

# A Case Study of Black Spot on Jaipur Kishangarh Section on National Highway - 48 in Rajasthan

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**Abstract-** In recent past numbers of road accident in our country reportedly increased manifold in term of fatalities and grievously injured. It is, therefore, utmost essential to identify those vulnerable stretches where road accidents are occurred repeatedly and also to examine the main reasons of road accidents thereof. It is understood that the road accidents are not totally prevented in views of mixed traffic plying in our road networks but can be reduced to certain extent adopting appropriate safety measures and engineering skill. Considering the above, in 2015, a protocol has been notified by Ministry of Road Transport & Highway (MoRT&H), Government of India for identification of road accidents blacks spots and their rectifications. The terms that designating an accident-prone stretch as “Black Spot” based on combined criterion of numbers of fatalities & accidents in past years. The Case study was carried out on Jaipur Ajmer sections of National Highway No.-48 in Rajasthan at busiest intersections Bhankrota villages which are highly accident-prone area. The main aim of the study to identify the Black Spot in lines with MoRT&H protocol and accordingly the mitigation measures has been proposed ensuring the safety enhancement. The task was achieved by conducting Road Safety Audit (RSA). Based on the study various conclusions along with recommendations are also drawn for reducing the accidents at great extent.

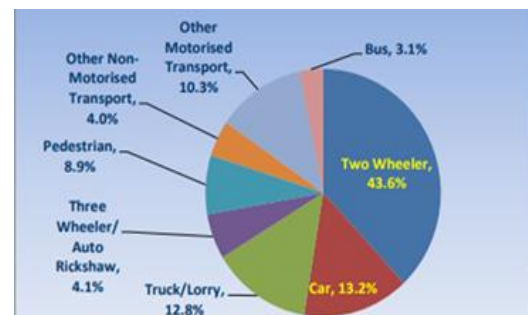
**Keywords-** Accidents, Ministry of Road Transport & Highways, National Highway, Black Spots, Road Safety Audit, Mitigation Measures.

## 1. INTRODUCTION

Recent statistics revealed that the road accidents are one of the leading cause of the fatalities across the world. In accordance to the World Health Organization (WHO) report year 2020, approximately 1.3 million people lost their lives in road accidents every year and much more people suffer serious injuries with many incurring a disability as a result of their injury. Road injuries not only adverse impact on the economic losses to individual's person and their families but also nation as a whole. The figures are eye opener, road accidents pay few countries about three precents of their Gross Domestic Product (GDP) and above ninety precents of road fatalities happened in low & middle-earning counties.

As per Annual Report National Crime Records

Bureau (NCBR) 2020 , India recorded 3,54,796 incidents of road accidents in 2020 comprising 1,33,201 persons devoid of lives and 3,35,201 got injured. During year 2020, more than forty three precents of suffers in road accidents were of two-wheelers, followed by other means like cars, trucks and buses attributing for about thirteen percent, twelve and three percent of causality on account of road accidents respectively. Vehicle wise Road Accident Death during 2020 indicated in Fig 1,



(Source- National Crime Bureau Report ,2020)  
Fig. 1 Vehicle wise Road Accident Death during 2020

In recent past, number of initiatives were taken by the Government of India to minimize the road accidents on Highways with main focus on the National Highways (NHs). In the lines of the initiatives, Ministry developed a protocol for identification of Black Spots and issued certain directions to the various States/UTs to mitigate the measures of the Black Spots based on frequency of the accidents in past years. Based on these mitigation measures such as short- and long-term measures are being taken up. The short-term measures involve construction of rumble strip, providing & fixing road signages, delineators, studs and road marking. The long-term measures such as construction of appropriate structures viz. Flyover, Vehicular Underpass, widening of road etc.

## 2. REVIEW OF LITERATURE

Many researchers in the field of transportation engineering have carried out the works related to Black Spot and published their Methodology, Observations and Conclusions. Some of important studies are summarized in this section. Nikhil Chauhan et al

(2020) [3] did their research work for reasons of accidents in between Pantha Ghati to Dhalli Road on NH-5 in Shimla. They observed that major accidents are happened on blind curves and intersections due to higher speed and overt-taking of vehicles. They suggested that providing speed breaker, strong parapets and other retaining structures, widening of blind curves could helped in improving safety aspects. Nivea John, et al (2019) [3] analyzed the Black Spots on Westfort-Kunnmkulam road section of State Highway-69 in kerala considering Weighted- Severity Index method and identification of Blackspots were done by Quantum Geographic Information System (QGIS). They suggested using appropriated speed and constant maintenance of road section along with improving deficiencies geometries. Sandeep Verma, et.al (2018) [5] studied to identify and Improve the stretches of accident Blackspots on National Highways No. 86 in Madhya Pradesh taking into consideration of two vital data viz road accidents and other relates to road geometrics. They concluded that accidents were mostly happened due to over speeding of vehicles, deficient road geometrics, failure to providing required way to vehicles and pedestrian. Athira Mohan, et al. (2017) [6] carried-out extensive study to identify the Blackspots on Highway. They considered Weighted-Severity Index (WSI) method and to providing ranking of the crash locations. After doing study, they find that maximum road accidents of two-wheelers taken placed due to not wearing of helmet and riding at higher speed. Sneha Bobade, et. al (2016) [7] worked on Pune-Bangalore Highway using ranking method. The ranking and weightage were given confirming to importance of parameter (i.e parameter being responsible for occurrence of more number of crashes). Considering above, the accidental blackspot is identified. They concluded that skid action, serious injuries and over-speed are more responsible for maximum number of crashes.

#### 4. ABOUT STUDY AREA

National Highway No 48 having a length of 2630 km is important route connecting various cities/towns of Delhi, Haryana, Rajasthan, Gujrat, Maharashtra, Karnataka and Tamil Nādu. Study area falls under Jaipur Kishanganh Section (From Km 273.500 to Km 363.885= 90.385 Km) which is first stretch which was upgraded as a part of the Golden Quadrilateral under National Highway Development Program (NHDP). The section was upgraded and developed by NHA in year 2002 under Build Owned Transfer (BOT) Toll. Presently the section having six laned carriageway

#### 5. OBJECTIVES

The objectives of the study are:

- Identification of accident blackspot at identified road section.
- Investigation of design deficiencies of the selected

road section .

- To recommend suitable solutions to reduce road accidents and traffic congestions

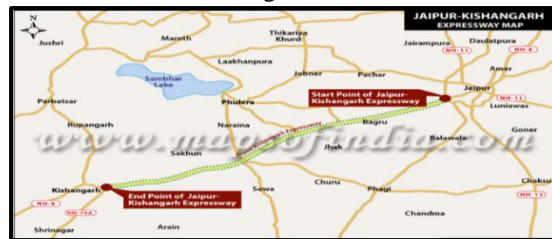


Fig.2 Google Image of the project road

#### 6. SCOPE OF THE STUDY

Although the improvement works were taken up during upgradations and development of the project road during Six laning but some of the intersections at identified locations become all time congested due to increased traffic and also ribbon development of commercial and habitations on both the side of intersections. From past three years accidental data showed that road side accidents near intersections are increased due to plying of mix type traffic and its deficient geometrical deficiencies. Hence there is a need to analyze the present condition with respect to applicable policies and codes and suggest improvement / revival measures to be undertaken.

Considering time availability. I have to limit my work on finding the issues pertaining to the redesigning of selected intersections and recommending measures for increasing the safety aspect of the project road. This paper presents a detailed study of safety audit at intersection near Bhankrota (Km 278.250 to 278.550).

#### 6. METHODOLOGY

Methodology incorporates introduction visual inspection, collection of accidental data, Study of accidental data and identify the Black Spot and safety audit that has been done.

Visual inspection shows that this is three-legged signalized intersection having congestion on both side of intersection due to commercial actives in close vicinity of the project road. Being mixed traffic scenario there is always possibility of occurring accidents. It is also observed that Pedestrian and two-wheeler traffic is always under threat. Road users cross ring the road in haphazard manner.

There are two types of data collected i.e primarily data and secondary data. primary data collected during the site inspection and secondary data collected from nearby police stations. and road authority. Accidental data collected is for period January 2019 to December 2021 and had been further processed as per standard format.

According to Government of India, black spot-on National Highway is a stretch of National Highway of about 500m in length in which either 5 road accidents (in all three years put together involving fatalities/grievous injuries) took place during the last 3

calendar years or 10 fatalities (in all three year put together) took place during the last 3 calendar years”

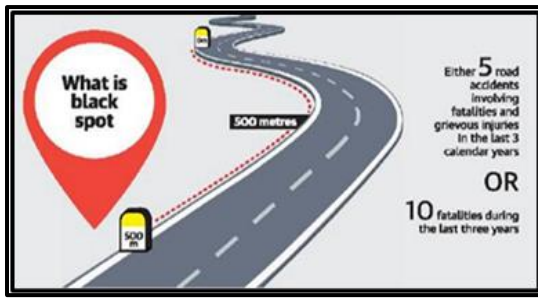


Fig. 3 Definition of Black Spot as per MoRT&H

Based on accidental analysis as per MoRT&H protocol following intersection is considered as Black Spot as per details tabulated below:

Table-1 Identification of Black Spot

Limits of High Accident-Prone Location		Number Of Accidents involving fatalities and Grievous Injuries				Number Of Fatalities			
Starting from (Km)	Ending to (Km)	2019	2020	2021	Total of three Yrs>=5	2019	2020	2021	Total of three Yrs>=10
278.050	278.550	3	2	1	6	2	1	0	3

7. OBSERVATIONS DURING STUDY

While study, a detailed reconnaissance was carried out and the existing layout of the intersection near Bhankrota village on NH-48 was studied. The road safety audit has been carried out and following observations were made:

- This is a three-legged intersection located on Six laned carriageway with service road in both sides.
- Accidents data revealed that most of accidents was occurred due to overspeed of vehicles approaching the intersection.
- In absence of refuge island, it was difficult for pedestrians to cross over the road.
- The turning radius is not sufficient causing difficulties for traffic movement towards the road leading to Jaisinghpura village.
- Although the intersection is signalized but it is observed that road commuter often jumping the signal.
- There is lack of necessary road signages at intersection location.
- From past three years accident trends shows that accident occurred at the junction is due to lack of proper pedestrian facility, wrong parking of Vehicles in front of Shops, obstruction of sight distance and over speeding of two-wheeler.
- There are following safety deficiencies observed-
- The separator island between service road and

main carriageway are damages at many locations in both sides resulting reckless movements of pedestrian and two-wheeler.

- There is no provision of authorized parking near intersection encouraging haphazard unregulated on- street parking, which is likely to affect the capacity and safety of the intersection.
- The opening/access of the side road leading to Jaisinghpura village is very near to junction causing increased the number of conflicts.



Fig. 4 Actual site view of Bhankrota Intersection



Fig. 5 Actual site view of Bhankrota Intersection



Fig. 6 Google map of Bhankrota Intersection

8. RESULTS AND ANALYSIS

Road Safety A (RSA) conducted on the Black Spot near Bhankrota village and following short and long term measures are suggest to remove the black spot: and enhancing road safety aspects.:

(i) Short-term measures

- Speed of vehicles approaching the intersection need to be reduced by providing Transvers Bar marking (TBM) on major carriageways of NH-

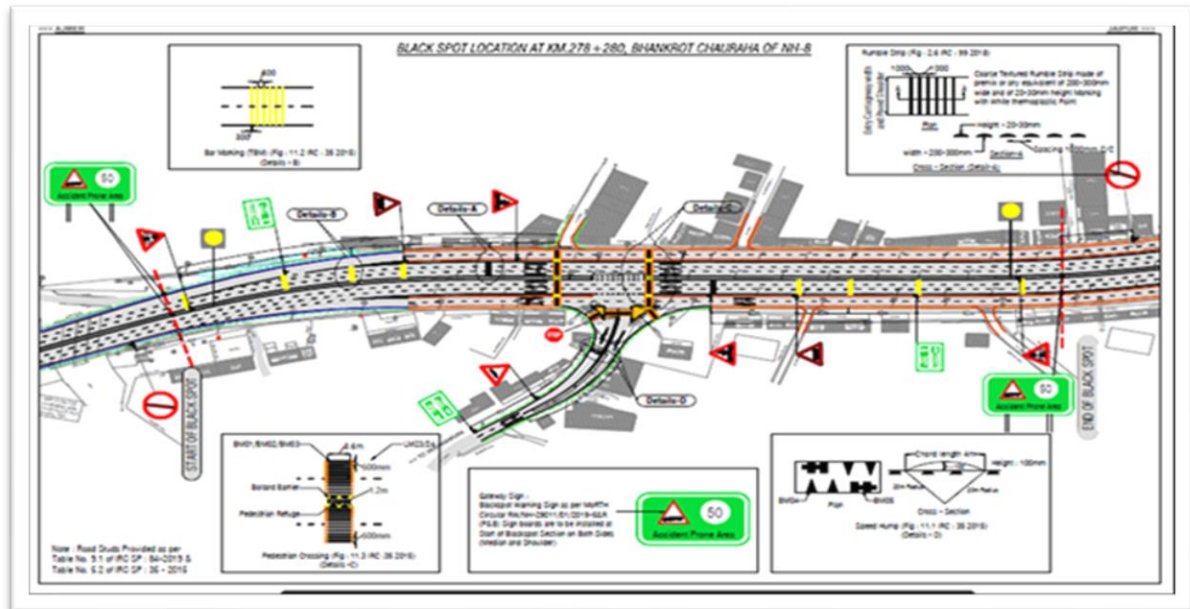
- 48 as per IRC: 35 -2015 and also provide rumble strips as per IRC:99-2018.
- There are encroachments observed on RHS service Road. The same need to be removed for safe movement of traffic
- Road marking as per IRC 35:2015 need to be done to instruct the drivers about the road. while doing audit road marking work has been made. Pedestrian crossing marking as shown in base plan need to be marked. Road studs (cat eyes) need also to be placed.
- Pedestrian crosswalks at mid blocks could be designed at an angle than being at 180 degrees straight angle. Providing crosswalks at an angle would promote better visibility to both the pedestrian as well the coming vehicle.
- Refuge islands need to be provided to enhance safety of pedestrian as per IRC:103-2012. This will give facility of local commuter to cross the main carriageway of NH-48 and approach road leading to Jaisinghpurs.village
- To caution drivers about the black spot location various signs are required to be placed as per IRC 67:2012 on both on main carriage of NH-48 and approaching road leading to Jaysinghpura village
- Solar Blinkers at starting of black spot on both direction (LHS & RHS) need to be placed to make driver aware that blackspot is about to start.

- Provided marked parallel parking bays along the road wherever possible to discourage unregulated and haphazard on-street parking.
- Replacement of Fixed Time traffic control signals/Flashing Amber with vehicle actuated signals to improve the safety as well as capacity of the junction during odd (off-peak) hours. Traffic signals are provided with primary, secondary, cantilever signal heads to be visible enough to be seen by all drivers and provided with pedestrian phases in the signal.
- The approach road leading to Jaisinghpura village need to be realigned brought nearly perpendicular to enhance the visibility of approaching side road traffic.

**(2) Long-term Measures**

As a long-term measures, it is proposed to construct the 6-lane flyover of following features is to provide ensuring uninterrupted movement of traffic

- Elevated structure with underpass - 4 span @30 m each
- Length of Retaining wall-360 m (Ajmer side- 215 m+ Jaipur side -145 m)
- Foundation- Pile foundation
- Sub Structure- RCC Solid Circular Abutment
- Bearing--POT cum PTFE
- Super Structure- PSC Box Girder



**Fig. 8 Base Plan of Bhankrota Intersection**

**9. CONCLUSION**

Safety aspects of intersections is utmost essential. The deficiency in the design were observed and the measures for improvements were suggested. The study suggests that without major demolition of the existing infrastructure, the improvement measures may be implemented on site.

**10. REFERENCES**

- [1] World Health Organization (WHO) report year 2020
- [2] Annual Report National Crime Records Bureau (NCBR) 2020
- [3] Nikhil Chauhan et al , 2020 Identification of Road Accident by using Black Spot method between Panthaghati to Dhalli Road, International Journal of Recent Technology and Engineering (IJRTE), ISSN: 2277-3878, Volume-9 Issue-2, July 2020
- [4] Nivea John, et al (2019), Crash Characteristic Analysis and

- [5] Blackspot Identification using QGIS, International Journal of Advanced Research in Computer and Communication Engineering Vol. 8, Special Issue 1, January 2019
- [6] Sandeep Verma, 2018, Identification and Improvement of Accident Black Spots on N.H.86 District Sagar, Madhya Pradesh, International Research Journal of Engineering and Technology, 5(2), 225-232
- [7] Athira Mohan, 2017, Identification Of Accident Black Spots On National Highway ,International Journal of Civil Engineering and Technology,8(4), 588-596
- [8] Snehal Bobade,2016, Black Spot Analysis on National Highway – 4, International Journal of Engineering Research & Technology, 5 (3),484-488
- [9] Ministry's OM No. RW/NH-15017/10912015-P&M(RSCE) dated 28th October ,2015 regarding identification and rectification of road accident black spots on National Highways