A Case Study of Black Spots at Amravati City and Proposal of Mitigation Measures.

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Abstract: A case study at, "Amravati Welcome point to Badnera Y point" which is around 15km. The annual, monthly, hourly variation of accident rate on the road and vehicles involved in fatalities have been presented. The route is divided into 5 stretches. 1st stretch is from "Welcome point Amravati to Irwin Square", 2nd stretch is from "Irwin square to Rajapeth police station", 3rd stretch is from "Rajapeth police station to Sai Nagar", 4th stretch is from "Sai Nagar to Old Town Badnera", and 5th stretch is from "Old Town Badnera to Badnera Y point". The stretch is around 15 km from "Welcome Point Amravati to Badnera Y Point". In this stretch maximum number of accidents occur at 1st, 2nd and 3rd stretch where 4th and 5th stretch is having less numbers of accidents as compare first 3 stretches. Finding out the reasons/causes for those accidents and to suggest mitigation measures in order to reduce accidents and if possible, to eliminate the causes which contribute to the accidents. In this study it is mention that why accidents occur on those places reasons of accidents and suggest mitigation measures to reduce accidents in those stretch. The present work deals with the study of BLACK SPOTS in Amravati city by collecting past Five-year First Investigation Reports from Amravati City Police station and Badnera police station to analysed the major causes for accidents on the selected stretch. Due to this we get to know the numbers of accidents and reasons of accidents are mention and preventive mitigation measures also given in this study.

IndexTerms - Black spots, Stretch, Mitigation measures

I INTRODUCTION

Road network of a country is one of the most important factors responsible for the economic and social development of that country. India has a high population and requires a large amount of transportation services like air, land and water transportation. Road network is the only means of transportation which has deep penetration in all areas and responsible for door-to-door service. Road safety is an issue of national concern, considering its magnitude and gravity and the consequent negative impacts on the economy, public health and the general welfare of the people. Today, Road Traffic Injuries are one of the leading causes of deaths, disabilities and hospitalizations, with severe socioeconomic

costs, across the world. Hence it is very important to increase and maintain the road network of our country. Maharashtra is one of the fastest growing states in India. In this study we are going to see the accident rate due to black spot in Amravati city. In Amravati city we have consider 5 stretch to check the accidents at those stretch. 1st stretch is from "Welcome point Amravati to Irwin Square", 2nd stretch is from "Irwin square to Rajapeth police station", 3rd stretch is from "Rajapeth police station to Sai Nagar", 4th stretch is from "Sai Nagar to Old Town Badnera", and 5th stretch is from "Old Town Badnera to Badnera Y point". The stretch is around 15 km from "Welcome Point Amravati to Badnera Y Point". In this stretch maximum number of accidents occur at 1st, 2nd and 3rd stretch where 4th and 5th stretch is having less numbers of accidents as compare first 3 stretches. Finding out the reasons/causes for those accidents and to suggest mitigation measures in order to reduce accidents and if possible, to eliminate the causes which contribute to the accidents.

II   OBJECTIVES OF STUDY

1. Identification of black spot on selected road.

2. Visual survey is determined at the black spot to identify the causes for the accident.

3. Detailed analysis of top ranked black spots.

4. Suggesting mitigation measures to reduce accidents.

1.   ROAD SELECTED FOR STUDY

Two-lane road of about 15 Km from Amravati Welcome Point to Badnera Y point Road was chosen for this study. The road was divided into five stretches. The following stretches were selected for data collection.
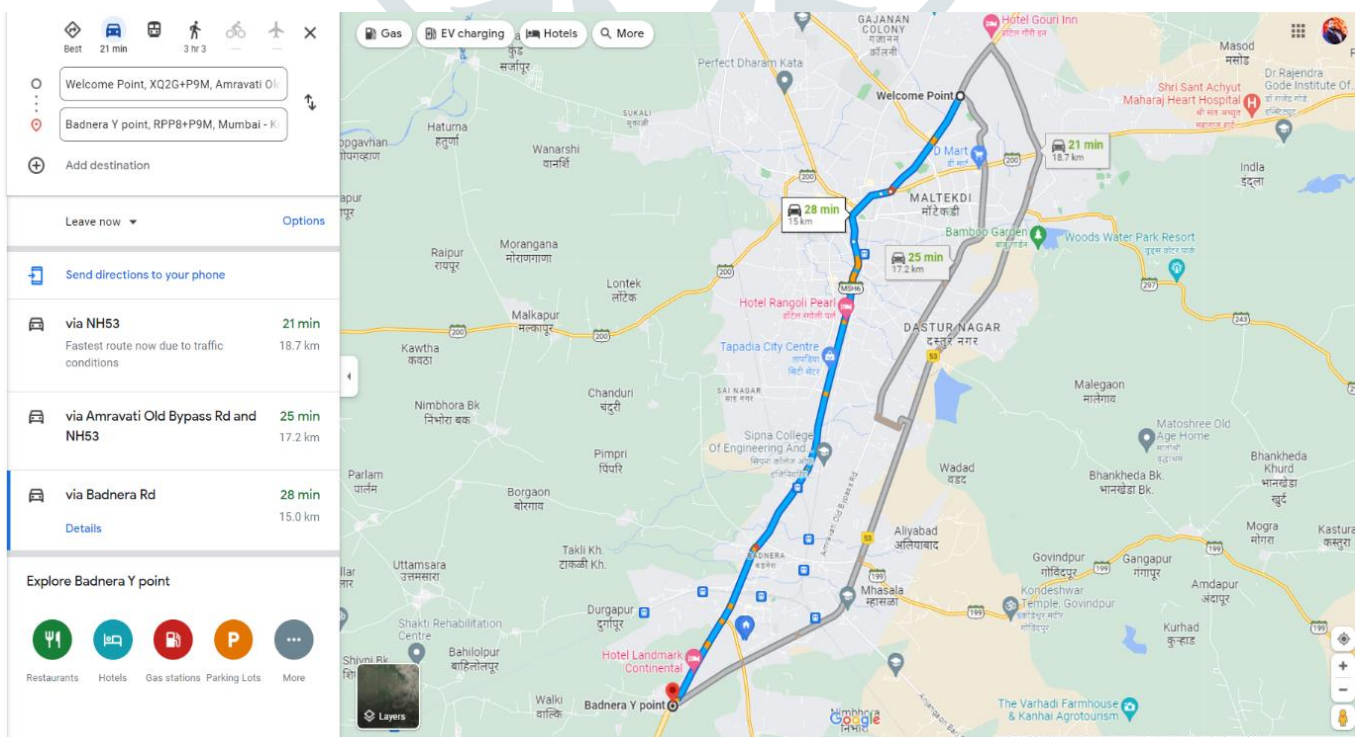
Stretch 1 – Amravati Welcome Point to Irwin Square.
Stretch 2 – Irwin Square to Rajapeth Police Station.
Stretch 3 – Rajapeth police station to Sai Nagar.
Stretch 4 – Sai Nagar to Old Town Badnera.
Stretch 5 – Old Town Badnera to Badnera Y point Road.

Fig. 1: Road selected for study

1.1. Stretch 1 – Amravati Welcome Point to Irwin Square

The route from Amravati welcome point to Irwin square consist of three black spot due to which more accident occurs. This black spot is having crossings, hidden areas, less wide road, road side shop, overcrowded area due to colleges, traffic signals etc. due to which accidents occur at this place.
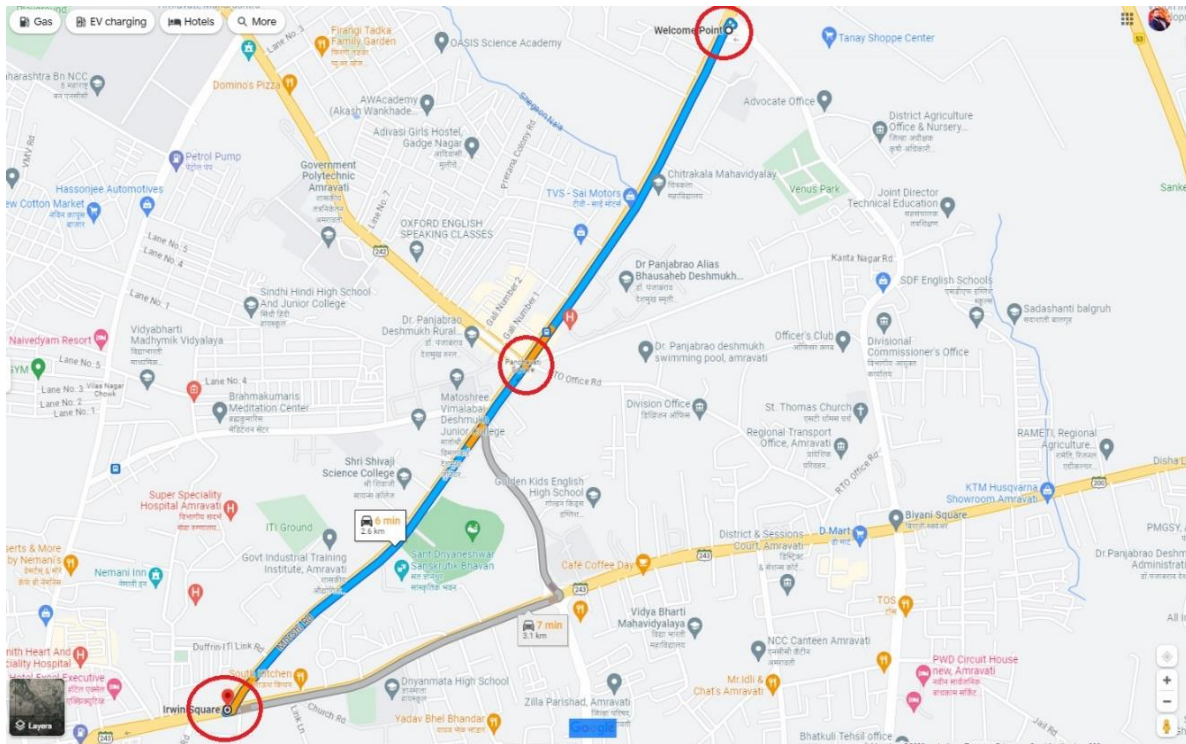

Fig. 2: Stretch 1 – Amravati Welcome Point to Irwin Square Google Map

1.2. Stretch 2 – Irwin Square to Rajapeth Police Station

The Stretch is from Irwin square to Rajapeth police station. In this Stretch the accidents occur due to over crowed, Road side shop, less wide road, Rush due Government hospital at this stretch, traffic signal, flyover which is having extra curvature due to which accidents occur. Now on that curvature barricades are install to reduce accidents. Also install speed breakers on flyover to reduce vehicle speed. This stretch is overcrowded due to market place of food, vehicle, mobile, cloths, due to which lots of accidents occur in this stretch.
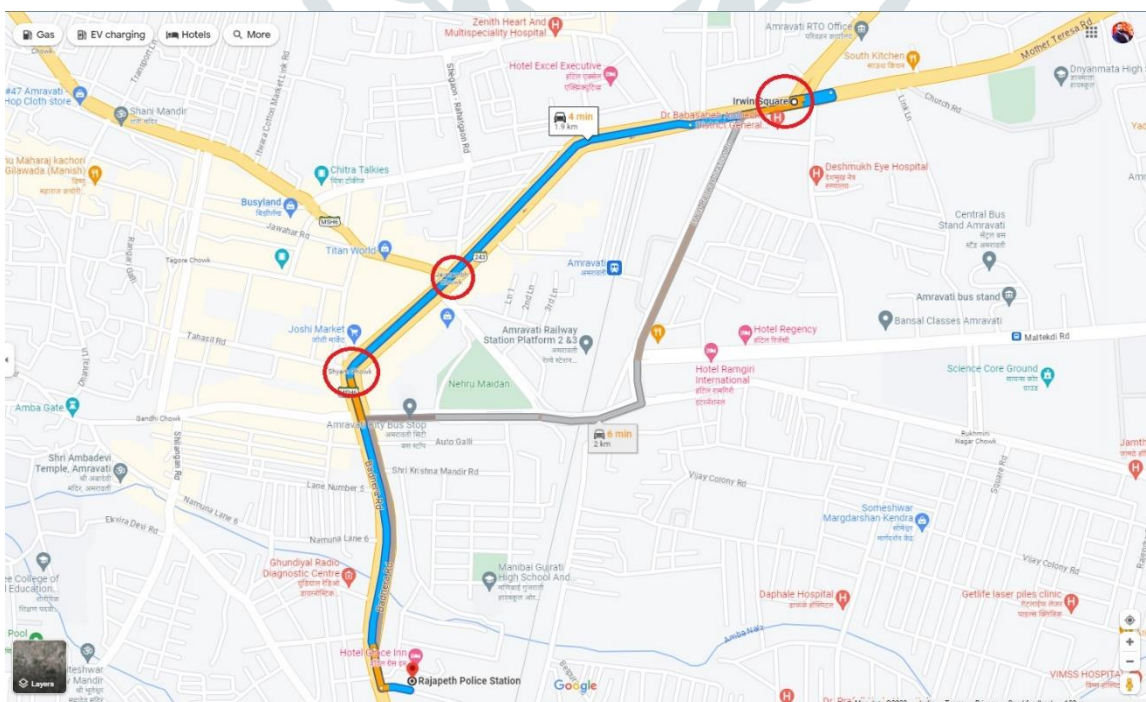

Fig. 3: Stretch 2 – Irwin Square to Rajapeth Police Station Google Map

1.3. Stretch 3 – Rajapeth police station to Sai Nagar

Rajapeth police station to Sai Nagar This black spot is having crossings, hidden areas, less wide road, road side shop, overcrowded area due to colleges, traffic signals etc. due to which accidents occur at this place. Now on this stretch new shopping mall like Tapadia city mall, D Mart, food stalls at road side due to which there is no extra widening of road available for transportation due to which there is rush at Gopal Nagar area on this route lots of crossings are present due to which accidents occur.
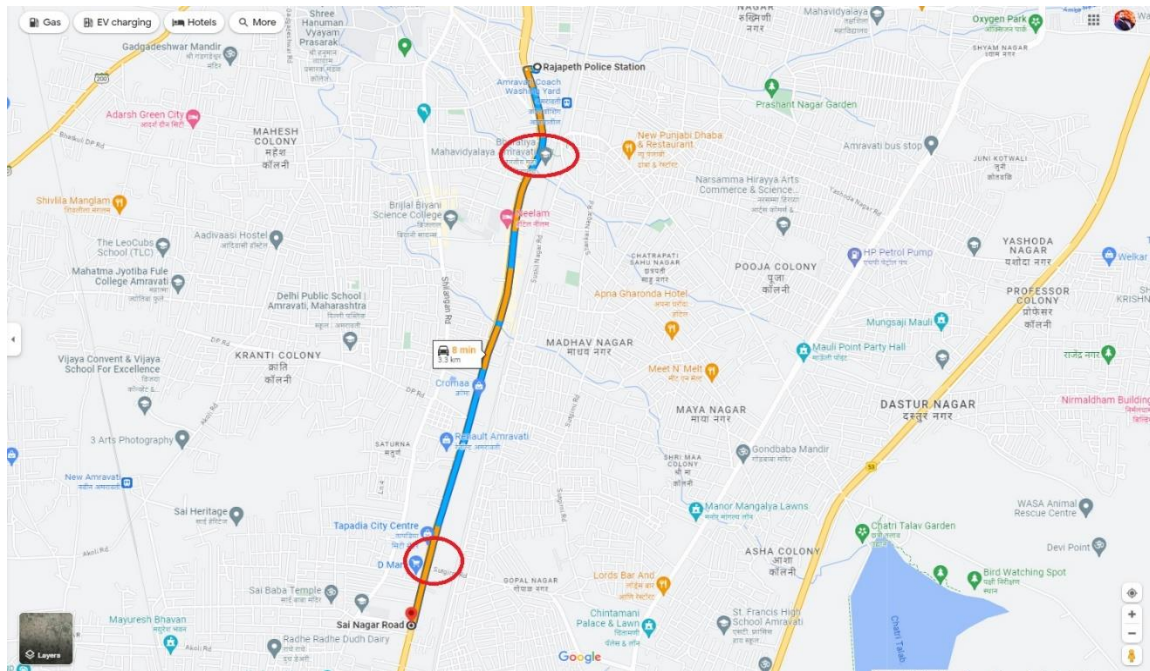

Fig. 4: Stretch 3 – Rajapeth Police Station to Sai Nagar Google Map

1.4. Stretch 4 – Sai Nagar to Old Town Badnera

The stretch from the Sai Nagar to Old Town Badnera is not that busy route. In this stretch less accident occurs. This route is having less rush because it is not that much developed as compare to previous stretch. There are less shops near road side there is enough road side and on this stretch less accident occur. There are few T junction on main road due to which sometimes accidents occur. From Old town Badnera to old town flyover cement concrete 4 lane road is constructed due to which extra widening is provided to this road and the result is less accident.
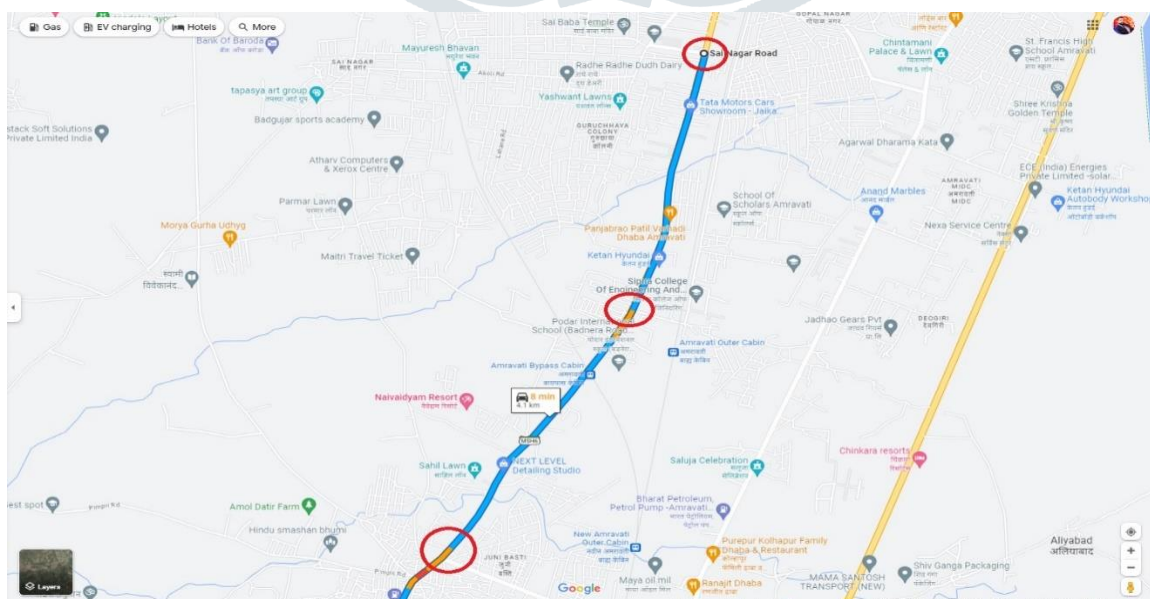

Fig. 5: Stretch 4 – Sai Nagar to Old Town Badnera Google Map

1.5. Stretch 5 – Old Town Badnera to Badnera Y point Road

The stretch from Old Town Badnera to Badnera Y point Road consist of lots of T-junction on main road. There are some black spot presents on this route. Badnera is Railway junction due to which every train stop at junction and lots of passenger from Amravati travel from Badnera to Amravati via auto rickshaw. Auto rickshaw stand are on road side it will create traffic. There are some crossing junctions are present on this route. On crossing there is no traffic light everyone breaks traffic rule due to which lots of accidents occur.
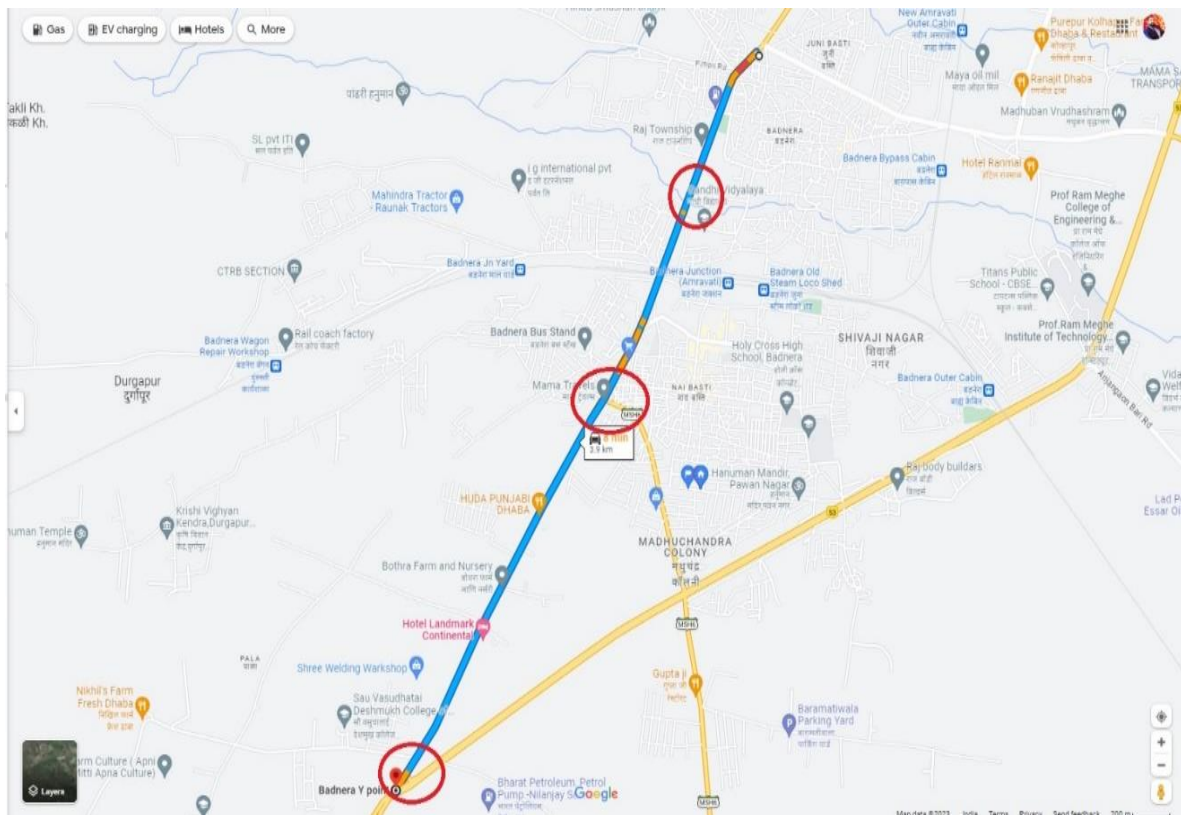

Fig. 6: Stretch 5 – Old Town Badnera to Badnera Y point Road Google Map

2. CASE STUDY AND DATA COLLECTION

2.1 Data Collection

The information available for accident studies is the FIR (First Information Report) lodged in the police stations. The data from these records of last eleven years (2017-2022) were extracted from the FIR record filed under IPC no.279/337/338/304 (A). Vehicles those involved in accidents and reported in the F.I.R with the details of accident. Traffic volume count survey is done for total traffic on stretch.

2.2 Annual Variation in Accidents

The annual variation in accidents of total stretches during year 2018-2022. It is observed that percentage accidents are increasing in most of the year. In the year 2018 accident rate was high and low in the year 2020-2021 due to Covid-19. Increase in accidents may be due to increase in number of vehicles, increase in population, bad traffic environment etc.

Table 2.1: Traffic Volume Count of Total Stretch

Sr.No.	Location	Total Traffic Count	Ranking
1.	Rajkamal Square	34214	1
2.	Rajapeth Square	33838	2
3.	Irwin Square	25687	3
4.	Nawathe Square	16954	4
5.	Gopal Nagar	15655	5
6.	Welcome point	10388	6
7.	New Town Badnera	8659	7
8.	Old Town Badnera	7607	8
9.	Sai Nagar	6639	9

Table 2.2: Annual Variation in Accidents

Years	2018	2019	2020	2021	2022	Total
Stretch-1 (S1)	19	15	7	6	12	59
Stretch-2 (S2)	23	17	5	9	17	71
Stretch-3 (S3)	15	13	3	7	14	52
Stretch-4 (S4)	18	9	1	3	6	37
Stretch-5 (S5)	12	11	0	1	8	32

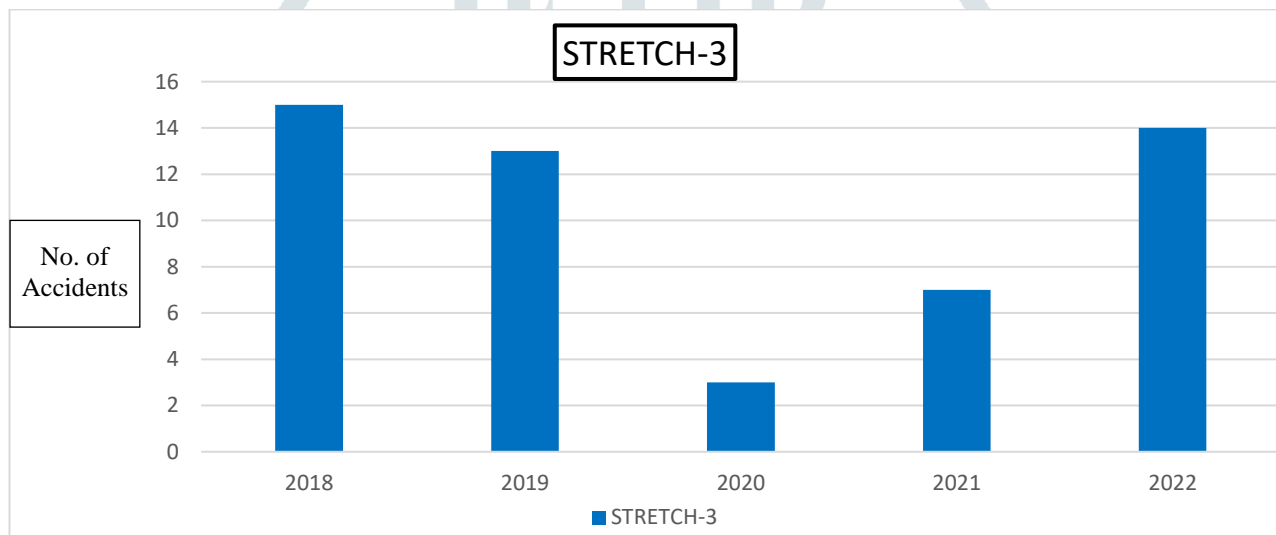**Graph 2.1: Annual Variation in Accidents on Stretch-1**
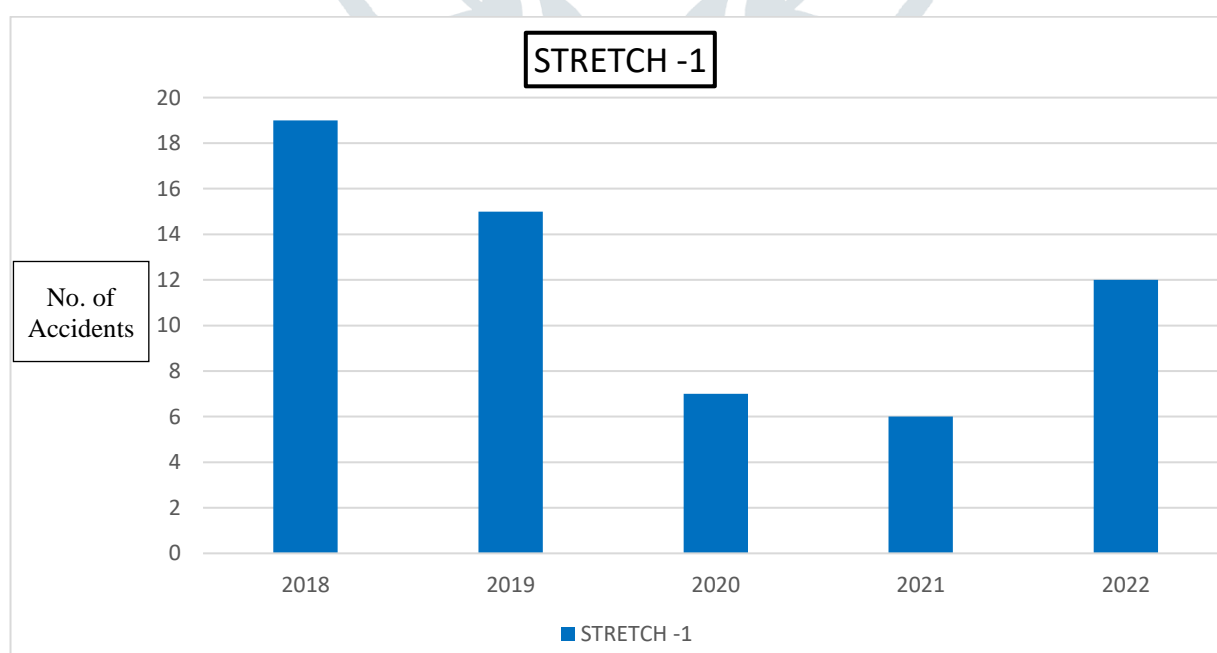
Graph 2.1: Annual Variation in Accidents on Stretch-1

Graph 2.2: Annual Variation in Accidents on Stretch-2
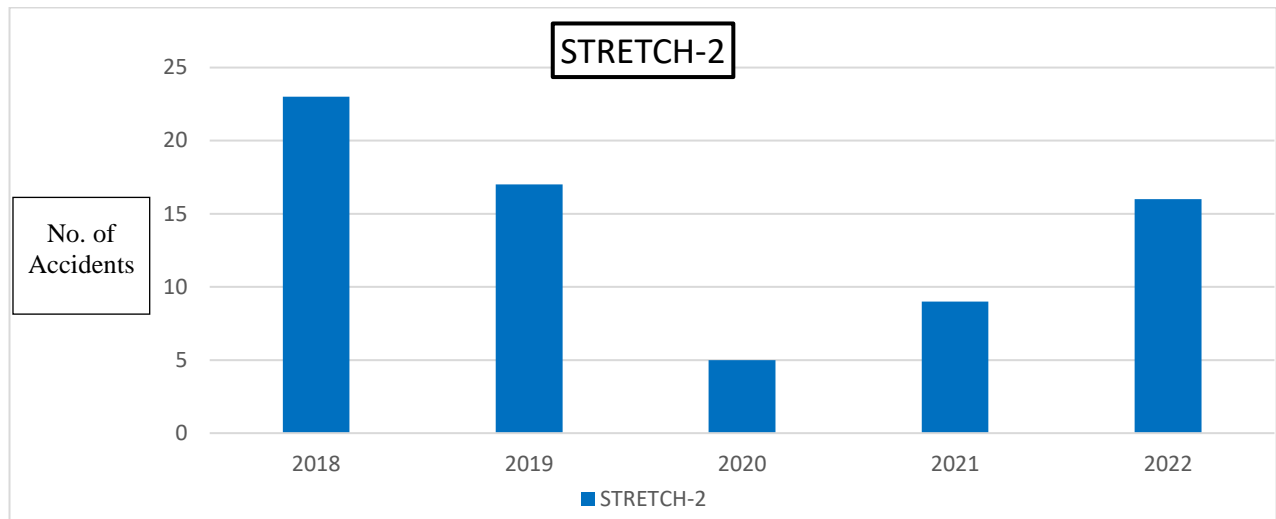
Graph 2.2: Annual Variation in Accidents on Stretch-2

Graph 2.3: Annual Variation in Accidents on Stretch-3

Graph 2.3: Annual Variation in Accidents on Stretch-3
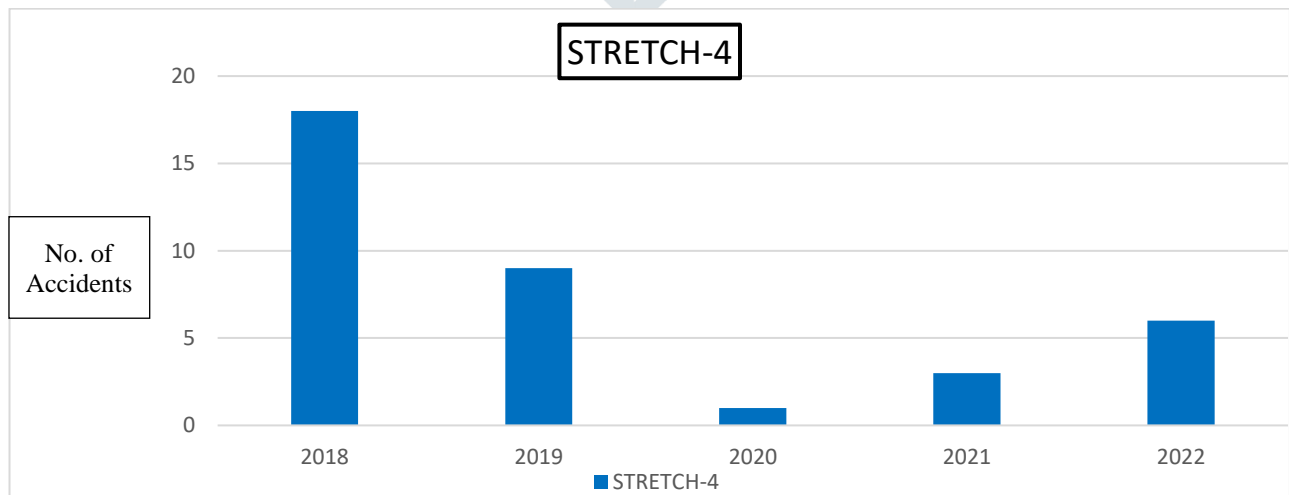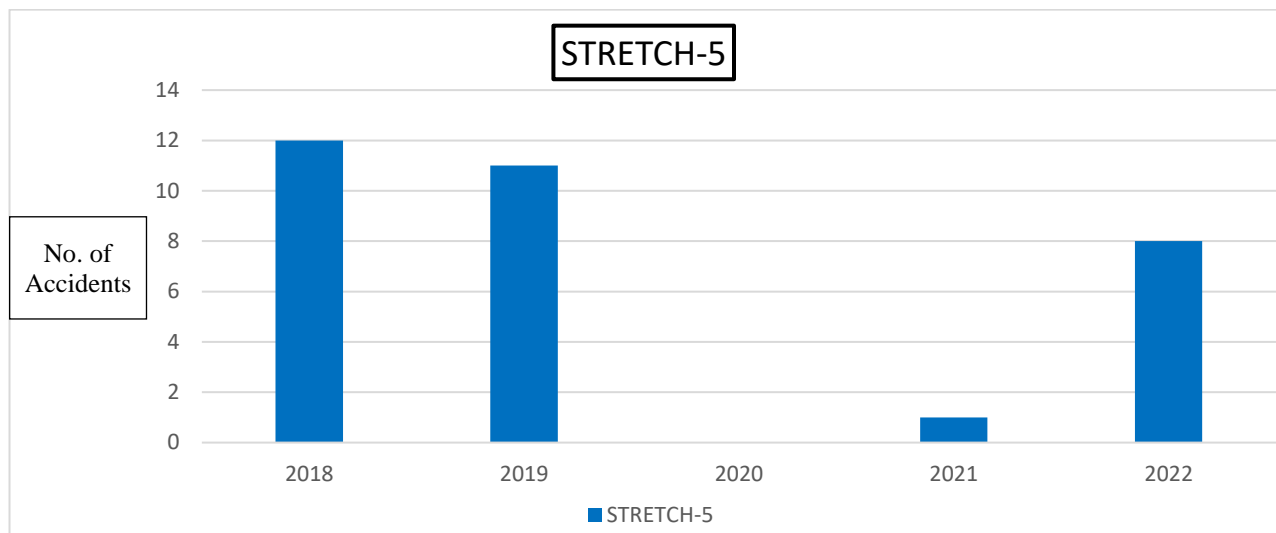
Graph 2.4: Annual Variation in Accidents on Stretch-4

Graph 2.4: Annual Variation in Accidents on Stretch-4

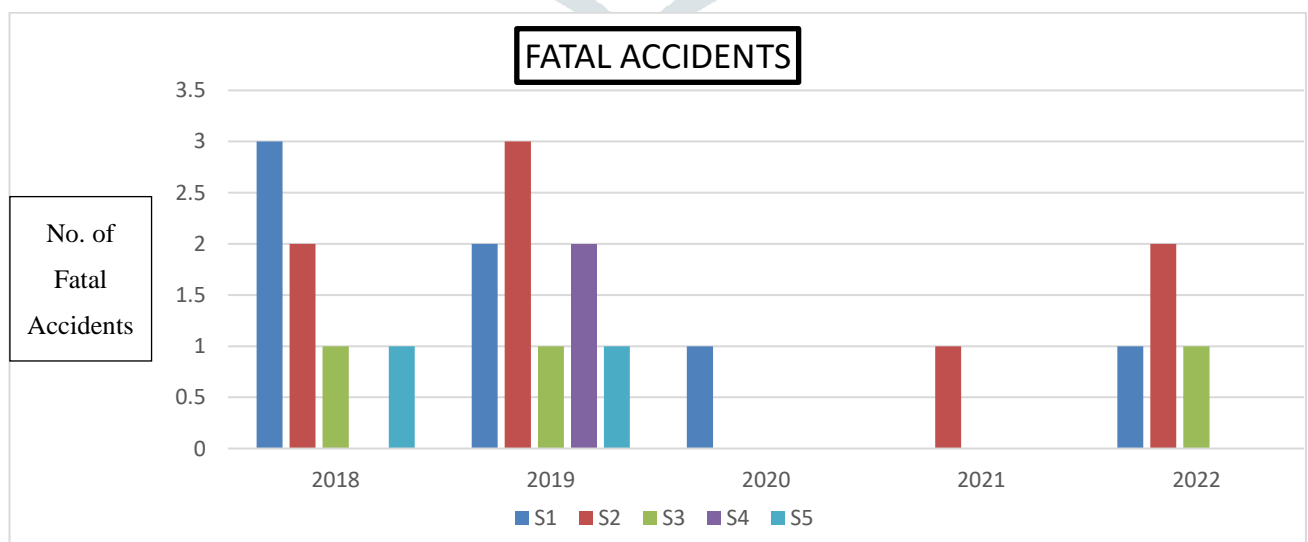**Graph 2.5: Annual Variation in Accidents on Stretch-4**

Graph 2.5: Annual Variation in Accidents on Stretch-4

Table 2.3: Details of Accidents on Stretches

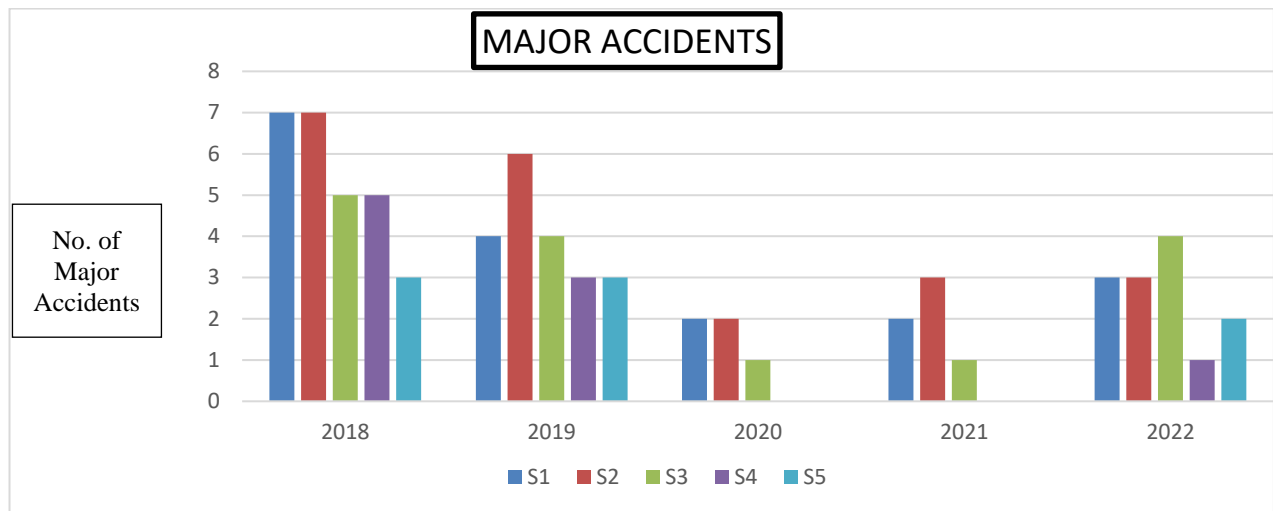| YEAR	FATAL					MAJOR					MINOR				
	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5	S1	S2	S3	S4	S5
2018	3	2	3	3	1	7	7	5	5	3	9	14	7	12	8
2019	2	3	1	2	1	4	6	4	3	3	9	8	8	4	7
2020	1	0	0	0	0	2	2	1	0	0	4	3	2	1	0
2021	0	1	0	0	0	2	3	1	0	0	4	5	6	3	1
2022	1	2	1	0	0	3	3	4	1	2	8	11	9	5	6

Graph 2.6: Fatal Accidents
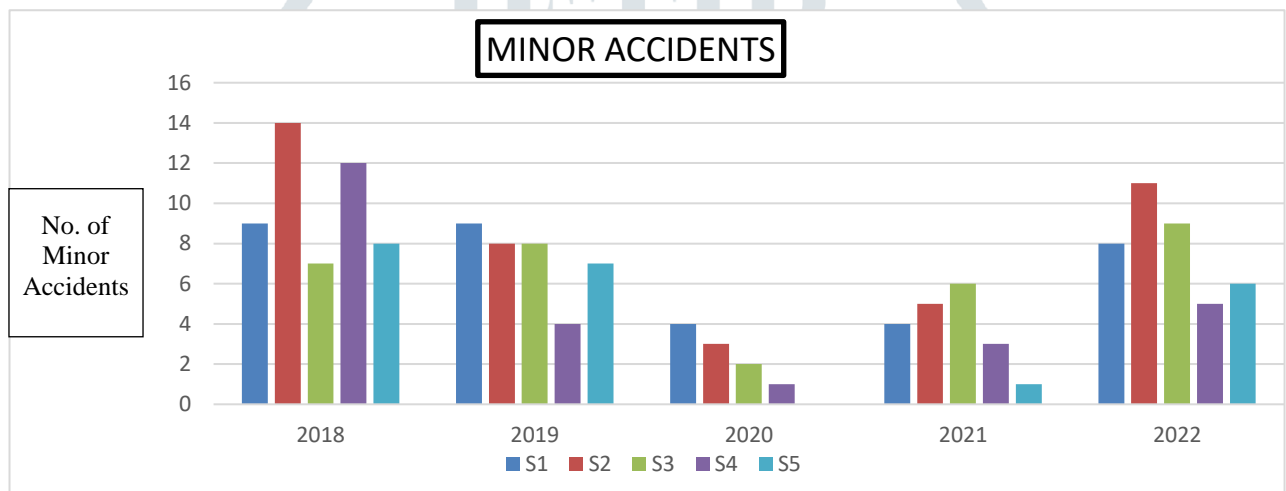

Graph 2.6: Fatal Accidents

Graph 2.7: Major Accidents

Graph 2.7: Major Accidents

Graph 2.8: Minor Accidents

Graph 2.8: Minor Accidents

2.3 Accident Rate

Accident Rate $= M/L$

Where, M= Total no of Accidents of a stretch.

L= Length of Road.

Table 2.4: Accident Rate from 2018 to 2022

Years	2018	2019	2020	2021	2022	Accident Rate
Stretch-1 (2.6km)	19	16	4	7	13	**59/2.6=22.69**
Stretch-2 (2.2km)	23	17	5	9	17	**71/2.2=31.81**
Stretch-3 (3.4km)	15	13	3	7	14	**52/3.4=15.29**
Stretch-4 (4.9km)	18	9	1	3	6	**37/4.9=7.55**
Stretch-5 (4.4km)	12	11	0	1	8	**32 /4.4=7.27**

Table 2.5: Ranking Position of Black Spot

Stretch	Location	Black Spot Ranking
Stretch-2	Irwin Square to Rajapeth Police Station	1
Stretch-1	Amravati Welcome Point to Irwin Square	2
Stretch-3	Rajapeth police station to Sai Nagar	3
Stretch-4	Sai Nagar to Old Town Badnera	4
Stretch-5	Old Town Badnera to Badnera Y point Road	5

3. RESULTS AND DISCUSSIONS

Based on the analysis of this project it is found that Stretch 1, 2 and 3 is having more numbers of accident as compare to stretch 4 and 5. Stretch 1, 2 and 3 is very populated and congested areas due to which lots of accidents occur.

Table 3.1: Black Spot at Stretch-1

Black Spot Location	Problems	Safety Enhancement
Welcome Point	• Private buses and auto stand cover most of the road side. • No Speed limit. • Divider is not provided. • Parking of vehicles on shoulder.	• As per IRC 99:1988 Speed Breakers Provided. • As per IRC 67:2010 Speed limit Sign Board Should Provide. • As per IRC 86:1983 Provide Divider Minimum Width 1.2m.
Panchavati Square	• Crossing cause accidents. • Speed limit is not set. • Speed breaker is not before signal. • Pedestrians required	• As per IRC 103:2022 Provide Pedestrians Facilities. • IRC 65:1976 Provide traffic rotary to regulate traffic automatically • As per IRC 99:1988 Speed Breakers Provided. • As per IRC 67:2010 Speed limit Sign Board Should Provide.
Irwin Square	• Crossing at Irwin square cause accident • Over speeding and drunken driving led to accidents particularly during the night time at this stretch.	• Rotary Intersection required at Irwin square. • As per IRC 99:1988 Speed Breakers Provided. • As per IRC 103:2022 Provide Pedestrians Facilities.

Table 3.2: Black Spot at Stretch-2

Accident Location	Problems	Safety Enhancement
Cotton Market Crossing	• Cotton market Y intersection causes accidents at this location • Parking of vehicles on shoulder • Speed breaker is not there • Speed limit is not set.	• IRC Code 86:1983 Provide Divider Minimum Width 1.2m Road Junction Improvement, • IRC Code 99:1988 Speed Breakers Provide. • IRC Code 67:2010 Speed limit Sign Board Should Provide
Shyam Chowk	• Wrong side crossing of vehicle. • Traffic rotary intersection not given • No sign boards • No speed limit	• IRC 65:1976 Provide traffic rotary to regulate traffic automatically • IRC 67:2010 Mandatory Warning and Informative Sign Board • IRC 99:1988 Speed Breakers Provided
Rajkamal	• Over speeding and drunken driving led to accidents particularly during the night time at this stretch. • Over speeding, Road side parking.	• IRC 99:1988 Speed Breakers Provided Required. • Provide the zebra crossings for the safe crossing of the pedestrians.

Table 3.3: Black Spot at Stretch-3

Accident Location	Problems	Safety Enhancement
Rajapeth	• Use of Road Shoulder for Parking. • Over speeding and drunken driving led to accidents • Narrow flyover and stiff landing at Rajapeth flyover.	• IRC Code 99:1988 Speed Breakers Provided • Restrict Road side parking. • IRC 35:1997 Road marking with paint • IRC 99:1988 Speed Breakers Provided
Gopal Nagar	• Over speeding, Road side parking at D-Mart and Tapadia Mall • Railway crossing cause traffic jams. • Trucks play a major role for accidents in this area.	• IRC 99:1988 Speed Breakers Provided • Underpass required at Gopal Nagar railway crossing. • IRC 103:2012 Provide Pedestrians Facilities. • IRC 67:2010 Speed limit Sign Board Should Provided

Table 3.4: Black Spot at Stretch-4

Accident Location	Problems	Safety Enhancement
Sai Nagar	• Buses and auto stand cover most of the road side. • Parking of vehicles on shoulder's • Use of Road Shoulder for Parking.	• IRC 103:2012 Provide Pedestrians Facilities Clearance required • IRC 67:2010 Speed limit Sign Board Should Provide. • IRC 99:1988 Speed Breakers Provided
Old Town Badnera	• Over speeding, Road side parking. • Wrong side crossing of vehicle. • Over speeding and drunken driving led to accidents • Trucks play a major role for accidents in this area. • Road Potholes leads to accidents	• IRC 103:2012 Provide Pedestrians Facilities • IRC 67:2010 Mandatory Warning and Informative Sign Board. • IRC 35:1997 Road marking with paint Remove or Repair Road Potholes.

Table 3.5: Black Spot at Stretch-5

Accident Location	Problems	Safety Enhancement
Gandhi Chowk	• Private buses and auto stand cover most of the road side. • Crossing makes confusion to driver • No rotary intersection	• IRC 65:1976 Provide traffic rotary to regulate traffic automatically • IRC 35:1997 Road marking with paint.
Badnera Railway Bridge	• Less carriageway of Badnera railway flyover • Provide the zebra crossings for the safe crossing of the pedestrians.	• Provide extra widening to Badnera railway flyover • IRC 103:2012 Provide Pedestrians Facilities
Yavatmal Y Point	• Speed breaker required before Stiff turning of Yavatmal Y junction • Rotary intersection required at Yavatmal Y point	• IRC 99:1988 Speed Breakers Provided • IRC 65:1976 Provide traffic rotary to regulate traffic automatically
Badnera Y Point	• Crossing at Badnera Y point makes confusion to Nagpur Mumbai Highway Drivers	• Speed breaker required for speed limit • Provide Flyover at NH 3 to avoid drivers confusion of Nagpur Mumbai Highway

CONCLUSION

1)   According to the **Ranking Position of Black Spot from Table 2.5**, on **1st Ranking is Stretch-2, 2nd is Stretch-1, 3rd is Stretch-3, 4th is Stretch-4 and 5th is Stretch-5.**

2)   **Stretch 2nd** has **71** numbers of accidents in which **Irwin Square, Cotton Market Road, Shyam Chowk, Rajkamal Square are black spot on stretch 2nd.** The accident rate can be decreased by road side clearance, junction improvement, and proper maintenance of shoulders and **IRC recommendation implementation of rotary intersection at Irwin Square** can help in reduction of accidents on **2nd stretch**. Speed limit should be brought down by providing speed breakers near accident spots. Providing Off-street parking facility.

3)   **Stretch 1st** have **59** numbers of accidents in which **Welcome point, Panchavati Square, Irwin Square are black spot on stretch 1st.** The accident rate can be reduced by providing speed breakers, signalized junction, junction improvement, and shoulder Clearance, shifting of poles, installation of humps, removal of trees near the edge of pavement etc.

4)   **Stretch 3rd** have **52** numbers of accidents in which **Rajapeth Square, Gopal Nagar are black spot on stretch 3rd.** Accidents can be minimized by clearing-off shoulders, reducing speed limit, junction improvement, providing the medians, improving road condition, providing underpass at Gopal Nagar Railway crossing.

5)   **Stretch 4th** has **37** numbers of accidents in which **Sai Nagar, Old town Badnera are black spot on stretch 4th.** Speed limit reduction near junction should be provided to prevent accidents. Provide speed breakers to reduce speed.

6)   **Stretch 5th** has **32** numbers of accidents in which **Gandhi Square, Badnera railway flyover, Yavatmal Y Point, Badnera Y point are black spot at stretch 5.** Provide flyover at Badnera y point on NH6 for ease of Highway user. Provide extra widening Proper lighting should provide on this stretch from Akola Road to Badnera y point.

7)   **In this study it is found that more numbers of accidents occur at stretch 1st, 2nd and 3rd where 4th and 5th stretch is having less numbers of accidents as compare first 3 stretches.**

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