“Road Safety Audit: A Case Study of Ahmedabad City”

A PROJECT REPORT

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समर्थित ज्ञान अमन्वर्

CERTIFICATE

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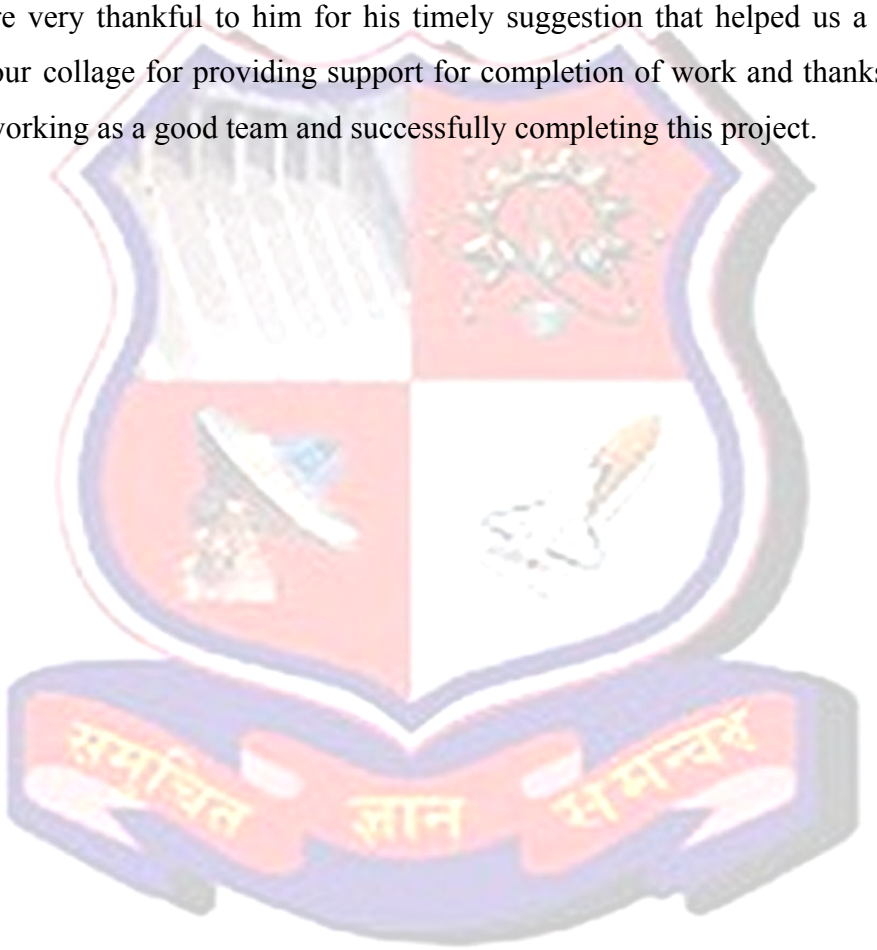
This is to certify that the dissertation entitled "Road Safety Audit : A Case Study Of Ahmedabad City" has been carried out by STUDENT NAME under my guidance in fulfillment of the degree of Bachelor of Engineering in Civil Engineering (8th Semester) of Gujarat Technological University, Ahmedabad during the academic year 2020-21.

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ABSTRACT

According to the estimates by experts around 5 million people die every year due to road accidents. The contribution of India in this estimated figure is quite large. With about 80,000 fatalities per annum, India's contribution is about 10%, which is becoming worse with the average rate of increase of 5% per year. This accidents not only cause injuries and fatalities but it also cost society in many ways such as hospital cost, court cases, insurance coverage and loss of fuel. The planning commission has estimated the annual loss amount of Rs.55, 000 Crores due to road accidents. The loss of such a huge amount requires a compelling need for use of certain road safety parameters. Thus road safety audit has become a prime concern in the field of transportation. There two types of engineering approach to address road safety issues-proactive and reactive. Road safety audit is an example of proactive approach-it includes assessing safety performance and potentiality of the accident on existing road and road under construction. In this study, a stretch of Shilaj-Thol of 14 km (for both L.H.S and R.H.S) is selected for carrying out RSA. Data collection includes accident data, classified traffic volume study, and road inventory. Accident data is collected from the police station, classified traffic volume data is collected by survey. A road inventory survey is carried out to collect data regarding road condition, geometry, signs, markings, etc. RSA checklist as per IRC: SP: 88-2010(Manual on Road Safety Audit) is used for the evaluation of safety level for this stretch. This work focuses on the causes of accidents, evaluation of available safety measures on the given stretch, and analysis of the road for safety before and after preventive measures. After the results of the analysis remedial measures have been recommended.

Key Words: Road Safety Audit, Safety Issues, Geometric Features, Crash Reduction, Black Spots, Road Accident Analysis

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1 INTRODUCTION

1.1 Introduction to Road Safety Audit

Road safety is becoming a global socio-economic issue. In developing countries like India number of victims and fatalities due to road accidents is increasing at an alarming rate. According to the statistics report given by National Crime Records Bureau, the death is about 10 to 20 times higher in India compared to other developed countries. According to the recent report published by Statista Research Department, in 2019 alone India reported around 151 thousand fatalities due to road accidents.

Though India has about 1% of the world's vehicle population, it accounted for about 6% of the road traffic incidents. According to the report by MORTH, in 2019 a total of 4,49,002 road accidents were reported by States and Union Territories killing 1,51,113 people and causing injury to 4,51,361 persons which accounts to the average of 1230 accidents and 414 deaths every day and nearly 51 accidents and 17 deaths every hour. Also highways including both State and National which constitute about 5% of total road network witnessed a very large share of accidents of 55% and accidents related to fatalities of 63% during year 2019. Two-wheelers had the maximum involvement in fatal road accidents across the country in the year 2018.

Road accidents are caused due to many problems such as over speeding which has been a cause of concern throughout the country regardless day and night-time, fast and risky maneuvers and illegal street races on road and highways which are not designed for the purpose are also the recent reasons of increase in road accidents. In addition to this road condition, vehicle condition, environment etc. also plays an important role in the causes of road accidents. According to the recent report by MORTH over 65% of the accidents also occurred on the straight roads. This road accidents not only cause fatalities and injuries but it also affects the economy of the country. A recent study commissioned by the Ministry of Road Transport and Highways (MORTH) estimates the socio-economic costs of road crashes at Rs 1,47,114 crore in India, which is equivalent to 0.77% of the country's GDP. Therefore for proper study of the causes of accidents each problem related to it should be studied separately.

The major problem nowadays is the rapid growth in vehicles due to urbanization, due to that the roads are not able to serve properly as they were design for less traffic compared to

present traffic volume. Thus Road safety audit is comparatively an extraordinary tool for the improvement of road safety and to recognize potentially dangerous areas, includes on highway and propose remedial measures.

Examine, the goal of a road safety audit is to ensure that all new road projects - as well as major operating and maintenance activities on existing roads - are evaluated from the standpoint of road safety, so that any project parameters that are unsuitable from the standpoint of road safety are corrected in a timely manner.

1.2 Define and Aim of Road Safety Audit

1.2.1 Define:

- "A formal evaluation of an existing or 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."
- An audit is not a check against standard. Compliance with standards, which may represent the minimum requirements, does not guarantee safety.

1.2.2 The essential elements of this definition are that the audit is:

- A formal process and not an informal check.
- An independent process.
- Carried out by someone with appropriate experience and training.
- Restricted to road safety issues.

1.2.3 The Main Aim of an RSA is:

- "To identify any existing safety deficiencies of design, layout and road furniture, which are not consistent with the road's functions and use. There should be a consistency of standards such that the road user's perception of local conditions assist safe behavior".

1.3 Scope of study

Defining the scope of RSA using an example of consultancy:

The Scope of Work in the Consultancy Services Contract specifies the following requirements for the road safety audit:

The consultant will ensure that all aspects of the project's designs adhere to current international and Vietnamese road safety standards and practices. The consultant will conduct a road safety audit on the completed design and report the results in the project's final design report." In order to meet these requirements, the document "Road Safety Audit for Road Projects – An Operational Toolkit," published by ADB in June 2003, is referred to.

Using this example as an reference, as we have audited on existing road our scope is to perform road safety audit for a selected stretch from Shilaj-Thol and carry out analysis of the collected data to suggest design measures and improvements to reduce road accidents on stretch.

1.4 Objectives of Road Safety Audits

The purposes of an RSA on an existing road are to:

1. Evaluate all roadway and roadside features, design elements and local conditions that would increase the likelihood and severity of a crash.

2. Review first-hand interaction of various design elements with each other and surrounding road network.

3. Observe how road users behavior with the road facility.

4. Determine if the needs of all road users have been adequately and safely met.

5. Explore emerging operational trends or safety issues at the selected stretch.

1.5 Benefits of Road Safety Audit

1. Improve the awareness of the safe design in planning, design, construction, and maintenance of roads.

2. The likelihood of accidents on the road network can be reduced.

3. The severity of accidents can be reduced.

4. Road safety is prioritized in the minds of road designers and traffic engineers.

5. The need for expensive corrective work is reduced.

6. The total cost of a project to the community is minimized, including accidents, disruption, and trauma.

2 LITERATURE REVIEW

Title	Author's Name	Conclusion
Road Safety Audit on Selected Stretch of NH-27 (Greenland to Chowkdi Hirasar Diversion)	Akshay Kumar V. Keraliya, Ravindra V. Solanki, Jay K. Kalaria	• The safe overtaking opportunities are less during the peak hour of traffic, which results into the risky overtaking operations and may result into the accidents. • The deficiency in road markings and signs are seen regularly on all the horizontal curves and diversions to the adjacent villages& industrial areas. At some curves the guide signs is provided on inner edge of the curve on median, where the signs are not visible due to plantation. • The poor pedestrian facilities observed on the roadway, guard rail is not provided on the bridges. • In village areas the poor condition of the guard rail is observed. In sub-urban area and villages, the slow moving traffic have been observed. Which may cause into the accidents.
Road Safety Audit as a Tool for Improving Safety on the Intercity Road Network	Kristina Baklanova, Evgeny Voevodin, Elena Cheban, Andrey Askhabov, Artem	• First of all, safety audit is demanded as a modern system of quality and safety control of roads and services for the road maintenance and operation. • A careful road safety audit conducted at all stages of road construction, from planning to operation, will allow to identify and to eliminate errors already at the stage of signing documents.

		• Thus, it will preventatively influence the appearance of accident factors, not only on existing roads but also on future ones.
Road safety analysis using multi criteria approach: A case study in India	Shalini Kanuganti, Ruchika Agarwala, Bhupali Dutta, Pooja N.Bhanegaonkar, Ajit Pratap Singh, A K Sarkar	• Decision maker's weights and Severity level rating given to the parameters depends upon human perception and thus involves fuzziness. Moreover, the result obtained from Fuzzy AHP justifies the visual inspection carried out in the field. Hence, results obtained by this method may be considered for practical purpose due to its high degree of accuracy. • The methodology suggested can be used to determine the level of contribution of parameters towards safety hazard. Accordingly, appropriate mitigation measures may be adopted. A further detailed study needs to be conducted on a large scale by carrying out sensitivity analysis to test the stability of the ranking obtained by the suggested methods.
Road Safety Audit	YuhaHuvarinen, Elena Svatkova, Elena Oleshchenko, Svetlana Pushchina.	• We looked at the outcomes of three decades of global road business practice and continual methodical development. The traffic safety audit is the primary instrument. The essay examines the expertise of the world's leading countries in integrating traffic safety audits into technical frameworks in the lifecycle of highways. The findings of Russian experience was viewed as part of research and development programmes aimed at mitigating injury costs and improving strategies for adjusting audits to Russian environments.

		• The audit is carried out on risks that are not covered by any guidelines or codes. In terms of cumulative injury causes, the audit could be able to avoid approximately 27% of injuries. A comprehensive traffic safety audit undertaken at all levels of road development — from preparation to service — would allow for the early identification and avoidance of mistakes on the level of emerging records, thus affecting the appearance of accident risk factors not just on current roads but also on prospective ones.
A Method to Quantify Road Safety Audit Data and Results	Joshua Reid Jones	• The aim of this study is to quantify the RSA mechanism so that the gains obtained by adopting the RSA guidelines can be increased. The benefits resulting from implementing RSA guidelines were discovered by comparing risk levels before and after safety changes. • The RSA quantification tool was created to assess programmes in both urban and rural environments. When the tool is applied to different roads in a network, policy makers may identify the roads with the greatest risk and focus their safety improvements there. This paper suggests a seven-category decision-making method that can be used to turn the possible danger seen on the road into a numerical value that can be measured. Five questions were derived from field observations during Utah LTAP's RSA program for each category. A risk ranking is assigned to each question based on the likelihood of an accident. The risk ranking is then quantified by a number that corresponds to the risk rating scheme used by the FHWA.

		Summing the risk scores and multiplying by the category weight yields the category risk.
Road Safety Audit of Selected Stretch from Umreth Junction to Vasad Junction	Devang G Patel, F.S. Umrigar, C.B. Mishra, Amit A Vankar	• The study's aim is to measure accident analysis, and it can be inferred that injuries occur more often during the day than at night. Bad road geometry and climate, as well as a lack of traffic sense and compliance measures, may be to blame. During rush hour, measures must be in effect. • There should be a new licensing scheme that combines the points allotted for fines to drivers for violations, as well as a cap of points beyond which the license should be cancelled and the driver retested for a new license. This would significantly minimize incidents on black spots.
Road safety audit: a case study on NH-65	Tummala Bharat Kumar , Chukkapalli Jeswanth Chowdary	• The four-lane National Highway-65, i.e., from 247.650km to 270.340km, it was discovered through data analysis that road markings, shoulder condition, carriageway condition, and the factors that cause accidents on the NH65 are median openings. • It was also discovered that moderately moving vehicular traffic is causing traffic problems for fast-moving vehicular traffic. It usually takes up the innermost lane of a national highway. Along the way this four-lane national highway requires service roads. So that slow-moving vehicular traffic is separated from fast-moving vehicular traffic Vehicle traffic. • All unauthorized gaps-in-median should be closed, necessary provisions, such as foot-over bridges, should

		be made to allow the local community to cross the national highway on a priority basis. All undeveloped minor and major crossings should be developed with the necessary lighting provisions so that the accident rate can be reduced be reduced along the surveyed areas. ● A pedestrian path must be built near the residence areas, industries, educational institutions, and it must be properly maintained wherever it is, and a guard rail must be provided along the entire length of the footpath. Facilities for the differently able people at bus stops need to be developed on the NH-65.
Road Safety Audit	Omkar Gholap , Nikita Shinde , Vaishnavi Shelke , NavnathNavale , Kuldeepak Deshmukh,Ashutosh Kotkar	● The continuous contact with potholes present on the road leads to major effects on the human health like back pain, spinal cord etc. No. of accidents are increases day by day. Due to the potholes damage to human body and motorist's vehicle. It found that Road Markings, Condition of Shoulder, Traffic Volume, Spot Speed, improper drainage arrangement were main parameters for causing accidents. As per experts like engineer, orthopedic surgeons the road section from "Agasti College, Akole to Ms. R. V. Traders Godown, Shekaiwadi (K.G.Road SH 44)" reaches the severe level. Absence of road informatory signs, regulatory signs boards, and road markings adds into seriousness of the problem for given chainage of the road. There is no utilization of road efficiency. Hence it affecting day to day life of road users. Hence there is necessity of particular remedial measures without delay.

		• Ground zero action is necessary. Improving safety on a given segment of roadway is rarely a simple process. As traffic grows, additional development occurs, and the pace of life in modern society increases, this task is even more challenging Everyone who used the road are committed to improving the safety of streets and highways are to be commended for their efforts to improve transportation safety for all roadway users.
Urban Road Safety Audit: Technique And Case Study	Bhatt B. V, Shah N. C	• RSA has proven to be a novel approach in India for safeguarding national highways and roads. At the same time, URSA was proposed. If this technique is used, it may result in a significant change in the event of a road accident in one of the country's urban centres the country It is possible that the suggestions and The solutions provided in a URSA report prove to be inadequate more expensive in terms of implementation So, the penny was well spent. There are numerous advantages for road users' safety cannot be imagined because it is directly related to human's existence. Awakening statistics and identified problems on Gaurav Path show that urban roads, while well-designed, are dangerously lacking in safety considerations. A national URSA policy will be developed. Based on the URSA technique, developed and implemented the paper discusses this good urban roads will make life easier.
Review On Road Safety Audit And A Case Study Of Sh26 &	Siddhant Karahe, Dr. Sunil Sugandhi	• In this paper study on Road accidents are more serious and fatally injurious, and they occur more frequently on SH and NH in all studies. The middle of the day the rush of heavy vehicles is more pronounced on highways.

Sh27 From Khandwa To Sanawad (M.P.) India		That in most cases, heavy vehicles are heavily involved in traffic accidents on the highway. • In some cases, unauthorized median openings and poor visibility at curves, embankments, and intersections were major causes of accidents. The geometry of the road, guardrails, and slopes are all steep and cannot be avoided. In terms of road safety, pavement is regarded as gentle. Potholes, road damage, and pavement edge, widths should be increased to avoid congestion and poor lighting. Route signs, Interchange signs, Exit signs, and Other Signs are all examples of road signs. Informational signs, road markings, and forgiving roads the board, as well as poor drainage and other factors, all played a role, but Most accidents are caused by "over speeding." • The accident occurred late at night or early in the morning, and the causes were drink and drive, excessive speed, loss of control of the vehicle, and so on. We reduce traffic accidents by using a model save as many lives as possible while also limiting property damage.
A Statistical Evaluation On Road Safety Audit	N.N.G. Sai Pavan,K. Hemantha Raja,B.G.Rahul,SS. Asadi	• The selected stretch starts from “hanuman junction and ends at kanaka durgavaaradhi, Vijayawada Andhra Pradesh, India” is being studied in this research. During the day, there is a lot of traffic on the lane, and there are several black holes where accidents happen regularly. On the basis of data collection, such as traffic volume report, unintentional data collection, on road data collection, road safety signs and symbols, public questionnaire survey, etc., a systematic examination of

		the road from “Hanuman Junction to Kanaka Durga Vaaradhi" is carried out. When traffic rises, more growth takes place, and the speed of life in urban society quickens, this challenge becomes ever more difficult. Everyone on the road that is dedicated to ensuring the safety of streets and highways deserves praise for their work to increase transportation safety for all road users. The aim of the analysis is to inspect the road in terms of safety precautions, road scenarios, and any form of defects, as well as to recommend mitigation and prevention measures for the selected section of road for audit
Road Safety Evaluation: An Analytic Model Proposal For The Road Safety Audit And Review	Agostinacchio M, Albunia G., Olita S	• The methodology proposed as an integration for standard RSA&R procedures aims to be an instrument for road safety analysis for the independent evaluation of infrastructure deficiencies from both a track geometrical-building and functional standpoint: in the first case, this methodology tends to discover the correlations between infrastructure deficits and accidents, and, second, the road's dependence the effect of the accident phenomenon on functional factors the procedure was exemplified by the application for the SP80 road in the Potenza district, the results of which being outstanding. Anyway, the operative application highlighted the need for a deeper study of the index-linked functional analysis, so as to get to more objective results. In conclusion, the Authors believe this instrument is a starting point for further improvements for the sake of a rational management of road safety.

3 Study Area

3.1 Study Area Location with History of Land Use Details

In our study road stretch of 14 km is selected from NH-147. The stretch starts from 1km from Shilaj circle (0 km) to Thol diversion (14 km).The roadway stretch passes through the plain terrain. The land use pattern are residential, sub-urban, agriculture and industrial area.

Table 1 Road infrastructure detail study of highway

Particulars	**Existing**
Road length (km)	14
Existing carriageway	2 lane divided
Design speed (kmph)	
Road land width (m)	
Major junction	
Minor junction	
Truck-Bus lay bye	0
Major Bridges	
Culverts	

3.1.1 IDENTIFIED ROAD USERS

- General public
- Commercial transport operators
- Pedestrians

- Bicyclist
- Motorcyclist
- Agriculture machinery
- Emergency services
- Road maintenance vehicles
- Heavy machinery operators

3.1.2 Adjoining Land Uses

- Agriculture farms
- Commercial shops and premises
- Hotels
- Petrol station
- Residential dwellings
- Rural residential development
- Heavy vehicles operators
- Roadside stalls
- Terminal Facilities
- Religious Place

3.2 Base Location Map

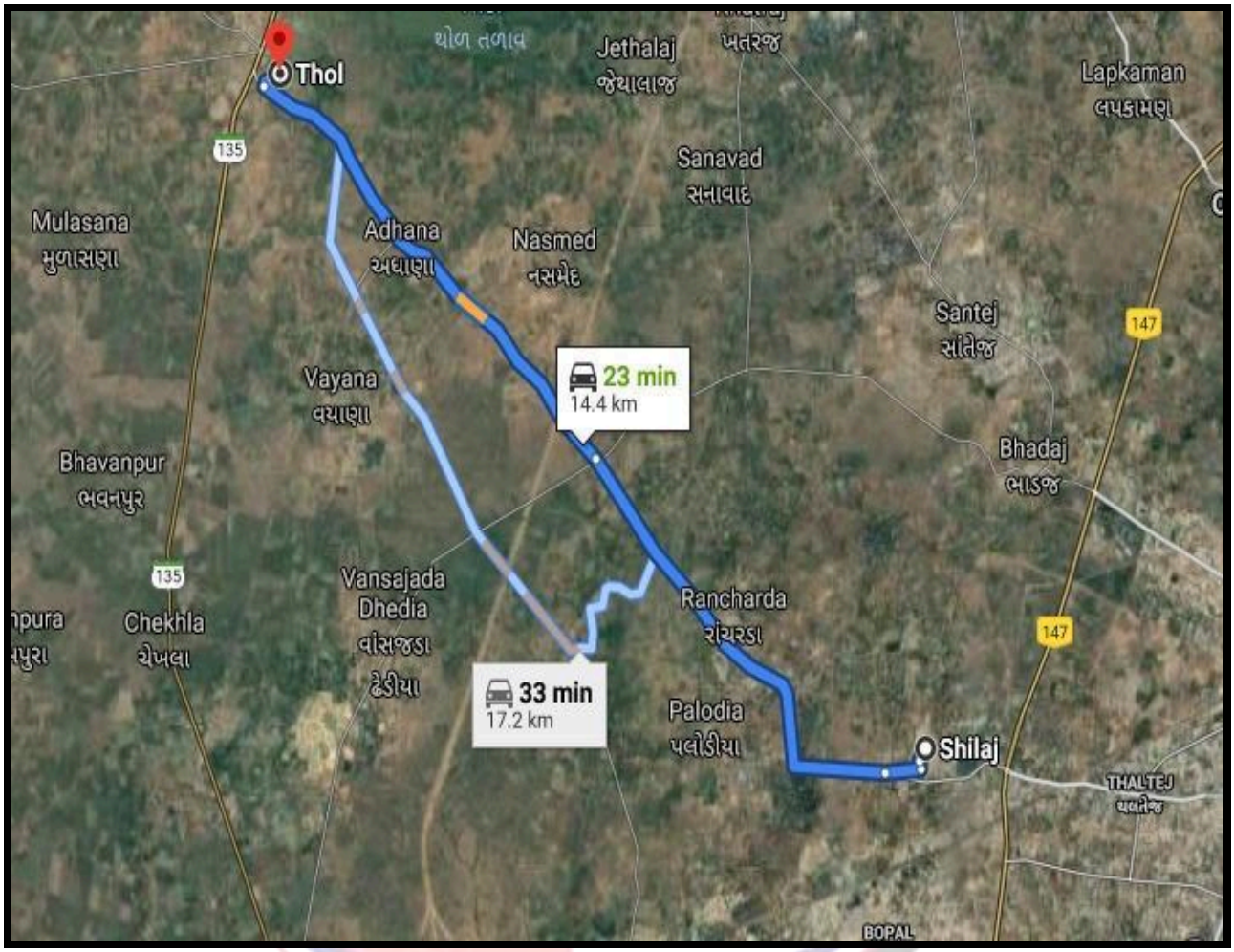


Figure 1 Satellite View of Stretch Shilaj to Thol

4 METHODOLOGY

Step: 1 To identify existing road to be audited.

Step: 2 Collection the accident data from police stations.

Step: 3 Road inventory survey is carried out to collect data regarding road condition, geometry, signs, markings, etc. RSA checklist as per IRC: SP: 88-2010(Manual on Road Safety Audit).

Following procedure were carried out in road inventory survey:

a) Marks the chainage at an interval of 200 m.

b) Along with marking the chainage the video was taken throughout the entire stretch.

c) The team walk through the segment together and note anything that will affect the safety of the road such as damage to the curbs, roadside barriers, trees, utility poles, delineator posts, and signs, scuff marks on curbs and concrete barrier etc.

Step: 4 Perform field reviews under various conditions.

Step: 5 Conduct classified traffic volume survey to find out the traffic volume of the selected stretch.

Step: 6 Perform audit analysis using SPSS Software and prepare report of findings.

Step: 7 Provide recommendation for the improvements.



Figure 2 Marking chainage at every 200 m.



Figure 3 Checking and noting down the criteria as per checklist for every chainage.



Figure SEQ Figure * ARABIC 5 Starting point of an audit (0-200 m.).



Figure SEQ Figure * ARABIC 4 End point of an audit (13.8-14 km).



Figure 6 Taking photos for every 1 km of stretch

5 DATA COLLECTION

5.1 Traffic Data

5.1.1 Traffic Volume Count Survey

For determining traffic on selected stretch on NH-147 (Shilaj-Thol), classified traffic volume count was carried out. Classified traffic volume count was carried out for 2 hours for two times a day with an interval of 15 minutes, in morning and in evening by the team of 2 people for each time. During morning time survey was conducted from 9 a.m.to 11a.m. and during evening time survey was conducted from 5 p.m. to 7 p.m. The survey was carried out by conventional method as per checklist given in IRC-SP-21-2001. The categories of vehicles observed during survey were four wheeler, three wheeler, two wheeler, multi-axle vehicle, heavy commercial vehicle, light commercial vehicle, non-motorized traffic, bus etc. At the study stretch the amount of cars, two wheelers and auto rickshaws were more due to surrounding villages and industrial areas. The following are the data collected from the survey.



Figure 7 Carrying out vehicle count for every 15 minutes using stop watch and noting down data in a sheet.

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CLASSIFIED TRAFFIC VOLUME COUNT SURVEY

Road Name	: NH-147		Road No	: NH-147	ADDL.INFORMATION	:	Nidhi Jariwala
Section From	: Shilaj	To: Thol	Station No	:	WEATHER	: Sunny	Shivani Pittaliya
Location Km	: 14		Date & Day	: 24/03/21	Guided by: **Mr. Jay Soni**	Auditors	Maitri Panchasara
Direction Towards	: LHS		Hour	: 9-11 am			Dhvanil Shah

TIME	FAST MOVING VEHICLES										SLOW MOVING VEHICLES					Total
	Two Wheeler	Auto-Rikshaw	Car / jeep Van /	BUS Mini	BUS Full	LCV	TRUCK 2-Axle	TRUCK Multi-Axle	TRUCK Semi Artic	Agri.Tractor With Trailer	Agri.Tractor Without Trailer	Cycle	Cycle Rickshaw	Animal Drawn Bullock cart	Animal Drawn Horse	Others(Pl.Specify) Drawn	
9-9:15	193	45	72	3	0	11	3	4	0	2	0	8	0	0	0	0	341
9:15-9:30	149	33	82	0	0	10	1	4	0	1	0	4	2	0	0	0	286
9:30-9:45	221	44	114	0	0	11	15	3	0	1	0	7	1	0	0	0	417
9:45-10	233	37	43	0	0	13	12	4	0	0	0	12	1	0	0	1	356
10-10:15	224	20	111	0	0	9	11	3	0	1	0	11	2	0	0	0	392
10:15-10:30	186	24	111	1	0	14	11	4	0	0	0	4	0	0	0	1	356
10:30-10:45	177	38	121	0	0	12	7	0	0	0	0	3	1	0	0	0	359
10:45-11	159	31	128	1	0	8	6	0	0	3	0	2	0	0	0	1	339
TOTAL	1542	272	782	5	0	88	66	22	0	8	0	51	7	0	0	3	2846

Figure 8 Classified traffic volume count from 9 to 11 a.m. on LHS of the stretch

L.J INSTITUTE OF ENGINEERING AND TECHNOLOGY

CLASSIFIED TRAFFIC VOLUME COUNT SURVEY

Road Name	: NH-147	Road No	: NH-147	ADDL.INFORMATION	:
Section From	: Shilaj	To: Thol	Station No	:	WEATHER : Sunny
Location Km	: 14		Date & Day	: 24/03/21	Guided by: **Mr. Jay Soni**
Direction Towards	: LHS		Hour	: 5-7 pm	

Auditors

Nidhi Jariwala

Shivani Pittaliya

Maitri Panchasara

Dhvanil Shah

TIME	FAST MOVING VEHICLES											SLOW MOVING VEHICLES					
	Two Wheeler	Auto-Rikshaw	Car / jeep Van /	BUS		LCV	TRUCK		Agri.Tractor		Cycle	Cycle Rickshaw	Animal Drawn		Others(Pl.Specify) Drawn	Total
				Mini	Full		2-Axle	Multi-Axle	Semi Artic	With Tralier	Without Trailer			Bullock cart	Horse		
5:00-5:15	120	31	102	0	0	17	1	0	0	0	5	7	0	0	0	1	284
5:15-5:30	111	32	112	0	0	10	4	1	2	0	0	4	0	0	0	0	276
5:30-5:45	103	27	124	0	0	11	5	1	1	0	2	6	0	0	0	0	280
5:45-6:00	112	31	107	0	0	9	2	1	4	0	2	3	1	0	0	0	272
6:00-6:15	133	31	111	0	2	9	3	3	0	1	4	6	0	0	0	0	303
6:15-6:30	155	27	120	0	0	8	5	2	2	0	0	6	0	0	0	0	325
6:30-6:45	158	30	133	0	1	11	5	3	3	1	0	3	1	0	0	0	349
6:45-7:00	170	35	113	0	0	10	5	4	0	1	0	3	1	0	0	0	342
TOTAL	1062	244	922	0	3	85	30	15	12	3	13	38	3	0	0	1	2431

Figure 9 Classified traffic volume count from 5 to 7 p.m. on LHS of the stretch

L.J INSTITUTE OF ENGINEERING AND TECHNOLOGY

CLASSIFIED TRAFFIC VOLUME COUNT SURVEY

Road Name	: NH-147		Road No	: NH-147	ADDL.INFORMATION :	Auditors: *Nidhi Jariwala*
Section From	: Shilaj	To: Thol	Station No	:	WEATHER : Sunny	*Shivani Pittaliya*
Location Km	: 14		Date & Day	: 24/03/21	Guided by: **Mr. Jay Soni**	*Maitri Panchasara*
Direction Towards	: RHS		Hour	: 9-11 am		*Dhvanil Shah*

TIME	FAST MOVING VEHICLES										SLOW MOVING VEHICLES					Total
	Two Wheeler	Auto-Rikshaw	Car / jeep / Van	BUS		LCV	TRUCK		Agri.Tractor		Cycle	Cycle Rickshaw	Animal Drawn		Others(PI.Specify) Drawn	
				Mini	Full		2-Axle	Multi-Axle	Semi Artic	With Tralier	Without Trailer			Bullock cart	Horse	
9-9:15	150	35	81	0	1	14	1	0	0	0	0	7	1	0	0	290
9:15-9:30	147	29	60	0	0	9	5	0	0	0	0	2	0	0	0	252
9:30-9:45	230	39	134	1	0	17	4	1	0	2	0	4	1	0	0	433
9:45-10	234	40	138	0	0	18	4	1	0	1	0	2	0	0	0	438
10-10:15	230	36	131	0	1	18	5	1	0	1	0	1	1	0	0	425
10:15-10:30	184	27	110	0	0	10	5	1	0	1	0	0	1	0	0	339
10:30-10:45	160	33	119	1	0	14	6	0	0	2	0	2	0	0	0	338
10:45-11	154	28	117	0	0	16	4	1	0	2	0	3	1	0	0	326
TOTAL	1489	267	890	2	2	116	34	5	0	9	0	21	5	0	0	1	2841

Figure 10 Classified traffic volume count from 9 to 11 a.m. on RHS of the stretch

L.J INSTITUTE OF ENGINEERING AND TECHNOLOGY

CLASSIFIED TRAFFIC VOLUME COUNT SURVEY

Road Name	: NH-147	Road No	: NH-147	ADDL.INFORMATION	:
Section From	: Shilaj	To: Thol	Station No	:	WEATHER : Sunny
Location Km	: 14		Date & Day	: 24/03/21	Guided by: **Mr. Jay Soni**
Direction Towards	: RHS		Hour	: 5-7 pm	

Auditors

Nidhi Jariwala

Shivani Pittaliya

Maitri Panchasara

Dhvanil Shah

TIME	FAST MOVING VEHICLES										SLOW MOVING VEHICLES					Total
	Two Wheeler	Auto-Rikshaw	Car / jeep Van /	BUS		LCV	TRUCK			Agri.Tractor	Cycle	Cycle Rickshaw	Animal Drawn		Others(Pl.Specify) Drawn	
				Mini	Full		2-Axle	Multi-Axle	Semi Artic	With Trailer	Without Trailer			Bullock cart	Horse	
5:00-5:15	134	31	97	1	0	8	6	3	0	0	0	5	1	0	0	0	286
5:15-5:30	205	31	135	0	0	15	5	4	2	3	0	5	0	0	0	1	405
5:30-5:45	213	32	123	1	3	20	5	4	1	2	0	4	1	0	0	1	409
5:45-6:00	259	34	128	1	0	11	4	3	0	0	0	6	1	0	0	1	448
6:00-6:15	245	42	146	0	1	10	9	5	2	0	0	4	0	0	0	2	466
6:15-6:30	311	33	170	2	1	7	6	4	0	2	0	4	0	0	0	0	540
6:30-6:45	280	19	189	0	0	5	6	3	0	1	0	8	0	0	0	3	514
6:45-7:00	247	17	185	2	0	9	7	3	0	0	0	5	0	0	0	0	475
TOTAL	1894	239	1173	7	5	85	48	29	5	8	0	41	3	0	0	8	3545

Figure 11 Classified traffic volume count from 5 to 7 p.m. on RHS of the stretch

5.2 Accident Data

Accident data were collected from Santej and Bopal police station for study area corridor, in khatiyan report, accident data is recorded as FIR (First Information Report). The data collected are analyzed accordingly.

“Photos of Visit to Police Station for Data Collection”



Figure 12 Visit at Shantej police station for accident data collection





Figure 13 Visit at Bopal police station for accident data collection

Table 2 Number of accidents on selected stretch on NH-147 during (2014-2020)

Sr. No.	Year	No.	Reasons
1	2014	2	Over speeding
2	2015	2	Over speeding
3	2016	1	Over speeding
4	2017	3	Bump
5	2018	4	Over speeding, Bump
6	2019	3	Over speeding, Overtaking
7	2020	3	Over speeding, Bump

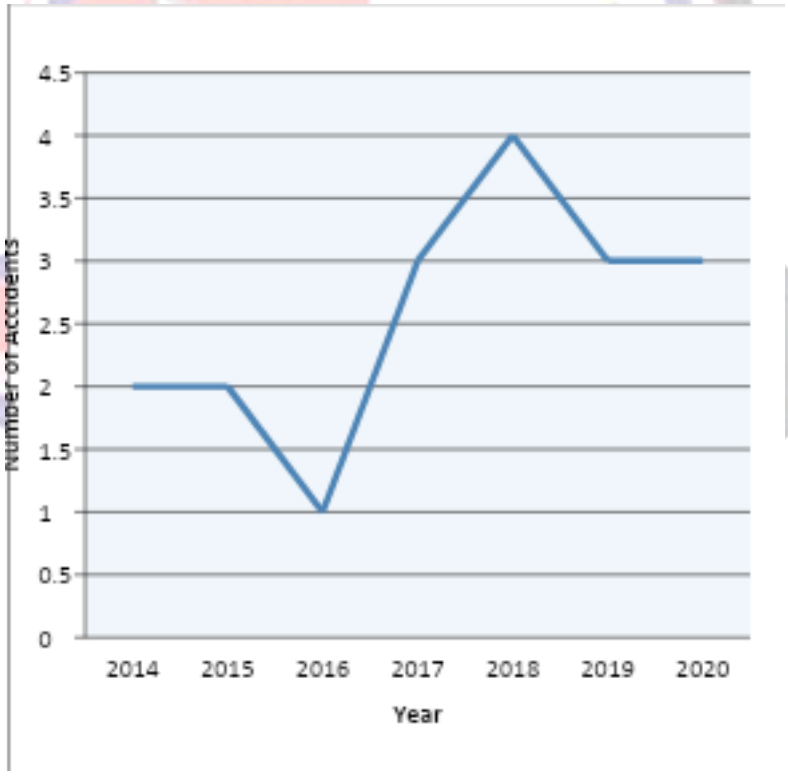


Figure 14 Number of accidents per year on selected stretch on NH-147 during 2014-2020

5.3 Audit Process

5.3.1 Site Selection (According to IRC: SP: 88-2010)

According to IRC: SP: 88-2010 following are the criteria for the Site Selection for RSA on all stages of road:

- Horizontal and vertical alignment should not have any features that may warrant any special consideration.
- There should not be any roadside hazards present.
- Enough been done to assist the safety of vulnerable road users-moving along as well as across the new road.
- There should not be any serious effects of weather on the roads and it should be safe at night.
- Cross section of the road should suitably be safe for the road classification.
- New road should be easily understood by road users.
- Any part of the design should not present direct risk to any group of future road users.

As we have carried out the survey for existing road following the reason for selection for the stretch.

- As it is one of the major road on NH-147 it is necessary to carry RSA on the stretch from Shilaj to Thol. The road consist of sub-urban area hence it is important to check safety of such areas as this areas are more prone to human movements. Also it connects any industrial areas hence many heavy vehicles transport heavy goods for which road safety should checked. This stretch consist of important junctions which is to be checked for its safety according to the criteria for junction given in IRC: SP: 88-2019. The stretch is of substandard profile. The alignment and center line at the stretch is inadequate. Hence RSA at this stretch is required.

5.4 Checklists for Existing Road

The audit utilized checklist provided by Austroads Road Safety Audit Manual – 2009. The completed checklists for stage 5-Existing Road are included in Appendix A, which includes following criteria:

- Road alignment and cross-section
    1. Visibility
    2. sight distance
    3. Design speed
    4. Speed limit/speed zoning
    5. Overtaking
    6. Readability by drivers
    7. Widths
    8. Shoulders
    9. Cross falls
    10. Batter slopes
    11. Drains
- Auxiliary lanes
    1. Tapers
    2. Shoulders
    3. Signs and markings
    4. Turning traffic
- Intersections
    1. Location
    2. Visibility

3. Sight distance
4. Controls and delineation
5. Layout
6. Miscellaneous

- Signs and lighting
  1. Lighting
  2. General sign issues
  3. Sign legibility
  4. Sign supports
- Markings and delineation
  1. General issues
  2. Centerlines, edge lines, lane lines
  3. Guideposts and reflectors
  4. Curve warning and delineation
- Crash barriers and clear zones
  1. Clear zones
  2. Crash barriers
  3. End treatments
  4. Fences
  5. Visibility of barriers and fences
- Traffic signals
  1. Operations
  2. Visibility

- Pedestrians and cyclists
    1. General issues
    2. Pedestrians
    3. Cyclists
    4. Public transport
- Bridges and culverts
    1. Design features
    2. Crash barriers
    3. Miscellaneous
- Pavement
    1. Pavement defects
    2. Skid resistance
    3. Ponding
    4. Loose stones/material
- Parking
    1. General issues
- Provision for heavy vehicles
    1. Design issues
    2. Pavements/shoulder quality
- Floodways and causeways
    1. Ponding, flooding
    2. Safety of devices
- Miscellaneous

1. Landscaping
2. Temporary works
3. Headlight glare
4. Roadside activities
5. Errant vehicles
6. Other safety issues
7. Rest areas
8. Animals

From this criteria given in Austroads Road Safety Audit Manual – 2009, the criteria satisfies in our stretch are visibility, sight distance, design speed, overtaking, readability by drivers, width of road, shoulders, drains, signs and markings, turning traffic, intersection locations, sight distance at intersection, controls and delineators, intersection layout, lightings, crash barriers, end treatments, fences, movement of pedestrians, movement of cyclists, pavement defects, loose gravel/material, temporary works, headlight glare, roadside activities, movement of animals.

5.5 Audit Reference Document

L.J. Institute of Engineering and Technology

Civil Engineering Department

Road Safety Audit Form

Location: Shilaj-Thol (L.H.S)

Date: 13/03/21

Auditors: Nidhi Jariwala, Shivani Pithadiya, Maitri Panchasara, Dhwani Shah

Guided by: Mr. Jay Soni

Chainage																				
From (kms/m)	To (kms/m)	Visibility	Readibility by Drivers	Signs and Markings	Intersection Location	Control and Delination	Lightings	Crash Barriers	Fences	Pedestrian	Cyclists	Temporary Works	Roadside Activities	Movement of Animals	Width of Road (m)	End Treatments	Loose Gravel	Shoulder	Pavement Defects	Gap in Median
0	0.2	Y	Y	N	N	N	Y	N/A	Y	N	N/A	N/A	2	N/A	7.2	Y	N	N	3	N
0.2	0.4	Y	Y	Y	Y	N	Y	N/A	N/A	Y	N/A	N/A	3	N/A	7.2	N/A	N	N	2	Y
0.4	0.6	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	3	N/A	7.2	N/A	N	N	2	Y
0.6	0.8	Y	Y	Y	Y	N	Y	N/A	N/A	N	N/A	N/A	5	N/A	7.2	N/A	N	N	4	Y
0.8	1	Y	Y	Y	Y	N	Y	N/A	N/A	Y	N/A	N/A	4	N/A	7.2	N/A	N	N	4	Y
1	1.2	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	2	N/A	7.2	N/A	N	N	4	Y
1.2	1.4	Y	Y	Y	Y	N	Y	N/A	N/A	Y	N/A	N/A	2	N/A	7.2	N/A	N	N	4	Y
1.4	1.6	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	0	N/A	7.2	N/A	N	N	3	N/A
1.6	1.8	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	3	N/A	7.2	N/A	N	N	4	N/A
1.8	2	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	2	N/A	7.2	N/A	N	N	4	N/A
2	2.2	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	1	Y	7	N/A	N	N	4	Y
2.2	2.4	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	4	N/A
2.4	2.6	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	2	N/A	7	N/A	N	N	3	Y
2.6	2.8	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	7	N/A	N	N	4	N/A
2.8	3	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	7	N/A	N	N	4	N
3	3.2	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	4	Y
3.2	3.4	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	2	N/A	7	N/A	N	N	4	Y
3.4	3.6	Y	Y	N	N/A	N	N	N/A	N	N	N/A	N/A	4	Y	7.2	N/A	N	N	4	Y
3.6	3.8	Y	Y	N	N/A	N	N	N/A	N	N	N/A	N/A	3	N/A	7.2	N/A	N	N	4	Y
3.8	4	Y	Y	N	N/A	N	N	N/A	Y	N	N/A	N/A	0	N/A	7.2	Y	N	Y	4	N/A
4	4.2	Y	Y	Y	N/A	N	N	N/A	Y	N	N/A	N/A	0	N/A	7.2	N/A	N	Y	4	Y
4.2	4.4	Y	Y	Y	Y	N	N	N/A	Y	N	N/A	N/A	1	N/A	7.2	N/A	N	N	3	Y
4.4	4.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	4	N/A	7.2	N/A	N	N	4	Y
4.6	4.8	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	3	N/A	7.2	N/A	N	N	4	Y
4.8	5	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	7.2	N/A	N	N	4	N/A
5	5.2	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	3	Y	6.7	N/A	N	N	3	Y
5.2	5.4	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	2	N/A	6.7	N/A	N	N	4	N/A
5.4	5.6	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	6.7	N/A	N	N	3	Y
5.6	5.8	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	6	N/A	N	N	4	Y
5.8	6	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	4	N/A	6	N/A	N	N	3	Y
6	6.2	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	6	N/A	N	N	1	N/A
6.2	6.4	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	3	Y	6	N/A	N	N	1	Y
6.4	6.6	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	2	N/A	6	N/A	N	N	3	N/A
6.6	6.8	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N/A	6	N/A	N	N	2	N/A
6.8	7	Y	Y	Y	N/A	N	Y	N/A	Y	N	N/A	N/A	2	N/A	7	N/A	N	N	1	N/A
7	7.2	Y	Y	N	Y	N	N	N/A	Y	N	N/A	N/A	1	Y	7	Y	N	N	4	Y
7.2	7.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	7	N/A	N	N	4	N/A
7.4	7.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	7	N/A	N	N	4	N/A
7.6	7.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	4	N/A
7.8	8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	3	N/A
8	8.2	Y	Y	Y	N/A	N	N	N/A	N	N	N/A	N/A	2	N/A	7	Y	N	N	4	N/A
8.2	8.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	4	N/A
8.4	8.6	Y	Y	Y	Y	N	N	N/A	N/A	N	N/A	N/A	3	N/A	7	N/A	N	N	3	Y
8.6	8.8	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	7	N/A	N	N	3	N/A
8.8	9	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	3	Y
9	9.2	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	6.8	N/A	N	N	4	N/A
9.2	9.4	Y	Y	Y	Y	N	N	N	N/A	N	N/A	Y	1	N/A	6.8	Y	N	N	2	Y
9.4	9.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.8	N/A	N	N	2	N/A
9.6	9.8	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.8	N/A	Y	N	2	Y
9.8	10	Y	Y	N	Y	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.2	N/A	Y	N	4	Y
10	10.2	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.2	N/A	Y	N	5	Y
10.2	10.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.2	N/A	N	N	4	Y
10.4	10.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	6.2	N/A	N	N	3	N/A
10.6	10.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	6.2	N/A	N	N	2	N/A
10.8	11	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	6.2	N/A	N	N	3	Y
11	11.2	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.2	N/A	N	N	4	Y
11.2	11.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	Y	0	N/A	6.2	N/A	N	N	3	N/A
11.4	11.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.6	N/A	N	N	3	N/A
11.6	11.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.6	N/A	N	N	3	Y
11.8	12	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.6	N/A	N	N	1	Y
12	12.2	Y	Y	Y	N/A	N	N	N/A	N	N	N/A	N/A	0	N/A	6.6	Y	N	N	4	Y
12.2	12.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	6.5	N/A	N	N	3	N/A
12.4	12.6	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.5	N/A	N	N	2	N/A
12.6	12.8	Y	Y	N	Y	N	N	N/A	N/A	N	N/A	N/A	1	N/A	6.5	N/A	N	N	2	Y
12.8	13	Y	Y	N	Y	N	N	N/A	N/A	N	N/A	N/A	3	N/A	5.5	N/A	N	N	1	Y
13	13.2	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	3	N/A	5.5	N/A	N	N	2	Y
13.2	13.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N/A	5.5	N/A	N	N	2	N/A
13.4	13.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	3	N/A
13.6	13.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N/A	7	N/A	N	N	3	N/A
13.8	14	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	Y	7	N/A	N	N	3	Y

Comments: 1) 3.8-4.2 : Median not provided 2) 7.0-7.1 : Median not provided

Figure 15 RSA Sheet of LHS

L.J. Institute of Engineering and Technology

Civil Engineering Department

Road Safety Audit Form

Location: Sihoj-Thol (R.H.S)

Date:

Auditors: Nidhi Jariwala, Shivani Pittaliya, Maitri Panchasara, Dhwanil Shah

Guided by: **Mr. Jay Soni**

Chainage																				
From (km/hr)	To (km/hr)	Visibility	Readability by Drivers	Signs and Markings	Intersection Location	Controls and Delineators	Lightings	Crash Barriers	Fences	Pedestrian	Cyclists	Temporary Works	Roadside Activities	Movement of Animals	Width of Road (m)	End Treatments	Loose Gravel	Shoulder	Pavement Defects	Gap in Median
0	0.2	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	7	N/A	N	N	2	Y
0.2	0.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	7	N/A	N	N	1	Y
0.4	0.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	7	N/A	Y	N	2	Y
0.6	0.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	7	N/A	Y	N	2	N/A
0.8	1	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	7	N/A	N	N	3	Y
1	1.2	Y	Y	N	Y	N	N	N/A	N/A	N	N/A	N/A	0	N	7	N/A	N	N	3	Y
1.2	1.4	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	7	N/A	N	N	3	Y
1.4	1.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	2	N	7	N/A	Y	N	2	N
1.6	1.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.6	N/A	Y	N	3	N
1.8	2	Y	Y	N	N/A	N	N	N/A	N	N	N/A	N/A	0	N	6.6	Y	Y	N	3	N
2	2.2	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.6	N/A	N	N	2	Y
2.2	2.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.6	N/A	Y	N	3	Y
2.4	2.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	6.6	N/A	N	N	4	N/A
2.6	2.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	6.6	N/A	N	N	3	N/A
2.8	3	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	6.6	N/A	N	N	3	Y
3	3.2	Y	Y	Y	Y	N	N	N/A	N/A	N	N/A	N/A	0	N	6.6	N/A	Y	N	3	Y
3.2	3.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.8	N/A	Y	N	4	N/A
3.4	3.6	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.8	N/A	N	N	4	N/A
3.6	3.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	6.8	N/A	N	N	2	Y
3.8	4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.8	N/A	Y	Y	2	Y
4	4.2	Y	Y	Y	Y	N	N	N/A	N/A	N	N/A	N/A	2	N	6.8	N/A	N	Y	1	Y
4.2	4.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	2	N	6.8	N/A	N	N	1	Y
4.4	4.6	Y	Y	Y	N/A	N	N	N	N	N	N/A	Y	2	N	6.8	N/A	N	N	1	N/A
4.6	4.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.8	N/A	N	N	3	Y
4.8	5	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.5	N/A	N	N	4	N/A
5	5.2	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.5	N/A	N	N	4	N/A
5.2	5.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	2	N	6.5	N/A	N	N	3	Y
5.4	5.6	Y	Y	Y	Y	N	N	N/A	N/A	N	N/A	N/A	2	N	6.5	N/A	N	N	4	Y
5.6	5.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	2	N	6.5	N/A	N	N	3	N/A
5.8	6	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	6.5	Y	N	N	4	N/A
6	6.2	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.5	N/A	N	N	4	N/A
6.2	6.4	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	0	N	6.5	N/A	N	N	4	N/A
6.4	6.6	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	1	N	7	N/A	N	N	3	N/A
6.6	6.8	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	2	N	7	N/A	N	N	3	N/A
6.8	7	Y	Y	Y	Y	N	N	N/A	Y	N	N/A	N/A	0	N	7	N/A	N	N	4	Y
7	7.2	Y	Y	Y	N/A	N	Y	N/A	N	N	N/A	N/A	1	N	7	N/A	N	N	3	N/A
7.2	7.4	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	0	N	7	N/A	N	N	3	N/A
7.4	7.6	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	2	N	7	N/A	N	N	3	N/A
7.6	7.8	Y	Y	Y	Y	N	Y	N/A	N	N	N/A	N/A	1	N	7	N/A	N	N	5	Y
7.8	8	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	6	N/A	N	N	5	N/A
8	8.2	Y	Y	Y	Y	N	Y	N/A	N/A	N	N/A	N/A	6	N	6	N/A	N	N	4	Y
8.2	8.4	Y	Y	Y	Y	N	Y	N/A	N	N	N/A	N/A	3	N	6	N/A	N	N	4	Y
8.4	8.6	Y	Y	Y	N/A	N	Y	N/A	N	N	N/A	N/A	4	N	6	N/A	N	N	4	N/A
8.6	8.8	Y	Y	Y	N/A	N	Y	N/A	N	N	N/A	N/A	2	N	6	N/A	N	N	5	N/A
8.8	9	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	3	N	6	N/A	N	N	5	Y
9	9.2	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	6	N/A	N	N	5	N/A
9.2	9.4	Y	Y	Y	N/A	N	Y	N	N/A	N	N/A	N/A	2	N	6	N/A	N	N	5	Y
9.4	9.6	Y	Y	Y	Y	N	N	N/A	N/A	N	N/A	N/A	6	N	7.6	N/A	N	N	4	Y
9.6	9.8	Y	Y	Y	N/A	N	N	N/A	N/A	N	N/A	N/A	5	N	7.6	N/A	Y	N	4	N/A
9.8	10	Y	Y	Y	N/A	N	N	N/A	Y	N	N/A	N/A	0	N	7.6	N/A	Y	Y	4	Y
10	10.2	Y	Y	Y	N/A	N	N	N/A	Y	N	N/A	N/A	0	N	7.6	N/A	Y	Y	5	Y
10.2	10.4	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	2	N	7.6	N/A	N	Y	4	Y
10.4	10.6	Y	Y	N	N/A	N	N	N/A	N/A	N	N/A	N/A	3	N	7.6	N/A	N	N	5	Y
10.6	10.8	Y	Y	Y	Y	N	Y	N/A	N/A	N	N/A	N/A	1	N	7.6	N/A	N	N	5	Y
10.8	11	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	7.6	N/A	N	N	4	Y
11	11.2	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	6.8	N/A	N	N	5	N
11.2	11.4	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	6.8	N/A	N	N	5	N/A
11.4	11.6	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	0	N	6.8	N/A	N	N	5	N/A
11.6	11.8	Y	Y	N	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	6.8	N/A	N	N	4	Y
11.8	12	Y	Y	Y	N/A	N	Y	N/A	N/A	N	N/A	N/A	1	N	6.8	N/A	N	N	4	N/A
12	12.2	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	1	N	6.8	N/A	N	N	4	Y
12.2	12.4	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	5	N	6.8	N/A	N	N	4	N/A
12.4	12.6	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	3	N	7	N/A	N	N	3	N/A
12.6	12.8	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	4	N	7	N/A	N	N	4	Y
12.8	13	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	3	N	7	N/A	N	N	3	N
13	13.2	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	5	N	7	N/A	N	N	4	Y
13.2	13.4	Y	Y	N	Y	N	Y	N/A	N/A	Y	N/A	N/A	4	N	7	N/A	N	N	4	Y
13.4	13.6	Y	Y	N	N/A	N	Y	N/A	N/A	Y	N/A	N/A	1	N	7	N/A	N	N	4	N/A
13.6	13.8	Y	Y	N	Y	N	Y	N/A	N/A	Y	N/A	N/A	3	N	7.2	N/A	N	N	4	Y
13.8	14	Y	Y	N	Y	N	Y	N/A	N/A	N	N/A	N/A	2	N	7.2	Y	N	N	4	Y

Comments: 1) 2-2.15: Median not provided 2) 9.8-10.2: Median not provided

Figure 16 RSA Sheet of RHS

5.6 Site Photographs



Figure 17 Garbage accumulation on side of the reduces width of the road and due to it shoulder width is not visible, center is not provided and damaged median



Figure 18 No shoulder width is provided, no fences are provided for safeguard against trees and turning movement



Figure 19 No fences are provided for safety against falling due to deep depression on the side of the road and center line is not provided



Figure 20 Longitudinal cracking and uneven alignment of road



Figure 21 Shoulder width is not provided, full length fences are not provided and huge area under land acquisition reducing road width



Figure SEQ Figure * ARABIC 22 Potholes on road, garbage on the road, no center line is provided



Figure 23 Shoulder width is not provided, fences are not provided for safety against trees



Figure 24 Shoulder width is not provided, reduced width for road due to side defects, edge cracking and no center line is provide



Figure 25 Raveling of pavement, center line is not clearly visible



Figure 26 Defective pavement, no center line and shoulder width is provided



Figure 27 Bump width is less and not clearly visible, shoulder width not provided and polished aggregate



Figure 28 Loose construction materials of the site are stacked on the road without protection and shoulder width is not provided



Figure 29 Bump marking is not provided, no intersection is provided at junction of road, no warning signals are provided



Figure 30 Shoulder width is not provided, guard rails for safety against trees is not provided and uneven road surface



Figure 31 Signs are broken, center line is not clearly visible, shoulder width is not provided and road is poorly maintained as growing shrubs are reducing road width



Figure 32 Wrong side moving vehicles, loose gravel on side of the road and no shoulder width provided



Figure 33 Fences are not provided for the full length of the depression due to which part of deep depression is open which can be prone to falling of the vehicle



Figure 34 Poor road condition with depression and loose sand on the road which reduces skid resistance



Figure 35 No protection of steel sheets provided on the road side construction site, no cautionary signs are provided and center line and shoulder width are absent



Figure 36 Poorly maintained road reducing road width, due to absence of shoulder width vehicles are parked unevenly on road side causing obstruction to moving traffic, no center line is provided and damaged median



Figure 37 Shoulder width and center line are not provided and illegal shops on road sides reduces road width

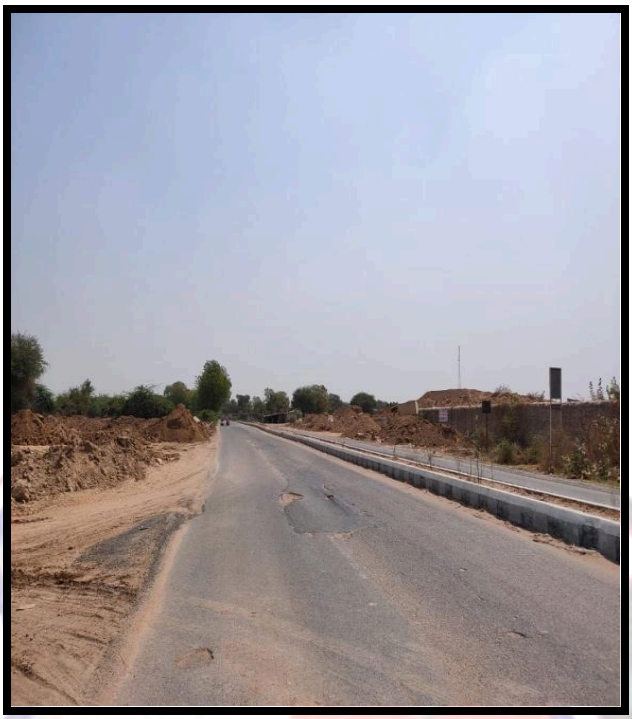


Figure 38 Potholes on the road, No shoulder width and center line are provided, stacking of loose soil on road side



Figure 39 Guard rails for safety against trees is not provided, Shoulder width is not provided, uneven road surface, Center line width is improper

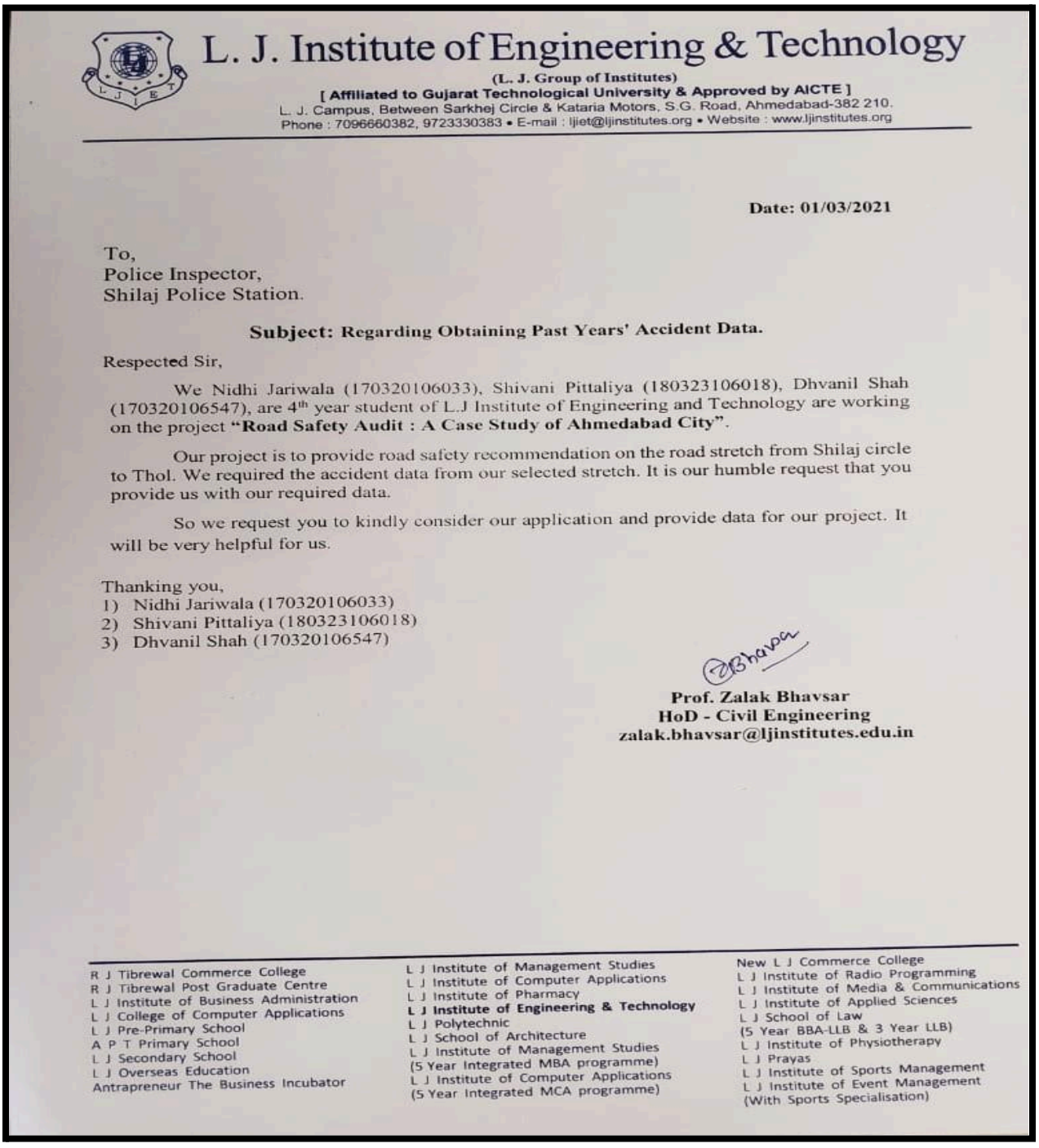
5.7 Group Photograph



Figure 40 Group photograph

Thank you to all of our group members for working together to complete this project.

5.8 LOR, Police Station Data Collection Photographs and SPSS Certificate



L. J. Institute of Engineering & Technology

(L. J. Group of Institutes)
[Affiliated to Gujarat Technological University & Approved by AICTE]
L. J. Campus, Between Sarkhej Circle & Kataria Motors, S.G. Road, Ahmedabad-382 210.
Phone : 7096660382, 9723330383 • E-mail : ljiet@ljinstitutes.org • Website : www.ljinstitutes.org

Date: 01/03/2021

To,
Police Inspector,
Shilaj Police Station.

Subject: Regarding Obtaining Past Years' Accident Data.

Respected Sir,

We Nidhi Jariwala (170320106033), Shivani Pittaliya (180323106018), Dhvanil Shah (170320106547), are 4th year student of L.J Institute of Engineering and Technology are working on the project **"Road Safety Audit : A Case Study of Ahmedabad City"**.

Our project is to provide road safety recommendation on the road stretch from Shilaj circle to Thol. We required the accident data from our selected stretch. It is our humble request that you provide us with our required data.

So we request you to kindly consider our application and provide data for our project. It will be very helpful for us.

Thanking you,
1) Nidhi Jariwala (170320106033)
2) Shivani Pittaliya (180323106018)
3) Dhvanil Shah (170320106547)

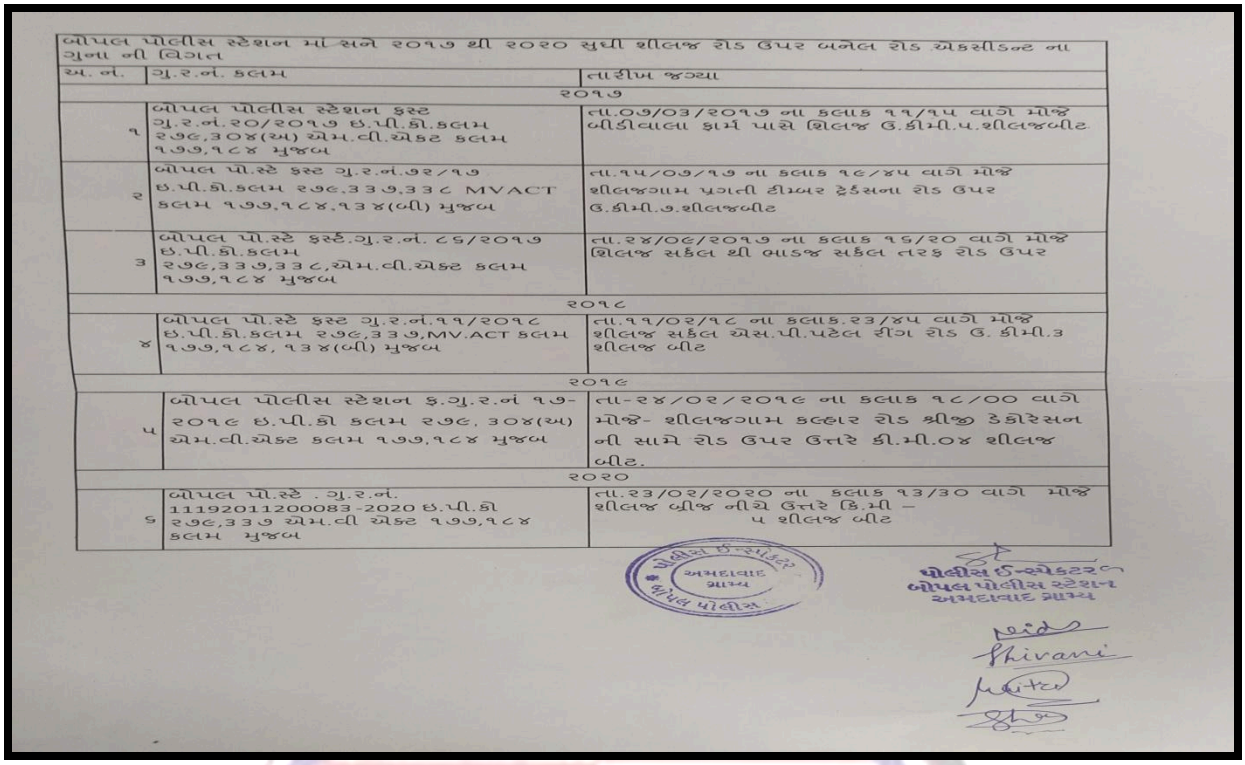
Prof. Zalak Bhavsar
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zalak.bhavsar@ljinstitutes.edu.in

R J Tibrewal Commerce College
R J Tibrewal Post Graduate Centre
L J Institute of Business Administration
L J College of Computer Applications
L J Pre-Primary School
A P T Primary School
L J Secondary School
L J Overseas Education
Antrapreneur The Business Incubator

L J Institute of Management Studies
L J Institute of Computer Applications
L J Institute of Pharmacy
L J Institute of Engineering & Technology
L J Polytechnic
L J School of Architecture
L J Institute of Management Studies
(5 Year Integrated MBA programme)
L J Institute of Computer Applications
(5 Year Integrated MCA programme)

New L J Commerce College
L J Institute of Radio Programming
L J Institute of Media & Communications
L J Institute of Applied Sciences
L J School of Law
(5 Year BBA-LLB & 3 Year LLB)
L J Institute of Physiotherapy
L J Prayas
L J Institute of Sports Management
L J Institute of Event Management
(With Sports Specialisation)

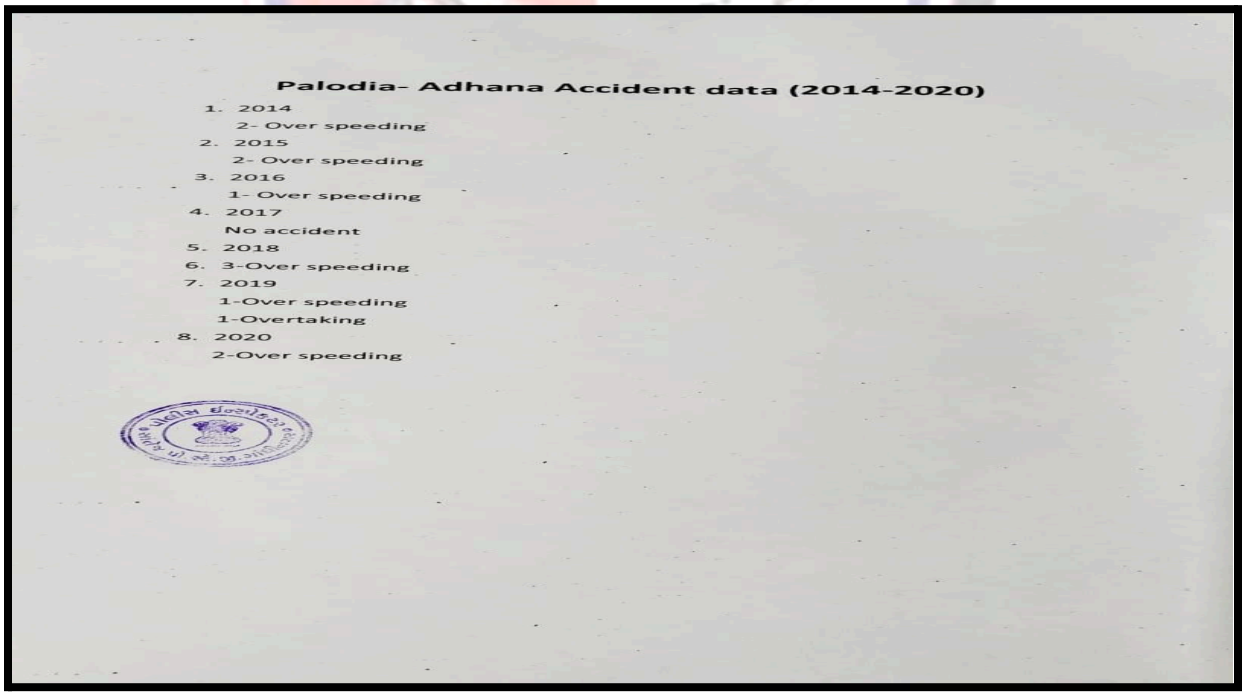
Figure 41 Proof of visit to police station for accident data collection



બોપલ પોલીસ સ્ટેશન મા સને ૨૦૧૭ થી ૨૦૨૦ સુધી શીલજ રોડ ઉપર બનેલ રોડ એકસીડન્ટ ના ગુના ની વિગત

અ. નં.	ગુ.ર.નં. કલમ	તારીખ જગ્યા
	૨૦૧૭	
૧	બોપલ પોલીસ સ્ટેશન ફસ્ટ ગુ.ર.નં.૨૦/૨૦૧૭ ઇ.પી.કો.કલમ ૨૭૯,૩૦૪(અ) એમ.વી.એકટ કલમ ૧૭૭,૧૮૪ મુજબ	તા.૦૭/૦૩/૨૦૧૭ ના કલાક ૧૧/૧૫ વાગે મોજે બીડીવાલા ફાર્મ પાસે શિલજ ઉ.કીમી.૫.શીલજબીટ
૨	બોપલ પો.સ્ટે ફસ્ટ ગુ.ર.નં.૭૨/૧૭ ઇ.પી.કો.કલમ ૨૭૯,૩૩૭,૩૩૮ MVACT કલમ ૧૭૭,૧૮૪,૧૩૪(બી) મુજબ	તા.૧૫/૦૭/૧૭ ના કલાક ૧૯/૪૫ વાગે મોજે શીલજગામ પ્રગતી ટીમ્બર ટ્રેડર્સના રોડ ઉપર ઉ.કીમી.૭.શીલજબીટ
૩	બોપલ પો.સ્ટે ફસ્ટે.ગુ.ર.નં. ૮૬/૨૦૧૭ ઇ.પી.કો.કલમ ૨૭૯,૩૩૭,૩૩૮,એમ.વી.એકટ કલમ ૧૭૭,૧૮૪ મુજબ	તા.૨૪/૦૯/૨૦૧૭ ના કલાક ૧૬/૨૦ વાગે મોજે શિલજ સર્કલ થી ભાડજ સર્કલ તરફ રોડ ઉપર
	૨૦૧૮	
૪	બોપલ પો.સ્ટે ફસ્ટ ગુ.ર.નં.૧૧/૨૦૧૮ ઇ.પી.કો.કલમ ૨૭૯,૩૩૭,MV.ACT કલમ ૧૭૭,૧૮૪, ૧૩૪(બી) મુજબ	તા.૧૧/૦૨/૧૮ ના કલાક.૨૩/૪૫ વાગે મોજે શીલજ સર્કલ એસ.પી.પટેલ રીંગ રોડ ઉ. કીમી.૩ શીલજ બીટ
	૨૦૧૯	
૫	બોપલ પોલીસ સ્ટેશન ફ.ગુ.ર.નં ૧૭-૨૦૧૯ ઇ.પી.કો કલમ ૨૭૯, ૩૦૪(અ) એમ.વી.એકટ કલમ ૧૭૭,૧૮૪ મુજબ	તા-૨૪/૦૨/૨૦૧૯ ના કલાક ૧૮/૦૦ વાગે મોજે- શીલજગામ કલ્હાર રોડ શ્રીજી ડેકોરેસન ની સામે રોડ ઉપર ઉત્તરે કી.મી.૦૪ શીલજ બીટ.
	૨૦૨૦	
૬	બોપલ પો.સ્ટે . ગુ.ર.નં. 11192011200083-2020 ઇ.પી.કો ૨૭૯,૩૩૭ એમ.વી એકટ ૧૭૭,૧૮૪ કલમ મુજબ	તા.૨૩/૦૨/૨૦૨૦ ના કલાક ૧૩/૩૦ વાગે મોજે શીલજ બ્રીજ નીચે ઉત્તરે કિ.મી – ૫ શીલજ બીટ

પોલીસ ઇન્સ્પેક્ટર બોપલ પોલીસ સ્ટેશન અમદાવાદ ગ્રામ્ય



Palodia- Adhana Accident data (2014-2020)

1. 2014
   2- Over speeding
2. 2015
   2- Over speeding
3. 2016
   1- Over speeding
4. 2017
   No accident
5. 2018
6. 3-Over speeding
7. 2019
   1-Over speeding
   1-Overtaking
8. 2020
   2-Over speeding

Figure 42 Photos of accident data collection from police station



Figure 43 Certificate for SPSS Software

6 DATA ANALYSIS

The Visibility and Readability by drivers is constant and always positive. There is no provision for cyclists as no separate lane is provided for that. There are no control and delineators present on the whole stretch. It is important for the guidance of vehicles at night time. In the To direction of stretch, median is not provided from 3.8-4.2km and 7.0-7.1km.

6.1 Signs and Markings

Table 4 Signs and Markings frequency

Signs and Markings LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	40	57.1	57.1	57.1
	N	30	42.9	42.9	100.0
	Total	70	100.0	100.0	

Signs and Markings RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	46	65.7	65.7	65.7
	N	24	34.3	34.3	100.0
	Total	70	100.0	100.0	

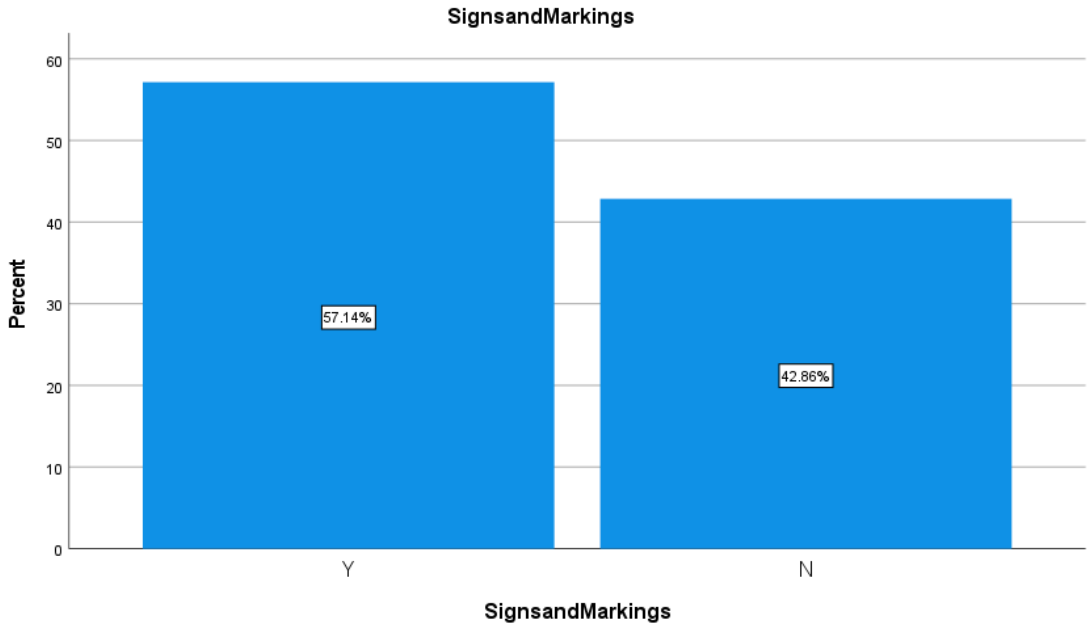


Figure 45 Bar chart count of Signs and Markings of LHS

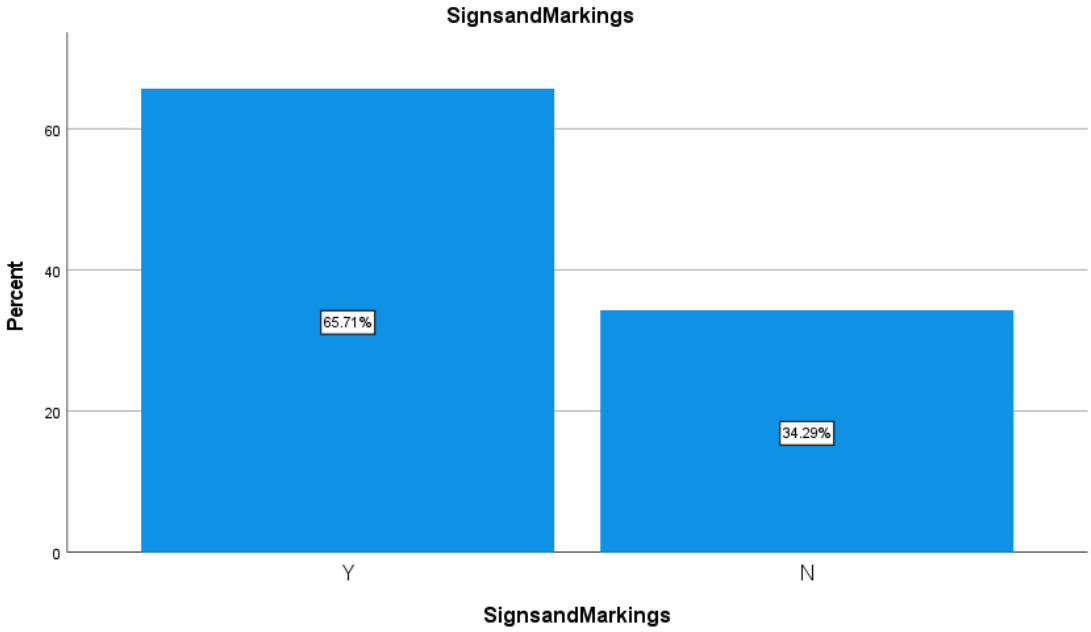


Figure 46 Bar chart count of Signs and Markings of RHS

As we can see Signs and Markings are present on 57.14% on LHS of the road stretch which is poor. It is necessary to be present on the whole stretch. On RHS side it is 65.71%. Regulatory

and Warning signs were mostly present but the road markings were absent on the majority of the stretch.

6.2 Intersection Location

Table 5 Intersection Location frequency

Intersection Location LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	16	22.9	22.9	22.9
	N	54	77.1	77.1	100.0
	Total	70	100.0	100.0	

Intersection Location RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	14	20.0	20.0	20.0
	N	56	80.0	80.0	100.0
	Total	70	100.0	100.0	

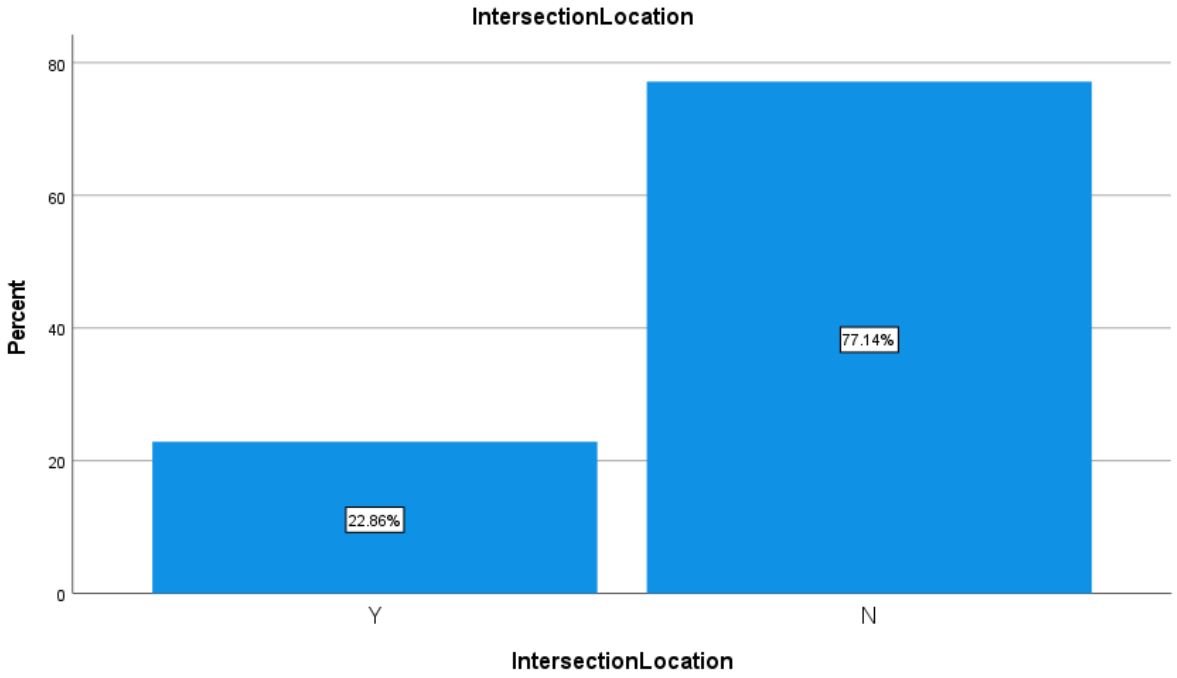


Figure 47 Bar chart count of Intersection Location of LHS

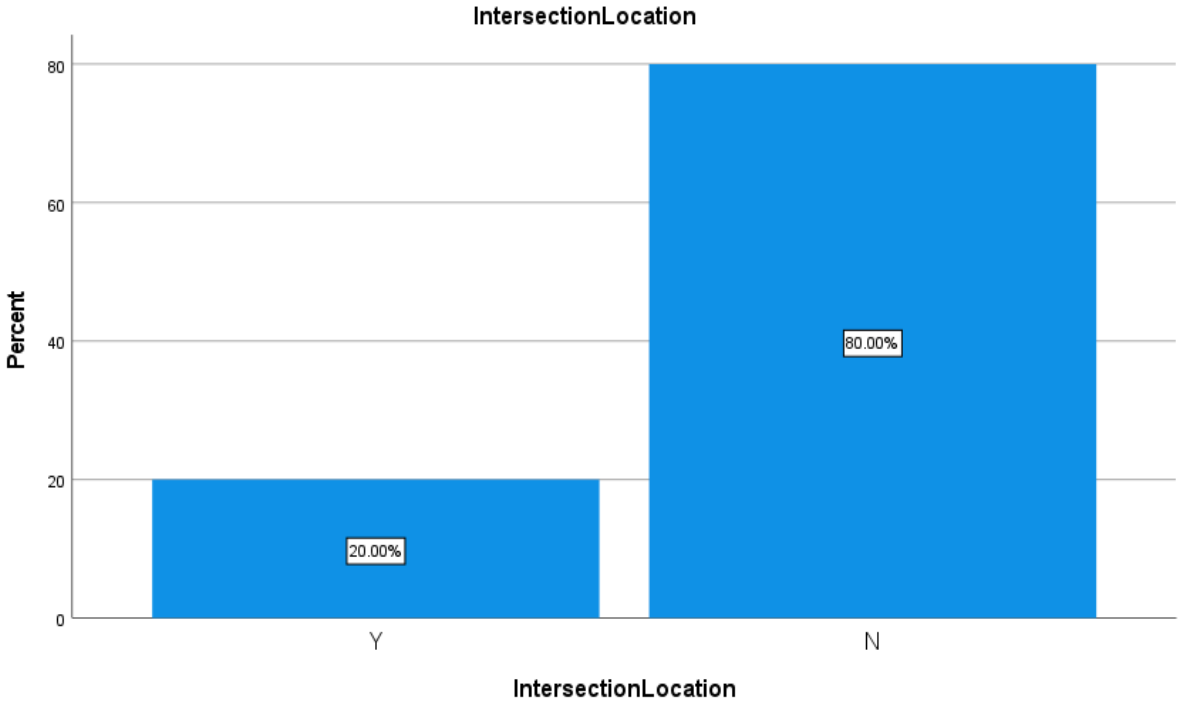


Figure 48 Bar chart count of Intersection Location of RHS

22.9% of LHS and 20% of RHS of our road stretch has intersection which signifies that there is a possibility of traffic congestion in future at that locations.

6.3 Lightings

Table 6 Street Lighting frequency

Lightings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	29	41.4	41.4	41.4
	N	41	58.6	58.6	100.0
	Total	70	100.0	100.0	

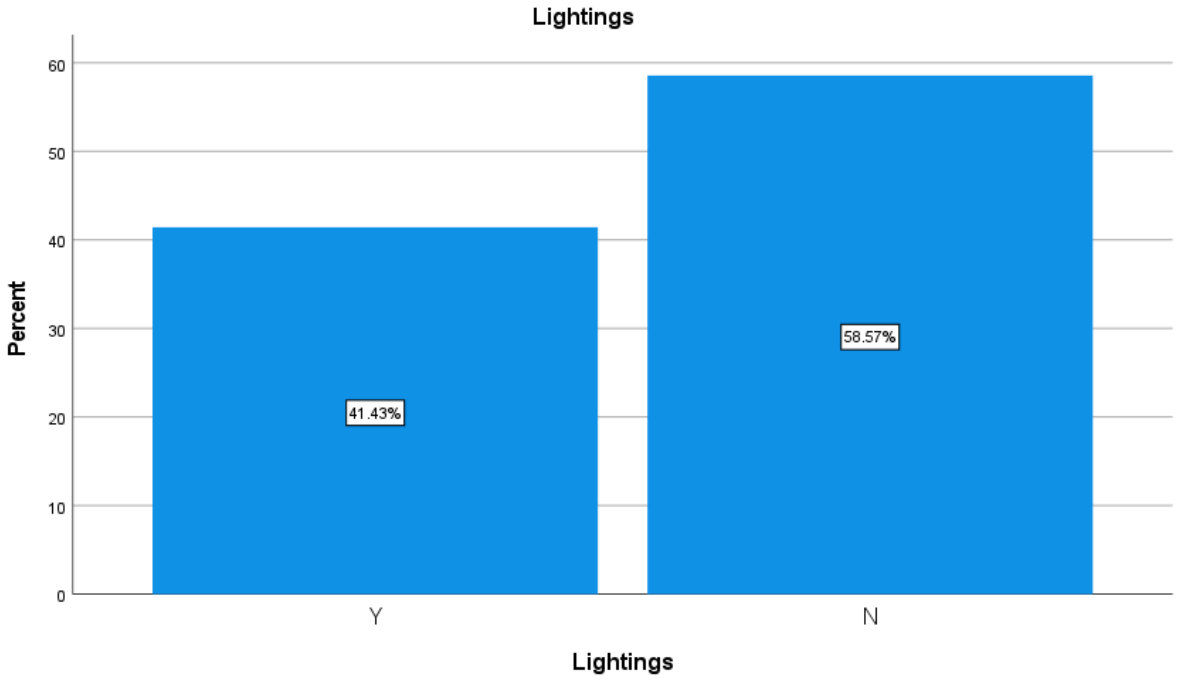


Figure 49 Bar chart count of Street Lighting

Street lightings are useful for visibility at night by the drivers. Analysis shows that the lighting is provided only on 41.4% of the stretch which is very poor. Risk of accidents at night are very with such low percentage of lighting.

6.4 Crash Barriers

Table 7 Frequency of Crash Barriers

Crash Barriers LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	N	1	1.4	1.4	1.4
	N/A	69	98.6	98.6	100.0
	Total	70	100.0	100.0	

Crash Barriers RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	N	2	2.9	2.9	2.9
	N/A	68	97.1	97.1	100.0
	Total	70	100.0	100.0	

Crash Barriers are provided when there is ongoing construction so that vehicles don't crash into it. There was only one site on LHS where Crash Barriers were required but they were not provided. On RHS there were 2 ongoing sites which required crash barriers.

6.5 Fences

Table 8 Frequency of Fences

Fences LHS

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Y	6	8.6	8.6	8.6
	N	4	5.7	5.7	14.3
	N/A	60	85.7	85.7	100.0
	Total	70	100.0	100.0	

Fences RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	3	4.3	4.3	4.3
	N	7	10.0	10.0	14.3
	N/A	60	85.7	85.7	100.0
	Total	70	100.0	100.0	

Fences are required where there is depression on the side of the road or trees are growing out and covering the pavement area of the road. Fences were provided on 8.6% on LHS of the road but it wasn't provided on 5.7% of road where it was required. On RHS they were provided on 4.3% but were absent on 10% road where they were necessary. This may prove hazardous especially at night with lack of Street lighting.

6.6 Pedestrian

Table 9 Frequency of provision for pedestrians

Pedestrian LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	7	10.0	10.0	10.0
	N	63	90.0	90.0	100.0
	Total	70	100.0	100.0	

Pedestrian

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	8	11.4	11.4	11.4
	N	61	87.1	87.1	98.6
	N	1	1.4	1.4	100.0
	Total	70	100.0	100.0	

Footpaths are necessary for the easy movement of pedestrians along the road. They were not provided on around 90% of the stretch on both sides.

6.7 Temporary Works

Table 10 Temporary Works frequency

Temporary Works LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	2	2.9	2.9	2.9
	N	68	97.1	97.1	100.0
	Total	70	100.0	100.0	

Temporary Works RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	1	1.4	1.4	1.4
	N	69	98.6	98.6	100.0
	Total	70	100.0	100.0	

Temporary works like ongoing construction was present on 2.9% on LHS and 1.4% on RHS of the road. This may create temporary rise in the traffic.

6.8 Roadside Activities

Table 11 Frequency of Roadside activities

Roadside Activities LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	18	25.7	25.7	25.7
	1	27	38.6	38.6	64.3
	2	10	14.3	14.3	78.6
	3	10	14.3	14.3	92.9
	4	4	5.7	5.7	98.6
	5	1	1.4	1.4	100.0
	Total	70	100.0	100.0	

Roadside Activities RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	23	32.9	32.9	32.9
	1	20	28.6	28.6	61.4
	2	13	18.6	18.6	80.0
	3	6	8.6	8.6	88.6
	4	3	4.3	4.3	92.9
	5	3	4.3	4.3	97.1
	6	2	2.9	2.9	100.0
	Total	70	100.0	100.0	

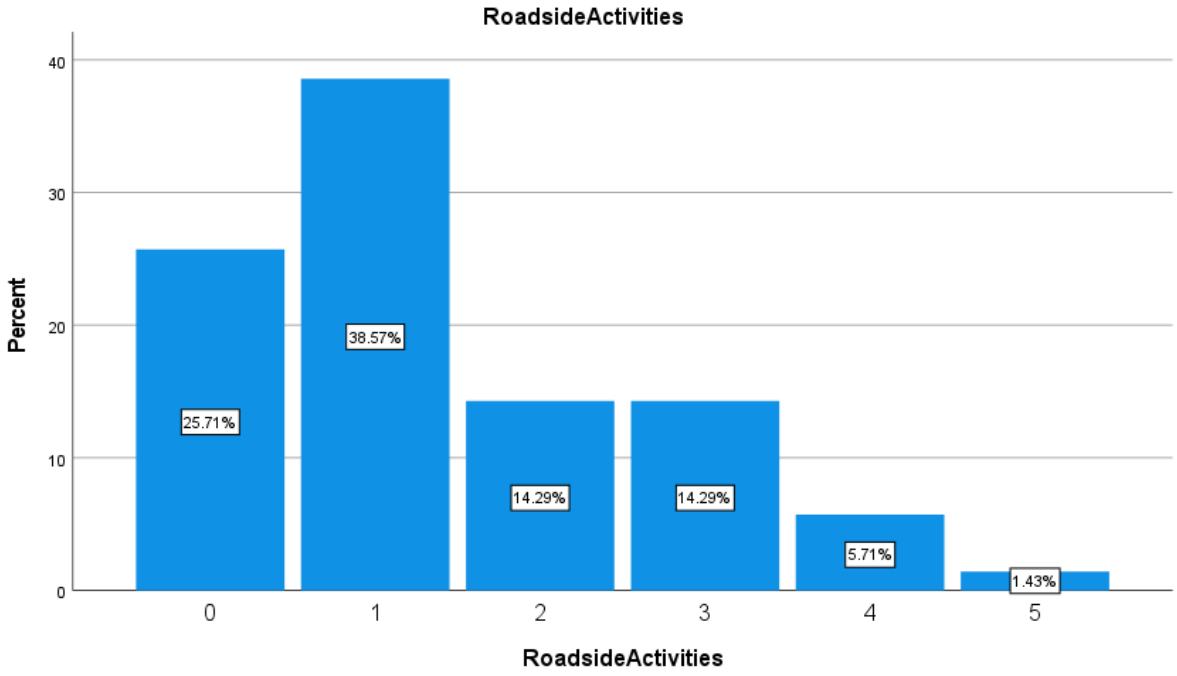


Figure 50 Bar Chart count of Roadside Activities on LHS

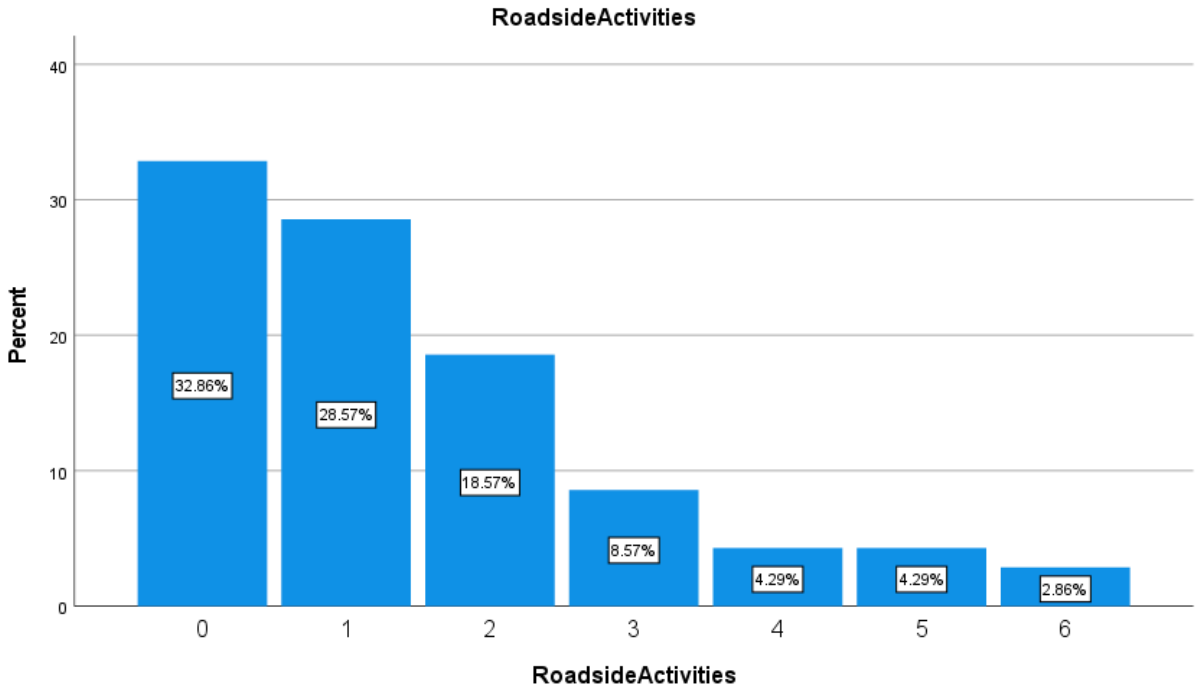


Figure 51 Bar Chart count of Roadside Activities on RHS

Maximum there are 5 activities and minimum is 0. Analysis shows that there are 1.4 activities on an average on LHS which is between 1 and 2. On RHS the average activities are 1.47 which is similar to LHS. Roadside activities signifies the likeliness of vehicles stopping at that location. There might be traffic congestion due to on-street parking on locations with more roadside activities.

6.9 Movement of Animals

Table 12 Frequency of Movement of Animals

Movement of Animals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	6	8.6	8.6	8.6
	N	64	91.4	91.4	100.0
	Total	70	100.0	100.0	

Movement of Animals may cause delay in the journey speed of vehicles and increase the travel time. They might also cause accident in some cases. Only 8.6% on LHS of the stretch has movement of animals which is good. RHS doesn't have any movement of animals.

6.10 Width of Road

Table 13 Width of Road

Width of Road on LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.5	3	4.3	4.3	4.3
	6.0	6	8.6	8.6	12.9
	6.2	8	11.4	11.4	24.3
	6.5	3	4.3	4.3	28.6
	6.6	4	5.7	5.7	34.3

	6.7	3	4.3	4.3	38.6
	6.8	4	5.7	5.7	44.3
	7.0	21	30.0	30.0	74.3
	7.2	18	25.7	25.7	100.0
	Total	70	100.0	100.0	

Width of Road on RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.0	8	11.4	11.4	11.4
	6.5	8	11.4	11.4	22.9
	6.6	8	11.4	11.4	34.3
	6.8	15	21.4	21.4	55.7
	7.0	21	30.0	30.0	85.7
	7.2	2	2.9	2.9	88.6
	7.6	8	11.4	11.4	100.0
	Total	70	100.0	100.0	

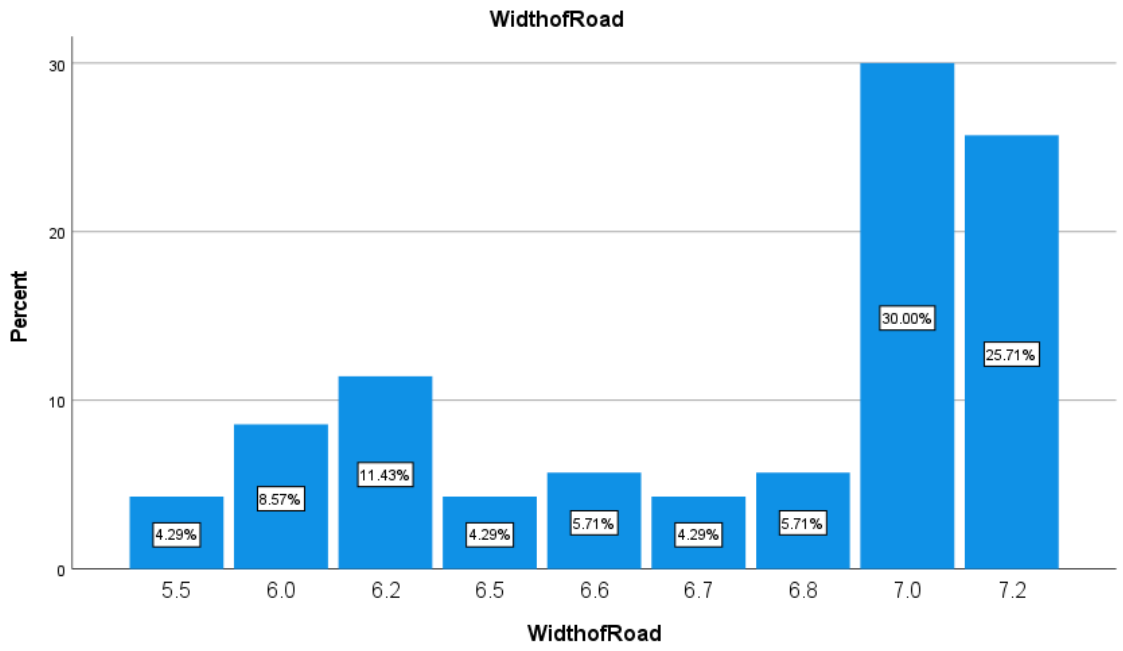


Figure 52 Bar Chart count of Width of Road on LHS

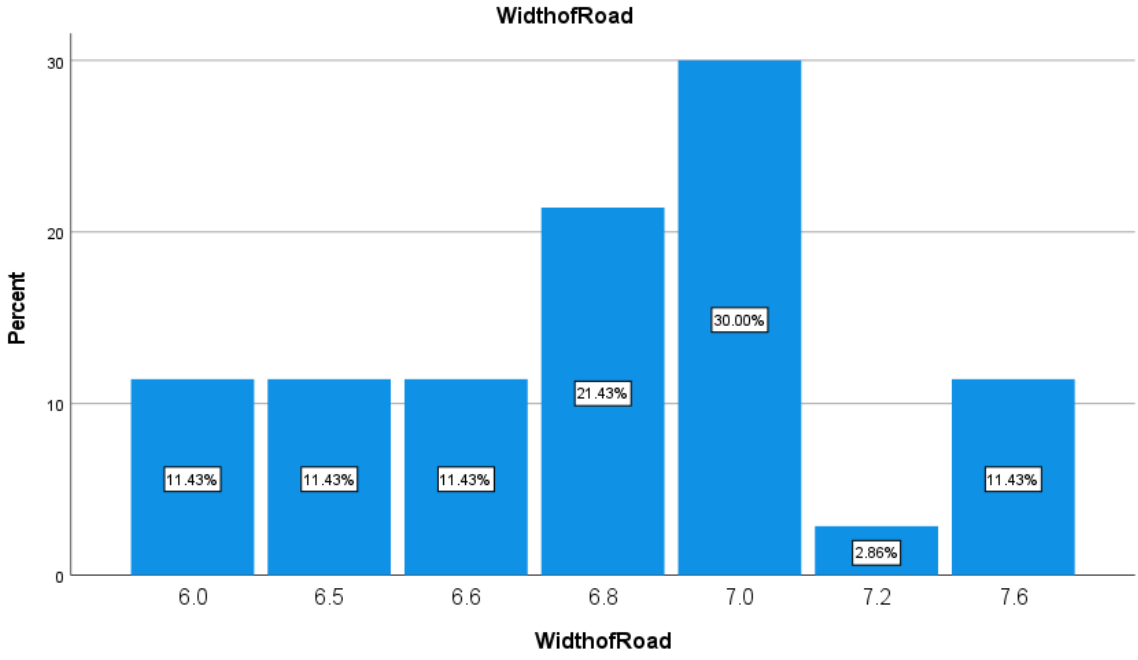


Figure 53 Bar Chart count of Width of Road on RHS

From the analysis it is known that the average width of road is 6.74m on LHS and 6.81m on RHS. Generally the width of road should be 7m. The average width of our road is a little less

than 7m which decreases the carriageway. The lowest width is as less as 5.5m which is considered very poor.

6.11 End Treatments

Table 14 Frequency of End Treatments

End Treatments on LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	6	8.6	8.6	8.6
	N	64	91.4	91.4	100.0
	Total	70	100.0	100.0	

End Treatments on RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	3	4.3	4.3	4.3
	N	67	95.7	95.7	100.0
	Total	70	100.0	100.0	

End Treatments are provided on 8.6% of LHS and 4.3% of RHS of the stretch where ever it was necessary.

6.12 Loose Gravels

Table 15 Frequency of Loose Gravel

Loose Gravel on LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	3	4.3	4.3	4.3

	N	67	95.7	95.7	100.0
	Total	70	100.0	100.0	

Loose Gravel on RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	12	17.1	17.1	17.1
	N	58	82.9	82.9	100.0
	Total	70	100.0	100.0	

Loose gravels decreases the skid resistance of the road and hence it may cause accidents. They are present only on 4.3% on LHS our stretch but 17.1% on RHS.

6.13 Shoulder

Table 16 Frequency of provision of Shoulder

Shoulder on LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	2	2.9	2.9	2.9
	N	68	97.1	97.1	100.0
	Total	70	100.0	100.0	

Shoulder on RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	5	7.1	7.1	7.1
	N	65	92.9	92.9	100.0
	Total	70	100.0	100.0	

Shoulders are provided at the side of the road. They were not provided on the majority of our road stretch.

6.14 Pavement Defects

Table 17 Pavement Defects frequency

Pavement Defects on LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY POOR	5	7.1	7.1	7.1
	POOR	11	15.7	15.7	22.9
	MODERATE	21	30.0	30.0	52.9
	GOOD	32	45.7	45.7	98.6
	VERY GOOD	1	1.4	1.4	100.0
	Total	70	100.0	100.0	

Pavement Defects on RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY POOR	4	5.7	5.7	5.7
	POOR	7	10.0	10.0	15.7
	MODERATE	19	27.1	27.1	42.9
	GOOD	28	40.0	40.0	82.9
	VERY GOOD	12	17.1	17.1	100.0
	Total	70	100.0	100.0	

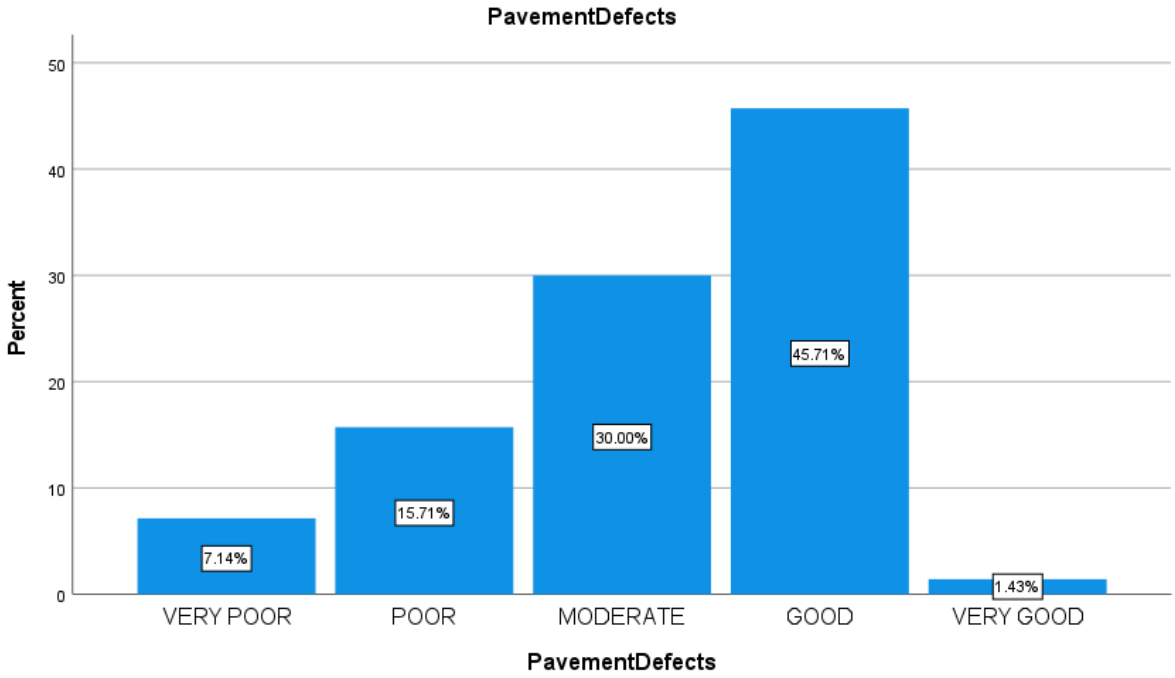


Figure 54 Bar Chart count of Pavement Defects on LHS

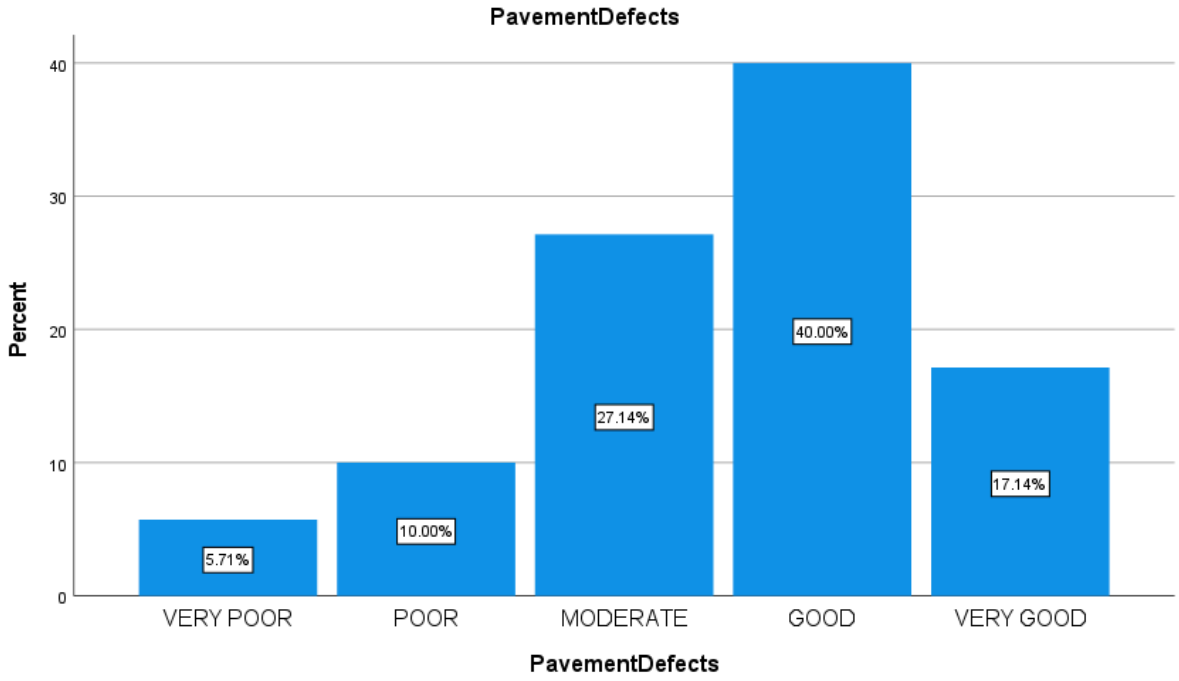


Figure 55 Bar Chart count of Pavement Defects on RHS

Pavement defect was rated on a Likert scale of 1 to 5 where 1 signifies very poor and 5 signifies very good. On LHS, 22.9% of the road is rated poor and very poor, 30% is moderate and 47.1% is good and very good. The average value is 3.19 which is a little better than moderate. On RHS, 15.7% of the road is poor and very poor, 27.1% is moderate and 57.1% is good and very good. On an average the value is 3.53 which is above moderate.

6.15 Gap in Median

Table 18 Frequency of Gap in Median

Gap in Median on LHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	38	54.3	54.3	54.3
	N	2	2.9	2.9	57.1
	N/A	30	42.9	42.9	100.0
	Total	70	100.0	100.0	

Gap in Median on RHS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Y	37	52.9	52.9	52.9
	N	5	7.1	7.1	60.0
	N/A	27	38.6	38.6	98.6
	NA	1	1.4	1.4	100.0
	Total	70	100.0	100.0	

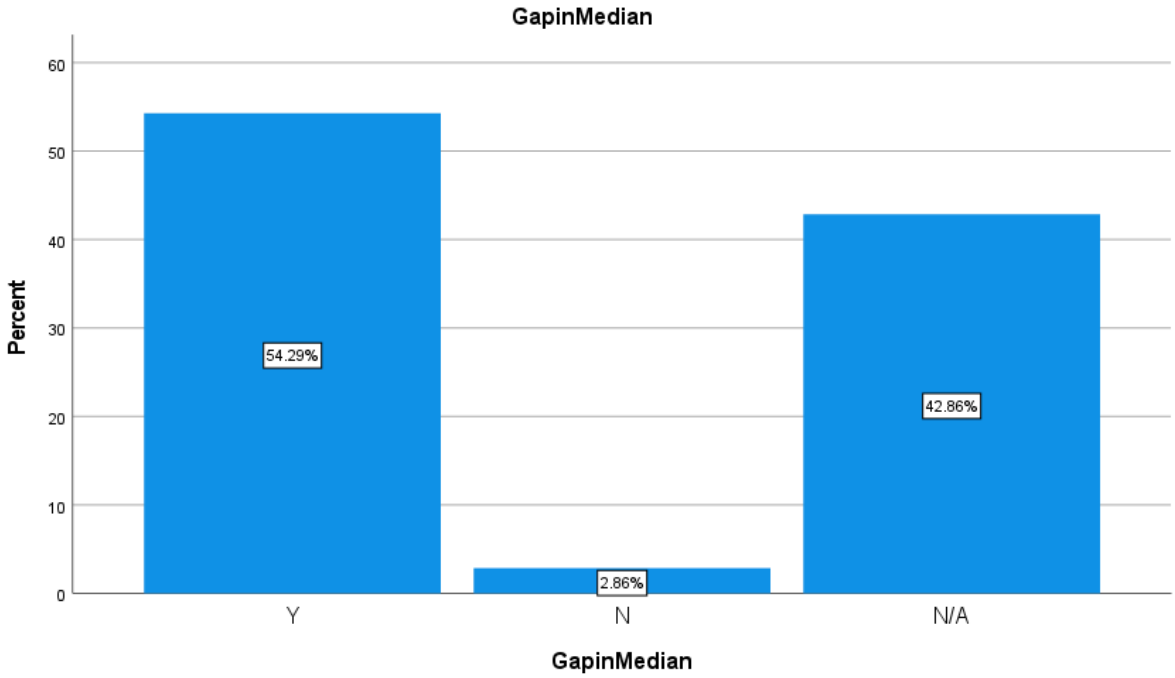


Figure 56 Bar Chart count of Gap in Median on LHS

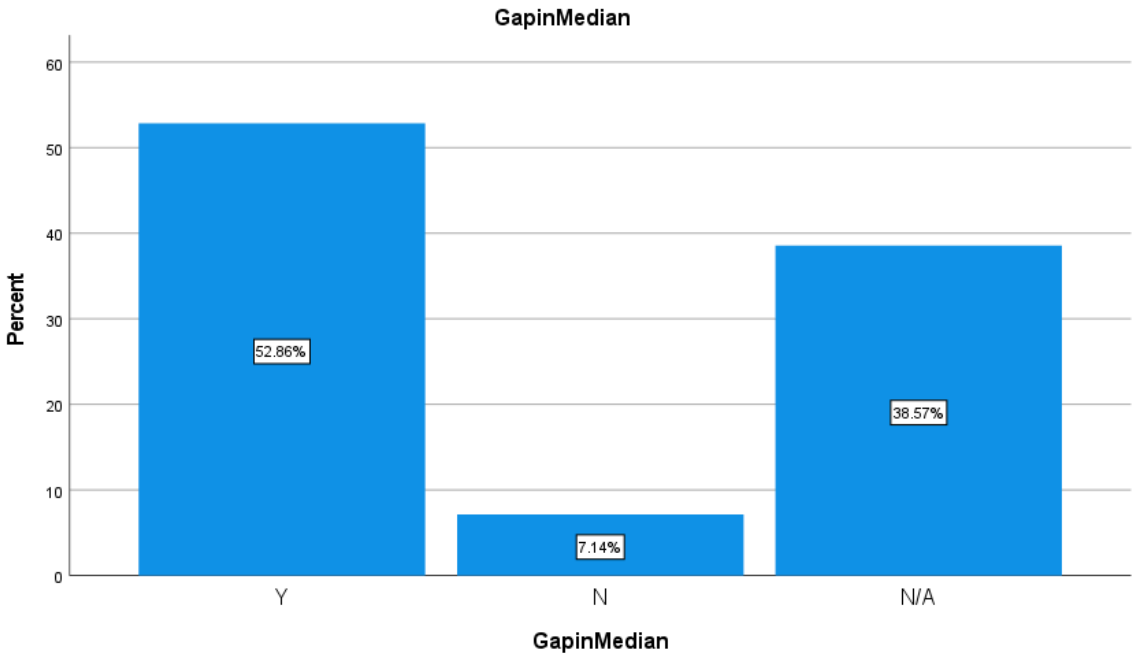


Figure 57 Bar Chart count of Gap in Median on RHS

On LHS, 54.3% times the median was provided where it was necessary but 2.9% times the gap wasn't provided when required. On RHS, 7.14% times the gap was required but wasn't provided. But it can be ignored as it is very less.

6.16 Recommendations

1. On the bridges, the safety barrier should be maintained properly. The gap between rigid and flexible safety barrier should be closed.
2. The proper pedestrian facilities should be installed in sub-urban area and villages along the roadway.
3. Parking of vehicles on the roadway must be restricted and proper parking space should be provide.
4. Provision of the shoulder is required. The places where the edge drop is more, it should be removed by filling of the earthen material.
5. Proper center line and shoulder width should be provided and should be made clearly visible. Proper road markings should be provided to guard the driver.
6. Stacking of the loose material like gravel and sand on the roadway should be cleared which otherwise decreases the skid resistance.
7. At intersections proper signs, markings and channelizing islands should be provided.
8. Broken signs should be replaced with new signs and broken median should be repaired. Median should be provided where there is no median.
9. Separate provision for the cyclists should be provided.
10. Controls and delineators should be provided on the whole stretch for the guidance to driver during night time.
11. Sufficient street lighting should be provided throughout the stretch to avoid accidents during night.
12. Crash barriers should be provided on the road side construction site to avoid crashing of vehicles.
13. Fences should be provided where there is a depression on the side of the road and to avoid covering of the pavement due to growing trees or shrubs.
14. The width of the road should be increased to increase the carriageway capacity.
15. The road should be properly maintained to reduce the defects on the road like potholes, rutting, polished aggregate etc.

7 CONCLUSION

Road surface was not in a good condition. At some places there was a recent overlay but it was not properly done making the surface uneven and creating patches. Fast and risky overtaking maneuvers also results in accidents. The edge drop at the shoulder was high, at some places it was about 25-30 centimeter. This may unsafe road condition for small vehicles like two wheeler, auto rickshaw, etc. The deficiency in road markings and signs were seen, at some places there were no signs and markings provided. At some curves guide signs were provided on the inner edge of the curve where signs were not visible due to plantation. At some places signs were broken. On the some of the minor bridges and culverts, the deficiency observed into safety barriers. There were gaps in safety barriers, at other places broken barriers and at some places safety barriers were not provided. Safety barriers were also not provided at some places were height of embankment was high.

The poor pedestrian facilities were observed on the roadway. Guard rails or fences were not provided to safeguard against the obstruction cause by the haphazardly grown plantation. In village areas poor condition of the guard rails were observed. At some places slow moving and poorly parked vehicles were observed which may cause accidents. Due to absence of shoulder width vehicles were parked or stop haphazardly causing obstruction to the moving vehicles. At many junctions signs and markings were absent. There were also improper approach width and absence of channelizing islands. Unmaintained median opening and width, at some places medians were broken making turning maneuvers difficult and risky. At many places haphazard parking of the vehicles causes visibility problems for the approaching vehicles and also reduces lane width.

At some places vehicles moving on the wrong side were observed which may cause head on collision between vehicles. There were stacking of the loose construction material on the road side without any warning signs which reduces lane width and may also cause night accidents. There were also stacking of garbage on the road side reducing lane width and making overtaking operation risky. There were no protection provided of crash barriers around the construction site in progress on the road side. Except few places center line and shoulder width were not provided and at some places center line was not clearly visible. The lane width was less than the

recommended width i.e.7m. There were potholes on the roadway which may cause night accidents.

AUDIT STATEMENT

Many aspects regarding road safety were considered while performing Road Safety Audit. Out of them, a few aspects like Visibility and Readability by drivers are fulfilled completely whereas aspects like provision of lane for cyclists and control and delineators are not fulfilled at all. All other aspects are analyzed and discussed in this report. The pavement condition of this road stretch needs to be improved as soon as possible. Provision of street lighting must be ensured on the whole stretch as it is very vital for night driving.

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