31	49		27	39		11		
34	31	50		27	39		13		
34	31	50		27	39		14		
34	31	50		27	39		15		
34	31	50		27	40		15		
34	31	50		27	40		14		
34	31	50		27	40		9		
34	31	51		27	40		14		
34	31	51		27	40		17		
34	31	52		27	40		21		
35	31	52		27	40		12		
35	31	52		28	41		13		
35	31	53		28	41		16		
35	31	53		28	41		10		
35	31	53		28	41		15		
35	31	53		28	41		14		
35	31	54		28	41		14		
35	31	54		28	41		15		
35	31	54		28	41		20		
35	31	54		28	42		14		
35	31	55		28	42		10		
35	31	55		28	42		15		
35	31	55		28	42		15		
35	32	56		28	42		15		
35	32	56		28	42		10		
35	32	57		28	42		12		
35	32	58		28	42		15		
35	32	60		28	43		13		
35	32	60		28	43		14		
35	32	61		28	43		16		
35	32	63		28	43		9		
35	32	67		28	44		10		
35	32	73		28	44		11		
35	32	79		28	44		8		

35	32			28	44		9		
35	32			28	44		18		
35	32			28	44		19		
35	32			28	45		16		
35	32			28	45		16		
35	32			28	45		8		
35	32			28	46		12		
35	32			28	46		11		
35	32			28	46		12		
35	32			28	46		14		
35	32			28	47		11		
35	32			28	47		8		
36	32			28	47		13		
36	32			28	50		18		
36	32			28	50		14		
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41.44	**37.36**	**33.7**	**29.37**	**28.57**	**31.87**			**11.03**	**17.86**

Collector Roads (Mid blocks) - 30 km/h

Speed							
Motorized vehicles						Non-Motorized Vehicles	
Motorized four wheeler = 53	**Motorized two-wheeler = 43**	**Bus = 52.5**	**Truck = 36**	**Auto Rickshaw = 32**	**Light Commercial Vehicle = 35**	**Bicycle = 10.5**	**Hand driven rickshaw = 11**
21	15	31	16	21	15	8	6
24	16	49	21	21	18	12	16
25	21	54	29	22	20	11	10
28	21	56	32	22	20	8	12
28	22	60	45	22	20	7	
28	22	65	48	23	22	9	
30	25		64	23	24	9	
30	26			24	24	13	
30	26			24	25	14	
31	27			25	27	14	
31	27			26	28	8	
32	28			26	30	13	
32	30			26	33		
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	88						
53.329	42.681	52.5	36.43	32.15	35	10.5	11

Collector Roads (Intersections) - 30 km/h

Speed									
Motorized vehicles							Non-Motorized Vehicles		
Motorized four-wheeler =26	Motorized two-wheeler = 29	Bus = 29	Truck = 19	Auto Rickshaw = 21	Light Commercial Vehicle = 24		Bicycle = 11	Hand driven rickshaw = 10.5	E-rickshaw = 17
11	11	24	16	7	13		11	8	18
13	12	34	16	9	19		9	17	14
14	14		17	11	19		12	10	14
14	15		18	12	21		13	7	16
16	16		26	12	22		12	12	24
17	19			12	22		10	18	17
18	20			13	22		15	11	
18	20			14	22		10	10	
18	20			14	22		10	7	
20	21			15	23		14	7	
20	21			16	23		11	10	
21	21			16	24		9	12	
21	22			17	24		9	8	
21	22			18	25		5	7	
21	22			19	26		10	10	
22	22			20	26		13	11	
22	22			20	30		12	12	
22	23			21	34		10	9	
22	23			22	38		11	9	
24	23			22			25	10	
24	23			22			12	7	
24	23			23			8	10	
24	23			23			12	11	
25	24			23			15	12	
26	24			24			12	7	
26	24			24			9	5	
26	24			24			12	7	
26	25			24			11	10	
26	25			24			6	8	
26	25			25				10	
26	25			26				9	
26	25			27				12	
27	25			27				10	
27	26			27				10	
27	26			28				13	
27	26			28				11	
28	26			28				14	
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26.07	28.9	29	18.6	21	24		11.3	11	17

Local Roads (Intersections) – 20 km/h

Speed									
Motorized vehicles							Non-Motorized Vehicles		
Motorized four wheeler = 24	**Motorized two wheeler = 27**	**Bus = 23**	**Truck = 14**	**Auto Rickshaw = 19**	**Light Commercial Vehicle = 21**		**Bicycle = 12**	**Hand driven rickshaw = 10**	**E-rickshaw = 17**
8	8	12	12	9	10		11	9	12
9	12	18	16	10	11		14	12	21
10	12	18		10	12		19	10	19
10	13	21		11	14		14	13	
11	14	21		11	15		13	11	
11	15	22		12	15		10	4	
11	15	22		12	16		11	10	
12	15	23		12	16		14	9	
12	16	23		12	16		5	6	
13	16	24		12	16		8	12	
13	16	24		12	17		10	18	
13	17	25		12	17		10	8	
13	18	26		13	17		15	7	
14	18	29		14	18		11	7	
14	18	30		15	18		10	8	
14	18	33		15	18		16	11	
14	18			15	18		12	9	
15	18			15	19		13	10	
15	19			15	20		13	9	
15	19			15	20		12	7	
15	19			16	22		14	10	
15	19			16	22		8	12	
15	19			17	22		12	10	
15	19			17	23		20	7	
15	19			17	24		11	6	
16	19			17	24		9	11	
16	19			18	25		13	12	
16	19			18	25		16	13	
16	20			18	25		11	12	
17	20			18	25		12	10	
17	20			18	25		11	12	
17	20			18	25		10	10	
18	20			19	26		12	10	
18	20			19	27		13	6	
18	20			20	28		10	7	
18	20			20	30		9	7	
18	20			20	31		14	9	
18	20			21	38		8	9	
18	21			21			10	10	
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19	21			22				8	
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24.25	**26.78**	**23.2**	**14**	**19**	**20.78**		**11.89**	**9.73**	**17.33**