

# IDENTIFICATION OF BLACKSPOTS IN PALA-THODUPUZHA ROAD AND RECOMMENDATION OF REMEDIAL MEASURES

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**Abstract** - Road safety has become a global issue of concern and concerted efforts need to be initiated at the ground level to avoid the thousands of lives being lost in road crashes around the world. It is attempted to identify and prioritize the accident-prone points (black spots) in "Pala-Thodupuzha" road located in Kottayam. The task is to identify where accidents are happening and investigate them to determine the factors involved so that appropriate and effective remedial measures can be applied. Here we are using speed profile method for identifying blackspot. Taking actual accidents as the starting point is of fundamental importance, because it is not possible to reliably identify and analyze hazardous locations from the look of the road alone. The main aim of this paper is to use the variability in the speed data for the identification of accident-prone spots. The expected outcome includes providing standard proposals to help with the mitigation of accidents. This paper also discusses some suggestions which can be successfully implemented on that stretch for increasing safety.

## 1. INTRODUCTION

There are mainly four techniques for identification of blackspots and these are: i) Statistical methods ii) Engineering methods iii) Bio-medical techniques iv) Subjective assessment techniques

Here we used Statistical methods. Statistical methods which take information from police records are useful only for the identification of blackspots or accident spots. But by treating these accident spots the accidents may not be reduced because the causative reason for accidents occurring on them may be due to criticalities elsewhere. It is indeed the accident prone locations or dangerous locations which are necessary to be identified in accident investigation work, for they are the ones responsible for escalation of accidents. This confusion between dangerous spots and accident spots is necessary to be clarified, so that some of the common mistakes committed by field engineers can be minimised. Dangerous spots are those which are characterised by criticalities in geometrical elements, either in plan or in profile or both. It is at these

sections the skin galvanic response and pulse rate of the drivers, enormously increase and it is the wide fluctuations in these quantities on short stretches of roads that are responsible for accidents. Sometimes, the dangerous spots can be accident spots also if they permit larger variability in the response of the drivers. None of the techniques listed can, be used singularly in the identification of accident prone locations. Accident

Coefficient Method is for establishing criticality in relation to geometrical elements, the Safe Coefficient Method is a measure of criticalities created due to operation of vehicles on the road. The main aim of this Paper is to use the variability in the speed data at different locations in the different runs of a test car for the identification of accident prone spots. The methodology proposed is experimented along with the above engineering methods of blackspot identification to demonstrate the usefulness of the former.

### 1.1 Data Collection

The study sections chosen, happens to be an 28 km length roadway on the Major Road between Pala and Thodupuzha. The extracts from this file include:

- i) Speed details at different locations
- ii) Accident particulars from police records.

#### 1.1.1 Speed Details

A representative test vehicle was used for the collection of the speed particulars. The time taken for travel of this test vehicle in free flow condition between successive 200 m stones on the road stretch was used for calculation of speeds at different sections. These speeds were plotted as profile on the test section and such profiles constructed for eight different runs of the test vehicle form the speed profile data.

#### 1.1.2 Accident Particulars

Accident particulars were gathered from the relevant Police Stations for a period of three years from 2019 to 2021 from the First Information Reports. The accidents in

these Police Stations are classified and recorded as fatal, major and minor.

## 2. LITERATURE REVIEW

Sanath A H, Nikhil T R, Yateen Lokesh [1] This paper deals with the identification of blackspot and improvements to the specific location in terms of geometrics of road. The procedure described is based on recorded accidents, data about accidents and traffic volume. The simultaneous increase of population results in rapid and extensive increase of motor vehicles in the country. It has faced many problems in traffic management; the major issue is Road accidents. The factors of the current scenario are Human, Vehicle and Road. As a matter of fact, to control the issue, road is preferable than Human and vehicle. This paper deals with the identification of Blackspots and improvements to the specific locations in terms of geometrics of road. The procedure described is based on recorded accidents, data about accidents and traffic volume. Finally, the evaluation of the proposed remedies will be simulated using vissim software.

Sunny Tawar, Sachin Dass This paper deals with the study and to analyze the traffic safety situations in the section from Chaudhriwas, Hisar to Hisar City on NH-65(new NH-52) in the state of Haryana(India) and to identify countermeasures for the stretch so that the total harm caused by the road crashes can be reduced to some extent in future. The stretch of 19.5 kms is taken for study. In this paper, the identification of road accidents and its causes, variations with respect to yearly, monthly, hourly, user type, vehicle, age, seasonal and also the number of black spots by further giving the suggestions and conclusions to reduce the road crashes and to make safer for road users.

Arun Kumar, Ajay Singh Chauhan, Abhishek Thakur, Khushpreet Singh and Aditya Tiwary To identify the reason that leads a particular stretch of National Highway an accidental prone area and to provide the helpful information. To find out the black spot on NH-21A from BADDI to NALAGARH. Methods: Data taken from PWD and FIR's have been analyzed and places were identified where maximum accidents occurred. IRC 53:1982 has been adopted for drawing the condition and collision diagram of the particular accident location. Peak hour traffic volume data has been collected.

R.R.Sorate1, R.P. Kulkarni, S.U. Bobade, M.S. Patil, A.M. Talathi, I.Y. Sayyad, S.V.Apte The project is to identify the accident black spots on National Highway-4 spanning 14.5Kms from New Katraj Tunnel to Chandani Chowk and to suggest remedial measures. The project concentrates on infrastructure errors and their combination with other

types. An accident blackspot is a term used in road safety management to denote place where road traffic accidents have been historically been concentrated. For finding out various causes of accidents, different methodologies adopted and to find out remedial measures. Methodology adopted includes collecting the secondary data from respective authority, conducting physical survey (primary data) and analyzing them by method of ranking and severity index, accident density method, weighted severity index. Locations appearing in all the three methods were termed as blackspots. Further corrective measures were suggested.

C. Vigneshkumar An accident black spot is a term used in road safety management to denote a place where road traffic accidents have historically been concentrated. It may have occurred for a variety of reasons, such as a sharp drop or corner in a straight road, so oncoming traffic is concealed, a hidden junction on a fast road, poor or concealed warning signs at cross-roads. This research work is focused on road accidents at identified black spots on National Highway-208 (Madurai- Virudhunagar Districts) origin from Kollam (Kerala) and terminates at Thirumangalam (Tamilnadu) where accidents cluster. After conducting field visits, deficiencies in road design were identified and remedial measures suggested with particular reference to sight distance, horizontal curvature, obstructions along the highway and junction design. This research work revealed that accidents at black spots can be prevented through better design of roads as there is relationship between speed and road geometry.

Parth B. Parmar, A. A. Amin , Dr. L. B. Zala In this paper, efforts have been made to recognize the locations of accident black spots on Sardar Patel Ring Road, Ahmedabad. The western part of Ahmedabad has settled mainly as a residential area and the eastern part has industrial estates. A 76.3 km road was planned around the developing areas of Ahmadabad to strengthen the existing road network within the city. Thus, the problem of traffic congestion and occurrence of road accidents are frequent on the Ring Road. Road crash data collection has been done from various police stations of Ahmadabad district. The road inventory survey, traffic volume count survey and spot speed survey are done on the study area stretch. Mapping and geospatial analysis has been done in freely available Quantum GIS (QGIS) software. This paper also discusses some suggestions which can be implemented on that particular corridor which has been identified as stretch with maximum accidents. This study will showcase how to carry out black spot identification for urban areas of developing countries using open source GIS software. The conclusion suggests the remedial measures as per the observations.

Snehal U Bobade<sup>1</sup>, Jalindar R Patil<sup>1</sup>, and Raviraj R Sorate The Yeshwantrao Chavan Expressway (Mumbai - Pune

Expressway) has witnessed large number of accidents since it became fully operational in April 2002. According to daily DNA, dated April 3, 2012, there were 11,057 accidents in 10 years of its existence. The PWD (Public Works Department) Government of Maharashtra state had undertaken the improvement of such accidental prone spots which generally designated as the black spots on highways. But little research has been done till day on prevention of accidents. The paper deals with study and identification of accidental black spots on Pune-Solapur National Highway (NH9) and Mumbai-Pune Expressway by method of ranking.

Pritam Kashid, Yugandhar Shinde , Siddhant Dhavare , Hrishikesh Pokharkar In this paper, objective factors are being analysed and explained along with a supplementary visual road survey and remedial measures. For the analysis of accidental black spots primary and secondary data was collected. Primary data was collected by conducting physical survey on NH-48 and secondary data (Existing data) was collected from national highway authority of India (NHAI) for two year (2017-2018). Then primary and secondary data was analysed by ranking method, weight severity method and accidental density method and accidental blackspots were detected on NH-48. Then the remedial measures can be suggested at respective accident prone zone after conducting different surveys. The remedial measures if not able to eliminate accidents to zero shall be able to reduce accidents to the bare minimum. The study of accidental black spots revolves around road safety study as they are an interlinked topic and thus if road safety is satisfied then apparently it is going to reduce the rate of accidents. This reduction in rate of accidents hence shall nullify an accidental black spot if any. Accidental prone areas are thus to be checked for absence of the safety norms and thus carrying out corrections in the existing road design or road condition to fulfill safety aspect. Indian National Highways are thus to be engineered considering all these inputs related to safety and design standards.

### 3. METHODOLOGY

Methods for analysis of blackspot are:

- ☑ Accidental statistical method
- ☑ Speed profile method
- ☑ Roadway characteristic study

#### 3.1.1 Statistical method

We take information from police record which are useful for identification of blackspot. But by treating these accident spot the accident may not be reduced because the reason for accident occurring on them may be due to criticalities elsewhere. It is indeed the accident prone location or dangerous locations which are necessary to be identified in accident investigation work for they are the once responsible for accident. Accident spots as identified from police records which are called as blackspots may or may not be the locations which are responsible for the accidents . treating such accident spots in isolation doesn't result in reduction of accidents we need to identify the dangerous locations which propel accidents along the blackspots , so that they can be treated together.

#### 3.1.2 Speed profile method

Speed profiles are studied with respect to following property such as:

- ☑ Mean speed of test vehicle
- ☑ Coefficient of variation at each location
  - ☑ Change of relative speed between adjacent sections

In order to compare sections on a universal basis the following indices have been proposed

- ☑ Speed index
- ☑ Coefficient of variation index
- ☑ Speed gradient index

#### 3.1.2 Speed index

The speed index on i section is

$$SI_i = \frac{S_i - S + 2\sigma_s}{\sigma_s}$$

#### 3.1.3 Coefficient of variation index

Coefficient of variation of the speed at the I th section is

$$CV_i = \frac{\sigma_i}{S_i} \times 100$$

#### 3.1.4 Speed gradient index

It is introduced to study the oscillation of speed profile around the mean. Speed Gradient index is calculated by

dividing obtained speed gradient to standard deviation. Using three indices obtained sections are classified as

- Safe
- Slightly dangerous
- Very dangerous

### 3.1.5 Roadway characteristic study

For this purpose, first, entire length of the road was checked for road imperfections and the factors which were expected to contribute into accidents along the road; listed as horizontal curves, vertical curves, traffic signs, adequate lighting at night, sight distance, road shoulder, guard rail and passage of animals across the road, traffic of smugglers' vehicles, interchanges at residential areas.

## 4 CONCLUSION

In spite of vast literature that has developed over years of research on accidents and accident analysis it has not been possible for the developing countries to reduce the accident severity on their road system. This is due to the lack of reference framework for comparing road sections of more or less identical disposition in relation to safety and gaining knowledge out of such efforts. The developed index values which are dimensionless are able to combine together to pick up accident spot more nearer to the compared to the existing techniques for identification of black spots. It is hoped that as and when the methodology suggested above is applied to roads in different regions, it will be possible to evolve design standards which will specify not only the sizes of the geometrical elements, but also rate of change of those elements to ensure traffic safety thus helping the development of uniform design standards on the roadways. With the help of speed profile method we can identify sections which are unsafe and hazardous.

Comparing the variations of speed index, coefficient of variation index and speed gradient index, helps to find out and prioritize accident prone areas. It could be seen that sections having low product index value is safe. In order to develop the design standards it is necessary to group together sections under different accident severity classification.

It is hoped that as and when the procedure suggested in this paper is applied to roads in different regions, it is possible to evolve design standards which will not specify not only the sizes of the geometrical elements, but also rate of change of those elements to ensure traffic safety, thus helping the development of uniform design standards on the roadways. The following are the main conclusions emerging out from the study:

- The speed coefficients of different classes of vehicles will be different in different directions in mixed traffic flow.
- In mixed traffic environment, the flow corresponding to capacity conditions can have widely varying values depending upon the degree of freedom enjoyed by vehicles.

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