

## Analysis of Black Spots on NH-3 and Its Rectification

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### Abstract

*This study based on the road safety and detailed study of black spot. National Highways accounts for a considerable percentage of these accidents foremost to massive economical loss and exaggerated the development of the country. Main aim of this paper to Identification of black spot and detailed studies for Analysis of Black Spots and its Rectification. In this study, the techniques and methods that are used for Selection of project study stretch (where high accidents occurred), accident data collection system, Bifurcation of data for better observation, analysis of black spots and black zones are included. Identification of black spot on the basis of several identification methods which are concluded in this paper. Also, it includes some techniques that are used to profile these accident locations and the use of before and after studies to estimate the effect of treatment on the Black spots zone. Methodology of rectification on the basis of short term measures, long term measures, mitigation measure, or improvement of geometric design which is depended on existing road condition are concluded in this paper.*

**Keywords:** Accidents, accident causes, black spot identification, black spot rectification

### INTRODUCTION

The India is a developing country & Road Infrastructure is growing rapidly. India is having second major road network in world (as per Basic Road Statistics of India 2015-2016) and National Highway is strength of our Road infrastructure. Road Accidents is the major issue in the country. Traffic accidents are the major cause of death and injuries worldwide. It also leads to rapid urbanization, Industrialization, rapid motorisation, social activities etc. Thus with the rapid Motorisation increases the Road traffic crashes also increases.

India's proliferating economy has accounted in drastic increase in traffic density. The figures for the people killed in the road accidents in India came down by 4,560 (3%) in 2017 from 1.50 lacs the previous year of 2016, as per the Supreme Court committee of Road safety. Black spots are those place in which various road

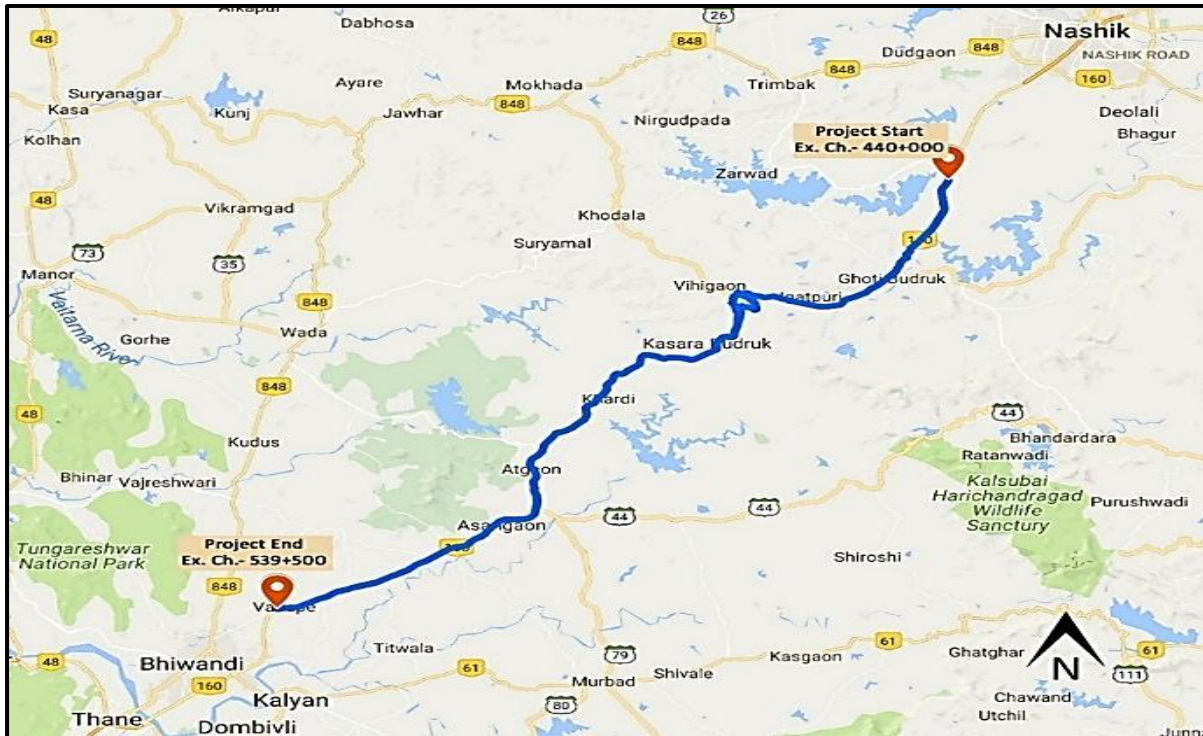
accidents occurred and as per MORTH defined as, The Road Accident Black Spot is a stretch of National Highway in which 5 road accidents at 500m distance (including fatalities/grievous injuries in totally 3 years) took place during the last 3 calendar years or 10 fatalities took place the last 3 calendar years.

Road safety is one of the most important issues regarding loss of life; Maharashtra is the state in which number of vehicular accidents was 90 resulting in 40 deaths and 55 injuries thus accounting for 75% of entirely accidental deaths due to unnatural causes according to the national crime record. The selected Project Study Area Stretch Nashik to Mumbai Project of NH-3 is in the Maharashtra state and the total Project Length is 96.90 km, which start point Ch.440+000 Gonde to end point start Ch.539+500 Vadape.

Therefore, the basic aim of the project is to identify accidental black spots on National Highway (NH-3) by considering the parameters responsible for occurrence of accidents on the basis

of Accident Severity Index (ASI). After Studying, Examining & Analysing Black spots we will be rectify and reduce drastically after implementation of short term measures.

**KEY MAP**



*Figure 1: Project Study Stretch.*

**LITERATURE REVIEW**

Myriam Marie Delcasse observed that for Title Black Spot Study: In this paper author suggested the selection of zone / area for Black Spot study, Physical and Non-physical accidents are two types of accidents. Accident prevention program was recommended and Comparison if IRC standards within site Conditions [1].

Dinesh Mohan observed that for The Road Accident in India: The literature of this paper was the data of traffic fatalities rate in cities with population and motor vehicle registration in India. Author suggested as official road traffic crash data not consider as fatalities road user category in India [2].

Snehal U Bobade et al. observed that for Identification of Accidental Black spots on National Highways and Expressways: In

these paper locations of accident prone zone can be predictable by ranking of the parameters based on basis of severity and computing the severity index method. The separate and particularly spot study is essential to nullify the effect of these factors so as to reduce the severity of accidental black spots [3].

P. Puvanachandra et al. (2011), Paper literature recommended to health & transport specialists need work together to prevent RTIs (Road Traffic Injuries) in susceptible populations. Author recommended to improving Standardizing data collection system [4].

Apparao G. P. Malikarjun Reddy et al. (2013) observed that for Identification of accident Black Spots for National Highway Using GIS: The main objective is the identification methods of accident

prone location and collection ground control points (GCP) with the assistance of GPS. The improvement in GIS & GPS can be put to effective use of accident analysis [5].

Kiran Avhad & Ganesh Sawant (2017) In this paper observed that causes of accident and study methodology involves verification of the various road safety implementation status at State level by using well designed and focused questionnaires [6].

Maen Ghadi and Aprad Torok (2017) observed that for Comparison Different Black Spot Methods: The main objective of this paper is announced three type of black spot identification methods i.e. screening method, Cluster method & Crash prediction method [7].

R.R. sorate et al. (2015), Naidu V.M. Venkat L. et al. (2011) and Srinivasan et al. (1987) Main objectives of these papers are to study methods of data collection, bifurcation of accident data, study of locations, analysis of accident black spots on the basis of Accident prone index method, Quantum of accident method & Severity Index Method and it was determined that severity index method is found to be most appropriate and the improvement measures have been comprised [8].

## OBJECTIVES

The objective of this paper is to verify the implementation of directions issued on the Road Safety and the same is being stated here under:

- a) Identification, Rectification and Monitoring of black spot.
- b) Improvement initiatives related to Road geometry & Engineering of the roads.
- c) Improvements initiatives related to enforcement by the State Police and Transport department.
- d) Progress inventiveness related to road

user consciousness by the Education Department.

- e) Improvement initiatives related to Trauma & Paramedical and Emergency Health Care System.
- f) Our aim to develop a robust institutional mechanism safety for road.

## METHODOLOGY

The study methodology involves verification of the various road safety implementation statuses at State level by using well designed and focussed questionnaires. These questionnaires are designed keeping in view the scope of the audit verification points.

1. The selected Project Study Area Stretch Nashik to Mumbai Project of NH-3 in the Maharashtra state and the total Project Length is 96.90 Km. Start point Ch.440+000 to end point at Ch.539+500.
2. Study Stretch for the project Gonde to Vadape Section (Ch. 440 + 000 to 539 + 500) is taken by Google Earth.
3. Past three years (from 2014 to 2017) and current year Road Accident data was collected from NHAI (National Highway Authority of India) office & Police station.
4. Comparison of real time data with records available in the police station and NHAI.
5. Separate out the accident data according to maximum accident occurring at particular spot.
6. To identify various traffic and road related factors causing accidents.
7. Separate out Accident data of past 3 years (from 2014 to 2017) bifurcated according to Nature of accident, Causes of accident, Type of Injury (Fatal, Grievous, and Minor), Road Feature, and Road Condition & Weather Condition.
8. The reading taken on (selected site) then analysed by accident severity index, According to importance of the parameter (ASI).

9. Give top rank and maximum weightage to the location on the basis of number of accidents occurred.
10. Analysis of the top ranked accidental spots.
11. The percentages after giving rank and weightage were calculated and on the basis of Accident Severity Index (ASI) the accidental black spots were identified.
12. To carry out analysis of black spots by using statistical models.
13. Detailed analysis of the identified black spots and Study the problems diagnosis at each black spots.
14. Counter measures for accidental spots will also be predicted.
15. Give the Improvement initiatives related to Geometric Design.
16. Comparison Proper measures for Rectification and implementations.

17. Black Spots will be rectified with support of accident data on these locations and will be reduced drastically after Implementation of short term measures.

**DATA COLLECTION & PROCEDURE FOR PRIMARY AUDITS**

- Study Stretch for the project (Gonde to Vadape Section (Ch. 440 + 000 to 539 + 500) is taken by Google Earth.
- Accident data is collected from the record of past 3 years (from 2014 to 2017) & current year at their NHAI office & Police station. (In Hard Copy)
- Separate out the accident data according to maximum accident occurring at particular spot.

**Table 1: Accident Data Analysis.**

ANALYZED & BIFURCATED ACCIDENT DATA																																				
Accident data Past from 2014 to 2017 & Current year (Source of Data Collection - NHAI & Police Station)																																				
Year	Total Accident	A						B				C		D				E		No of affected persons																
		Nature of Accident						Causes				Road Feature		Road Condition				Weather Condition		Injury Type																
		1-Overturning	2-Head on collision	3-Rear end collision	4-Collision brush/Side Wipe	5-Right turn collision	6-Skidding	7-Left turn collision	8-Others	1-Drunken	2-Overspeeding	3-Vehicle out of control	4-Fault of driver of motor vehicle/driver of other vehicle/cyclist/pedestrian/passenger	5-Defect in mechanical condition of motor vehicle/road	1-Single lane	2-Two lanes	3-Three lanes or more without central divider(median)	4-Four lanes or more with central divider	1-Straight road	2-Slight Curve	3-Sharp Curve	4-Flat Road	5-Gentle incline	6-Steep incline	7-Hump	8-Dip.	1-Fine	2-Mis/Fog	3-Cloud	4-Light rain	5-Heavy rain	Fatal	Grievous	Minor	Injured	
2018 (Jan. - July)	94	32	3	22	2	0	11	0	24	1	57	22	13	1	2	12	0	80	50	24	20	0	0	0	0	0	0	78	1	4	13	1	17	55	111	0
2017 (Jan-June)	48	12	1	15	0	1	14	0	5	1	23	14	7	3	1	13	1	33	23	9	15	1	0	0	0	0	31	0	3	11	3	9	24	24	1	
2014 - 2015 & 2015 - 2016	221	84	11	36	4	0	49	9	28	19	98	62	28	14	21	52	0	148	113	56	31	21	0	0	0	0	123	9	20	46	23	29	77	181	35	



**ACCIDENT DATA ANALYSIS & BIFURCATION**

- All accident data studied properly and compare their accident causes and location of the accidental spots.
- The accident data was analysed to identify the black spot on the highway stretch.

The accident data are studied of past 3 years (from 2014 to 2017) & current year at their NHAI office & Police station and bifurcated according to Nature of accident, Causes of accident, Type of Injury (Fatal, Grievous, and Minor), Road Feature, and Road Condition & Weather Condition.

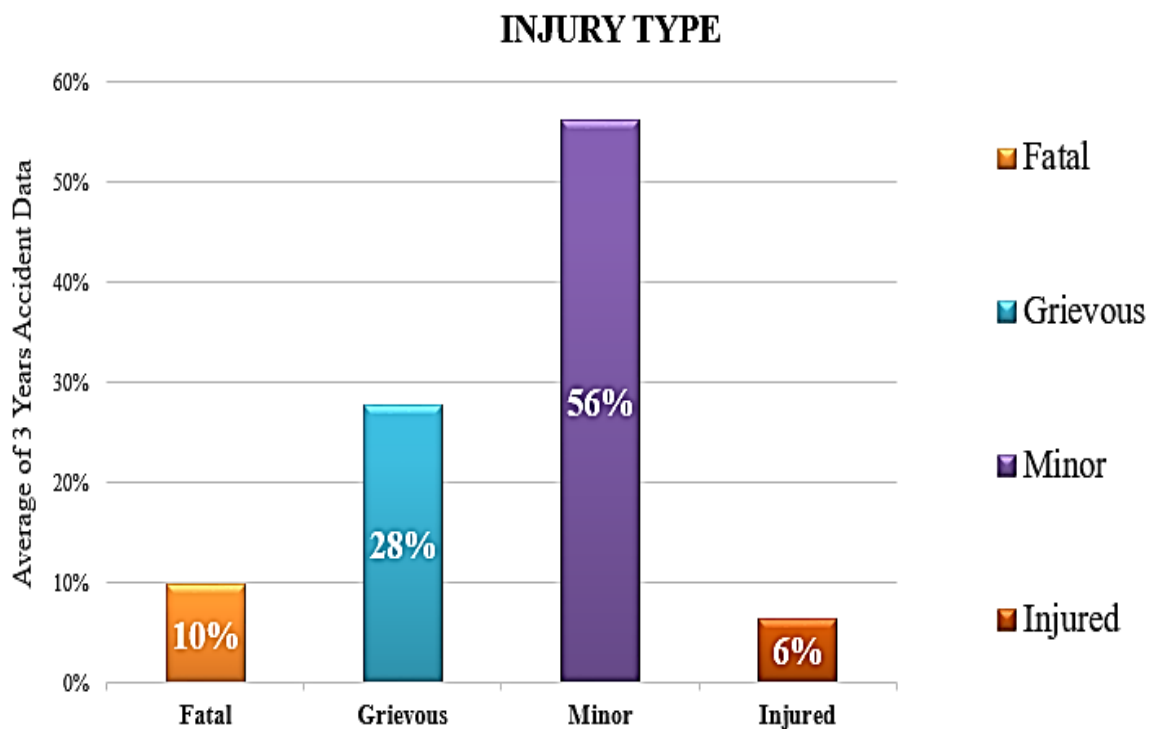
***Bifurcation of Accident Data:***

All accident data studied and compare their accident causes and location of the

accidental spots. 3 Years accident data was analysed to identify the black spot on the highway stretch. Accident data was bifurcated according to their Nature of accident, Causes of accident, Type of Injury (Fatal, Grievous, Minor), Road Condition & Weather Condition and Reason for accidents are shown by using Pie Diagram.

***Classification of Accident according to their injury type:***

Fig. 2 Show the injury type the Highway Stretch. It could be inferred that the highway is relatively safe due to the fact that majority of the accidents are minor in nature. A deeper insight is through required to understand the reasons behind the fatal and grievous accidents.

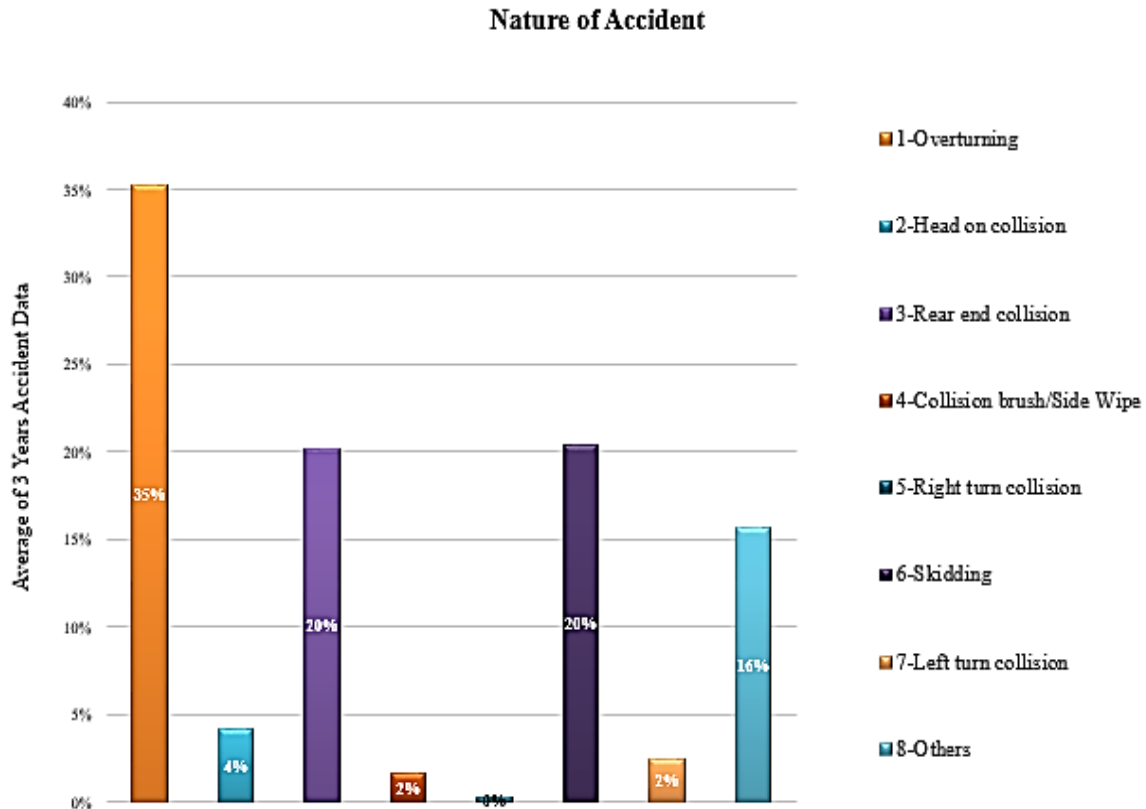


**Figure 2:** Classification of accident according to their injury type.

***Classification of Accident according to their Nature of Accident:***

The Nature of Accident on the Highway Stretch and the number of accidents are occurred by overturning, head on

collision and rear end collision. Overturning 35%, Head-on Collision is 4 %, Rear end collision is 20 % and Skidding of Vehicle is 20 % detailed shown in Figure 2.

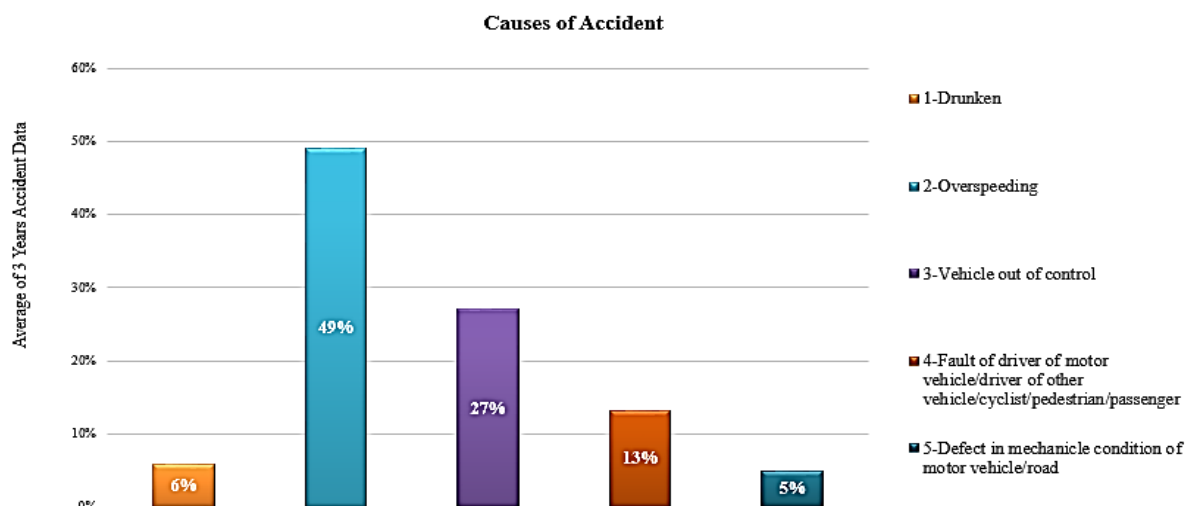


*Figure 3: Classification of accident according to their nature.*

**Classification of Accident according to their causes:**

Fig. 4 Show the Causes of Accident on

Highway Stretch. Maximum Number of accident occurred by over speeding and loss of vehicle control.

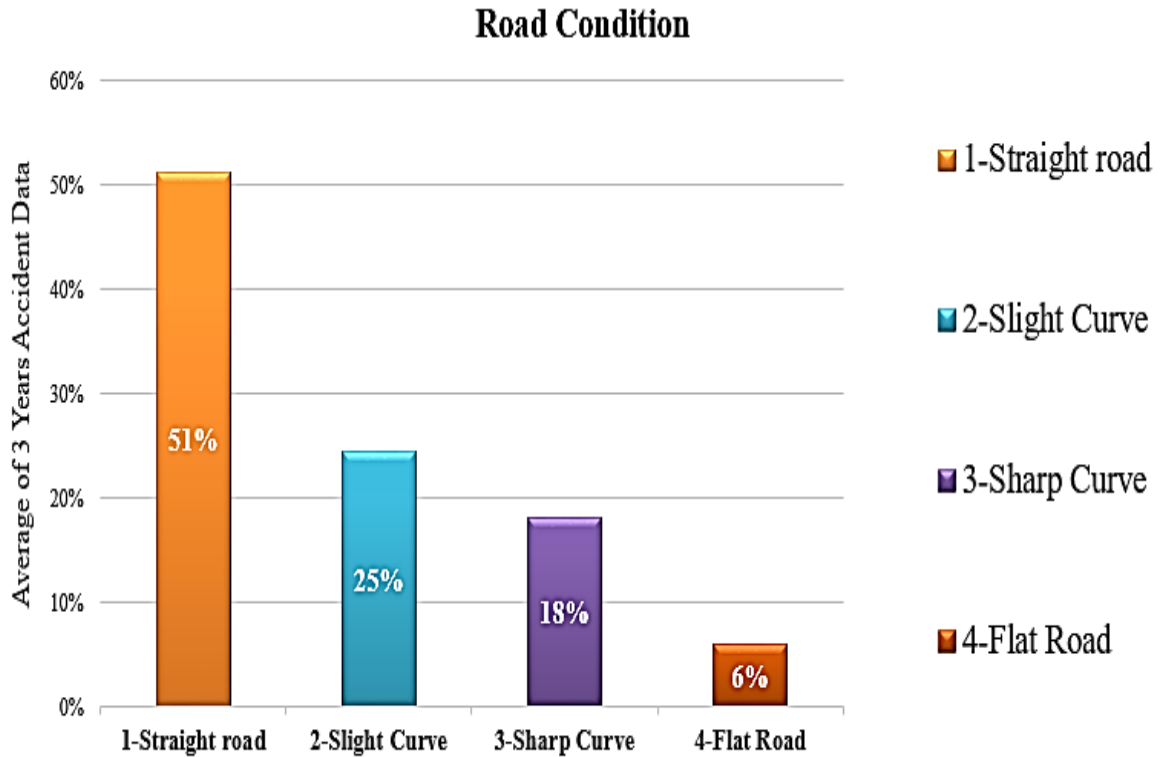


*Figure 4: Classification of accident according to their causes of accident.*

**Classification of Accident according to their Road Condition:**

Fig. 5 Shows the Road Condition are responsible for accident on Highway

Stretch. Maximum Number of accident occurred at Straight road, Slight curve and Sharp curve.

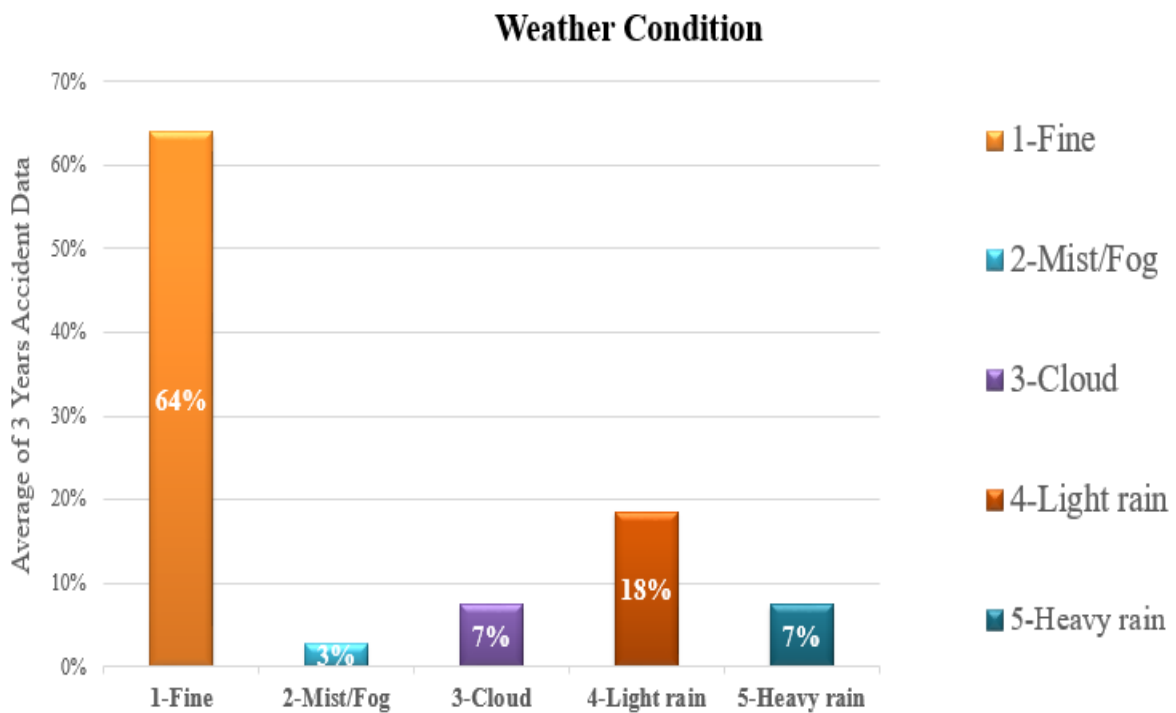


*Figure 5: Classification of accident according to their road condition.*

**Classification of Accident according to their Weather Condition:**

Fig. 6 Show the weather condition during

accidents was performed. Maximum Number of accident occurred in fine weather and light rain weather.



*Figure 6: Classification of accident according to their weather condition.*

**Table 2: Accident data of Sinnar road junction.**

ACCIDENT DATA OF IDENTIFIED BLACK SPOT																
ACCIDENT AT Ch. No. 453+000 - Sinnar Road Junction																
Sr. No.	Date	Time of Accident (am/pm)	A Accident Location	B Chainage	C Nature of Accident	D Classification of Accident	E Causes	F Road Feature	G Road Condition	H Intersection Type and Control	I Weather Condition	J Vehicle Responsible	No. of Affected Persons			Remarks
													K Fatal	L Grievous	M Injured	
1	26/01/2014	7:10 AM	453+000	RHS	3	3	2	4	1	N/A	1	Car	0	0	0	A Car Hit to Driver due to over speed and loss of control.
2	12/02/2014	9:35 PM	453+000	LHS	3	2	2	4	1	N/A	1	Truck	0	1	0	An Eicher hit to a bike due to over speed and loss of control and head on collision.
3	28/02/2014	11:40 AM	453+000	RHS	3	3	3	4	1	N/A	1	Bike	0	0	0	A Bike Slip and hit to driver due to driver lost his control.
4	31/03/2014	8:30 AM	453+000	LHS	6	3	5	4	2	N/A	1	Bike	0	0	0	A Bike Skid on road due to loss of control.
5	13/04/2014	5:45 PM	453+000	RHS	3	3	3	4	1	N/A	1	Truck	0	0	0	An Eicher Collided with slow moving bike due to over speed.
6	30/05/2014	9:05 AM	453+000	RHS	1	4	2	4	1	N/A	1	Container	0	0	0	A Container toppled down due to over speed.
7	03/06/2014	9:20 PM	453+000	LHS	6	3	2	4	1	N/A	1	Bike	0	0	0	A bike skid on road due to uncontrolled of vehicle.
8	27/07/2014	9:40 PM	453+000	LHS	6	1	2	4	1	N/A	5	Bike	1	0	0	A bike skid on road due to over speed.
9	20/08/2014	4:30 AM	453+000	RHS	4	4	2	4	1	N/A	4	Truck	0	0	0	A truck overturned to roadside due to loss of control and over speed.
10	12/09/2014	2:40 PM	453+000	LHS	6	2	4	4	1	N/A	5	Bike	0	0	0	A bike was skid on road due to heavy rain
11	28/09/2014	1:30 PM	453+400	LHS	2	2	3	4	2	N/A	1	Bike	0	1	0	A bike collided with bike due to wrong side driving
12	28/11/2014	9:05 PM	453+300	RHS	3	2 & 3	3	4	1	N/A	1	Bike	0	1	1	A Bike was hit to divider.
13	27/03/2015	10:40 AM	453+000	LHS	3	3	2	4	3	N/A	1	Sumo & Car	0	0	0	Sumo Collided with car due to over speed.
14	12/04/2015	4:00 AM	453+450	RHS	8	1	4	4	1	N/A	1	Unknown	1	0	0	Information received from Road user, RPV team reached on the accident spot. We have Provided MNEL Ambulance for Shifting the victims at Igatpuri RH, also inform to Ghoti traffic police and cleared the road traffic.
15	24/08/2015	6:00 AM	453+000	LHS	3	2	2	4	3	N/A	1	Tanker & Bike	0	3	0	Tanker hit to bike due to over speed.
16	13/04/2016	5:00 AM	453+550	LHS	3	2	2	2	3	N/A	1	Tanker	0	1	0	Information received from Road user, RPV team reach on the accident spot and covered the accident area with safety barricades and caution tape, they have Provided MNEL Ambulance for first-aid to the victim and further shifted the victim Nashik RH, also informs to traffic police and cleared the road traffic.
17	10/06/2016	9:00 PM	453+500	RHS	2	1	1	4	2	N/A	1	Bike	1	0	0	A bike hit to divider due to loss of control & over speed.
18	21/07/2016	3:00 AM	453+300	RHS	8	2	4	4	1	N/A	1	Unknown	0	2	0	Information received from Road user, RPV team reached on the accident spot, We have Provided MNEL Ambulance for Shifting the victims at Igatpuri RH, also inform to traffic police and cleared the road traffic.



19	03/02/2017	9:37 PM	453+300	LHS	6	2	2	4	1	N/A	1	Bike	0	2	0	A bike was Moved from Nashik to Mumbai has lost his control due to over speed resulting bike has skid, 02 Major injuries reported in the incident. They have provided highway ambulance for first aid of injured, shifting of victims to nearby Ghoti hospital, after then again shifted of the victims Nashik hospital, secured the accident spot and informed police.
20	14/04/2017	6:00 AM	453+200	RHS	8	3	4	4	1	N/A	1	Unknown	0	0	1	Information received from Road user, We have Provided MNEL Ambulance for Shifting victims at Igatpuri RH, also inform to police station and cleared the road traffic.
21	11/05/2017	8:33 AM	453+400	LHS	1	1	2	2	2	N/A	1	Container	1	0	0	Container has moving from Nashik to Mumbai and lost his control due to over speed resulting hitting to crash barrier & Toppling.
22	26/01/2018	12:22 AM	453+500	LHS	1	3	2	4	1	N/A	1	TRUCK	0	0	1	Truck was moved towards Mumbai has lost his control and topple down due to over speed, 01-Minor injury reported in this accident, Information received from road users, RPV team reached on the accident spot and covered the accident area with safety barricades and caution tape, they have Provided MNEL Ambulance for first-aid to the victims, also inform to Ghoti traffic police and cleared the road traffic.
23	26/04/2018	8:55 PM	453+400	LHS	8	1	4	4	1	N/A	1	Unknown	1	0	0	Information received from Road user, RPV team sent on the accident spot and covered the accident area with safety barricades, used MNEL Ambulance to shift the dead body at ghoti RH, also inform to ghoti traffic police about the accident and cleared the road traffic.
24	18/06/2018	1:30 AM	453+000	RHS	3	1	4	4	1	N/A	4	Bike	0	1	0	Unknown Vehicle was moving from Nashik to Mumbai (RHS Side) while come close to the slow moving vehicle Bike driver has lost his control the vehicle due to over speeding resulting hit to another vehicle this incident 01 Fatal case is registered, Information received from Road user, RPV team sent on the accident spot and covered the accident area with safety barricades, they have provide MNEL Ambulance to shift the dead body at padgha RH, also inform to padgha police about the accident and cleared the road traffic.
25	22/06/2018	10:45 PM	453+300	RHS	1	2	3	4	1	N/A	4	Omnie	0	1	3	Omnie was moved towards Nashik has lost his control and topple down due to over speed, 01 Major 03 minor injuries reported in this accident, Information received from Road user, RPV team reached on the accident spot and covered the accident area with safety barricades and caution tape, We have Provided MNEL Ambulance for Shifting the victims at Ghoti RH, also inform to Ghoti police. Towing used and cleared the road traffic.
26	30/07/2018	2:00 AM	453+000	RHS	8	1	4	4	1	N/A	4	Unknown	1	0	0	Information received from road users, RPV team and MNEL Ambulance reached at the accident spot, they have covered the incident area with safety cones and barricades, shifted the body at Bhivande RH, also inform to Padaga police about the accident and clear the road.
												<b>Total</b>	<b>6</b>	<b>13</b>	<b>6</b>	

**Table 3: Accident Data of New Kasara Ghat.**

Accident Data of Identified Black Spot																
ACCIDENT AT Ch. No. 470+500/600 - New Kasara Ghat																
Sr. No.	Date	Time of Accident (am/pm)	A Accident Location	B Change	C Nature of Accident	D Classification of Accident	E Causes	F Road Feature	G Road Condition	H Intersection Type and Control	I Weather Condition	J Vehicle Responsible	No. of Affected Persons			Remarks
													Fatal	Grievous	Injured	
1	20/01/2014	8:30 AM	470+600	LHS	1	4	5	2	3	N/A	1	Truck	0	0	0	A Truck hit to RCC Wall Topped down due to Break Failed.
2	17/02/2014	1:32 AM	470+500	RHS	1	4	2	2	3	N/A	1	Truck	0	0	0	An Eicher hit to MBC Vehicle toppled down road due to over speeding.
3	02/05/2014	9:10 AM	470+600	LHS	2	4	4	2	2	N/A	1	Container	0	0	0	A Container hit to side wall due to over speed & unsafe turn.
4	25/07/2014	8:30 AM	470+500	LHS	1	3	3	2	3	N/A	4	Container	0	0	1	A Container overturned due to loss of control.
5	04/09/2014	9:45 PM	470+460	RHS	2	4	2	2	2	N/A	4	Car	0	0	0	A Car hit the drain due to over speed, Tow crane was used.
6	29/10/2014	11:35 AM	470+450	RHS	7	3	2	2	3	N/A	1	Crane	0	0	2	A Crane toppled down due to loss of control.
7	02/11/2014	1:25 PM	470+500	LHS	3	2	3	4	1	N/A	1	Container	0	2	0	A Container hit to side wall.
8	12/12/2014	10:20 PM	470+550	LHS	3	3	3	2	2	N/A	1	Truck	0	0	1	Truck hit to side kerb stone due to loss of control.
9	08/02/2015	4:15 AM	470+650	LHS	4	1	4	2	2	N/A	1	4-Wheeler	1	0	2	A 4 -Wheeler has cross over speed in lane and vehicles suddenly topple down.
10	02/07/2015	8:00 AM	470+500	LHS	3	3	2	2	3	N/A	2	Eicher	0	0	1	Eicher hit to unknown vehicle.
11	14/08/2015	10:45 AM	470+600	LHS	6	2	2	4	3	N/A	1	Bike	0	1	0	Bike was skidded on Road
12	20/09/2015	10:30 PM	470+500	LHS	4	3	2	4	3	N/A	2	Commercial	0	1	2	Commercial Vehicle hit to over speed car.
13	2/2/2016	3:50 AM	470+500	LHS	6	4	2	2	1	N/A	1	Eicher	0	0	0	Eicher skidding due to over speed
14	20/02/2016	10:15 AM	470+600	LHS	4	1	4	2	3	N/A	1	Truck	1	0	0	Truck was collided with the parapet wall due to over speed and loss of control.
15	09/03/2016	10:20 PM	470+500	LHS	4	4	3	2	3	N/A	1	Container	0	0	0	Container hit to MBCB
16	11/07/2016	9:00 PM	470+700	LHS	2	1	3	4	1	N/A	4	Unknown	1	0	0	Unknown vehicle hit to bike rider.
17	17/02/2017	8:15 AM	470+600	LHS	1	1	3	2	2	N/A	1	Container	1	0	0	Container was moving nashik to mumbai has lost his control resulting hit to MBCB after that the uncontrolled vehicle toppled down resulting 01 fatal reported in the accident. When provided the highway ambulance for first aid of injury. Shifted of victims at lagatpuri

																	hospital. Inform to kasara police and they call also highway crane and remove the vehicle from the road and cleared the road traffic.
18	28/02/2017	8:33 AM	470+600	LHS	1	3	3	2	2	N/A	1	Container	0	0	0	0	Container has moving from nashik to Mumbai and lost his control due to over speed of vehicle, resulting hit to crash barrier and toppling. 02 minor injury reported in this accident, information received from road users. They have provided highway ambulance for first aid of injury, and shifted of the victims to nearby kasara hospital. Also provided crane, secured the accident spot and inform to kasara police.
19	10/09/2017	7:10 AM	470+600	LHS	6	2	3	2	2	N/A	1	Container	0	2	0	0	Container was moved from nashik to mumbai has lost his control due to over speed resulting topple down.
20	14/01/2018	8:45 PM	470+700	LHS	1	3	2	2	3	N/A	1	Container (MH-40-Y8278)	0	0	1	1	Container was moved towards Mumbai has hit to divider and topple down due to over speed, 01-Minor injury reported in this accident, Information received from road user, RPV team reach on the accident spot and covered the accident area with safety barricades and caution tape, they have Provided MNEL Ambulance for first-aid to the victims, also inform to kasara traffic police, vehicle removed by using MNEL crane and cleared the road traffic.
21	12/02/2018	9:10 AM	470+400	RHS	1	3	2	2	2	N/A	1	TRUCK	0	1	0	0	A Truck was moved towards Nashik has lost his control and topple down due to over speed, 01-Minor injury reported in this accident, Information received from Road user, RPV team reach on the accident spot and covered the accident area with safety barricades and caution tape, they have Provided MNEL Ambulance for first-aid to the



26	11/07/2018	1:20 AM	470+600	LHS	1	1	2	2	2	N/A	4	Container	1	1	0	Information received from road users, RPV team and MNEL ambulance reached at the accident spot, they have covered the incident area with safety cones and barricades, shifted the injured victims at igatpuri RH, also inform to kasara traffic police about the accident and clear the road traffic.
												<b>Total</b>	<b>5</b>	<b>11</b>	<b>11</b>	

**Legends:**

- A.** Urban /Rural and detail of Surrounding Land use
- B.** 1-Overturning, 2-Head on collision 3- Rear End collision 4- Collision Brush /Sideswipe 5- Right turn collision 6- Skidding 7-Left turn collision 8-Others (specify)
- C.** 1-Fatal 2- Grievous injury 3-Minor injured 4- non injury
- D.** 1-Drunken 2-Overspeeding 3-Vehicle out of control 4a-Fault of driver of motor vehicle /b-Driver of other vehicle/c-Cycle/d-Pedestrian/e-passenger,5-Defect in mechanical condition of motor vehicle /Road condition
- E.** 1-Singal lane 2- two lane 3-three lane or more without Central divider (Median) 4- four lanes or more with central divider
- F.** 1-Staight road 2-Slight Curve 3-Sharp curve 4-Flat road 5-Gentle incline 6- Gentle decline 7-Steep incline 8-Steep decline 9- Hump 10-Dip
- G.** 1-T-junction 2-Y-junction 3-Four arm junction 4- Staggered junction 5- junction with more than 4 arms 6 - Round about junction 7- Manned road crossing 8-unmanned Rail crossing
- H.** 1-Fine 2- Mist/Fog 3-Cloudy 4- Light rain 5-Heavy rain 6-Hail / sleet 7- Snow 8 -Strong Wind 9- Dust Storm, 10-Very Hot 11 - Very cold 12-Other Extraordinary weather condition.

**BLACK SPOTS IDENTIFICATION**

*Black Spots Are Identified On the Basis of Accident Severity Index (ASI)*

**Methods:**

- Black Spots are Identified On the Basis of Accident Severity Index (ASI) Methods.
- After Study and Analysis of 3 years Accident data we are calculate statically location wise fatal and grievous accidents along every 500m stretch.
- Black spots are identified as per the definition by National Highway authority of India, hazardous spots or black spots are to be identified on the basis of accident severity index (ASI). If the ASI is above a certain threshold value, the accident spot will be treated as a black spot.
- The weight age to fatal accident will be assigned as 7 (seven)
- The weightage of Grievous injury accident as 3 (three).
- Formula for calculate ASI= (Nf x Wf) + (Ng x Gg)
- Threshold =Average ASI+1.5 x (Standard Deviation)

Where,

Nf = No. of fatal accidents at the location

Wf = Weightage assigned to fatal accident

Ng = No. of grievous accidents at the location

Wg = No. of grievous accidents at the location



**CALCULATION OF ASI**

*Table 4: Analysis of Black Spot – ASI Method.*

Accident Severity Index (ASI) Methods										
Sr. No.	Highway section (Chainage)	Nf = No. of fatal accident at the location	Wf = Weightage assigned to fatal accident	Ng = No. of grievous accident at the location	Wg = Weightage grievous accidents at the location	ASI = (Nf x Wf) + (Ng x Wg)	Average ASI	Standard Deviation	Threshold = Average ASI + 1.5 x (Standard Deviation)	Remarks
1	440+000 – 440+500	1	7	1	3	10	1.6	12.30	20.01	N.A
2	442+500 – 443+000	2	7	0	3	14	2.2	12.30	20.63	N.A
3	445+000 – 445+500	2	7	1	3	17	2.6	12.30	21.09	N.A
4	446+000 – 446+500	2	7	1	3	17	2.6	12.30	21.09	N.A
5	449+500 – 450+000	1	7	4	3	19	3.0	12.30	21.40	N.A
6	450+500 – 451+000	1	7	2	3	13	2.0	12.30	20.47	N.A
7	452+000 – 452+500	0	7	4	3	12	1.9	12.30	20.32	N.A
8	452+500 – 453+000	1	7	4	3	19	3.0	12.30	21.40	N.A
9	453+000 – 453+500	6	7	13	3	81	12.6	12.30	31.05	Black Spot
10	455+000 – 455+500	1	7	1	3	10	1.6	12.30	20.01	N.A
11	460+000 – 460+500	1	7	3	3	16	2.5	12.30	20.94	N.A
12	460+500 – 461+000	2	7	1	3	17	2.6	12.30	21.09	N.A
13	461+500 – 462+000	0	7	3	3	9	1.4	12.30	19.85	N.A
14	463+000 – 463+500	2	7	1	3	17	2.6	12.30	21.09	N.A
15	467+000 – 467+500	1	7	4	3	19	3.0	12.30	21.40	N.A
16	467+500 – 468+000	1	7	3	3	16	2.5	12.30	20.94	N.A
17	470+500 – 471+000	5	7	11	3	68	10.6	12.30	29.03	Black Spot
18	471+000 – 471+500	1	7	2	3	13	2.0	12.30	20.47	N.A
19	471+500 – 472+000	2	7	1	3	17	2.6	12.30	21.09	N.A
20	472+500 – 473+000	0	7	3	3	9	1.4	12.30	19.85	N.A
21	473+000 – 473+500	0	7	4	3	12	1.9	12.30	20.32	N.A
22	477+500 – 478+000	1	7	1	3	10	1.6	12.30	20.01	N.A
23	478+500 – 479+000	2	7	1	3	17	2.6	12.30	21.09	N.A
24	483+500 – 484+000	0	7	5	3	15	2.3	12.30	20.78	N.A
25	486+000 – 486+500	2	7	1	3	17	2.6	12.30	21.09	N.A
26	487+000 – 487+500	1	7	4	3	19	3.0	12.30	21.40	N.A
27	488+000 – 488+500	2	7	2	3	20	3.1	12.30	21.56	N.A
28	489+500 – 490+000	1	7	3	3	16	2.5	12.30	20.94	N.A
29	493+500 – 494+000	1	7	3	3	16	2.5	12.30	20.94	N.A
30	496+500 – 497+000	1	7	4	3	19	3.0	12.30	21.40	N.A
31	506+500 – 507+000	0	7	4	3	12	1.9	12.30	20.32	N.A
32	516+500 – 517+000	2	7	1	3	17	2.6	12.30	21.09	N.A
33	521+500 – 522+000	1	7	2	3	13	2.0	12.30	20.47	N.A
34	530+500 – 531+500	1	7	1	3	10	1.6	12.30	20.01	N.A
35	534+500 – 535+000	2	7	1	3	17	2.6	12.30	21.09	N.A

**BLACK SPOTS IDENTIFIED**

Two black spots are identified on the basis of Accident Severity Index (ASI) methods

at vadape – gonde stretch km.440+000 to km. 539+500 on NH-3.

*Table 5: Summary of Black Spots.*

SUMMARY OF BLACK SPOTS					
Sr. No.	Chainages (Km )	Location (Name)	District	State	National Highway
1	CH: 453+000	SINNAR JUNCTION ROAD	NASHIK	MAHARASHTRA	NH-3
2	CH: 470+500	NEW KASARA GHAT	THANE	MAHARASHTRA	NH-3

**SINNAR ROAD JUNCTION: CH: 453+000**

**SITE INSPECTION REPORT**

*After site visit we observed the condition of site as follows:*

- a) T-Junction with two side roads at RHS, another median opening is provided 200m before this junction.
- b) Traffic from the side road is significant
- c) wide median opening and opening area without any channelization
- d) Solar blinkers with single head are provided 100m away from the junction opening.
- e) Faded road marking and kerb painting.
- f) Sub-standard one set of white color thermoplastic bar marking (10 Strips) on the approaching arms.
- g) Substandard one set of white color thermoplastic bar marking and warning sign on the side roads.
- h) Better replace plantation on the median about 100 by filling.
- i) Absence of night illumination.
- j) Object hazard marker at the ends of median opening is not as per IRC: 67-2012.

**Reason for Black spot:** Reason of accident is due to at - grade T junction and median opening with State Highway going to Aurangabad - Nagpur.

**Recommendations of Mitigation Measures for Rectification of Black Spots at Sinnar Road Junction:**

1. Reduce the median width by 25m and provide the small rotary on side road to regulate the traffic.
2. Other median opening has been closed 200m before junction and left in-out island has been created as given in enclosed drawing.
3. Repair road marking as per Fig.4.10, page-21 of IRC: 35-2015.
4. Repaint kerbs with alternate yellow and black strips.
5. Provide standard speed breaker along with marking and warning signs

6. Rumble strip will act as traffic calming measure and help to being the speeds up to 50 km ph. The rumble strips are to be providing around 30m after the pedestrian crossings median opening.
7. Provide retro reflective median markers @ 25mc/c on the edge of the median kerbs about 200m in length from the ends of the median opening.
8. Install Speed Limit signs of 50km/h at 453+950 for the EB and at 453+650 for the WB direction and 50km/h pavement marking and "SLOW" within the traffic calming zone
9. Provide four sets of yellow color thermoplastic marking of 300mm wide, 5mm height at 600mm apart (one set is of 6 strips) at 50m, 80m, 120m and 180m from the ends of the median opening on the approaching arms.
10. Provide white solar road studs on traffic lane line, Red on shoulder side edge line and yellow on medical side edge line @ 6m interval.
11. Provide solar lights (@30m interval) on the median about 100m in roadway length.

**NEW KASARA GHAT CH: 470+500**

**SITE INSPECTION REPORT**

*After site visit we observed the condition of site as follows:*

- a) Terrain at this location is hilly with sharp curve and steep gradient.
- b) Solar studs are provided at 25m interval.
- c) Signages are provided however numbers of chevron sign boards were not sufficient.
- d) Rumble strips are provided but need maintenance.
- e) Rigid barrier is provided where set back distance is not available and flexible barrier are placed where the sufficient setback distance is available.
- f) Series of sharp curve are observed at this location.
- g) It is observed that super elevation on the curve is not adequate super elevation and extra widening will be

checked once topographic survey will be available.

**Reason for Black spot:** Reason of accident is due to at-grade T junction and median opening with State Highway going to Aurangabad - Nagpur.

**Recommendations of Mitigation Measures for Rectification of Black Spot at New kasara ghat as follows**

1. Traffic calming zone for a stretch of about 1100m (including 1km of black spots) from km 470+450 to Km 471+550.
2. Provide solar blinkers 50m before the start of black spot section at km 470+450.
3. Rumble strip will act traffic calming measure and help to bring the speeds up to 40kmph. The rumble strips are to be providing around 30m before the start of black spots section at Km 470+470 as per MORTH.
4. Repaint kerbs barrier (Rigid, flexible both) with alternate yellow and black strips and paste reflective tape for night illumination.
5. Transverse bar marking (yellow) will help in making the driver aware of the approaching traffic calming zone by provide vibratory alert. Group of 6 raised bars made of thermoplastics paint are provided in all along the 1Km of stretch from km 470+500 to 471+500 @50m interval (Ref. IRC:35-2015 Fig. 11.2 "Bar Marking" Page no. 75).
6. Provide white solar road studs on traffic lane line, red on shoulder side edge line @6m interval.
7. Installed speed limit sign of 40 km/h at 40 at 40 km/h pavement marking and: Provide white solar road studs on traffic lane line, Red on shoulder side edge line "SLOW" (as per enclosed drawing) within the traffic calming zone.

8. Provide double Chevron signs all along the traffic calming zone as indicate in enclosed drawing.
9. Provide ladder hatching at the outer side of each curve as given in drawing.
10. Super elevation and extra widening will be checked once topographic survey will be available.

**CONCLUSION**

From the present study it has been found that fulfil the safety goal and targets, the goal does not only decide what resources are needed but also influence which short term measures should be applied.

- The simple aim of the project is to identify accidental black spots on National Highway (NH-3) by allowing for the parameters responsible for incidence of accidents on the base of Accident Severity Index (ASI). After Studying, Examining & Analysing Black spots will be rectifying and reduce drastically after implementation of short term measures.
- To improve accident data collection system especially location identification & their low cost remedial measures.
- Establish properties and schedule for traffic improvements.
- Design of intersection and other control devices.
- Monitoring the black spot and use to improve the level of service.
- Black spots will be rectify and reduce drastically after implementation of short term measures.

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