

# Identification of Black Spots & Accident Analysis on SH – 4

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**Abstract:** Traffic safety plays a major role in sustainable transportation development. The negative impact of modern road transportation systems are injuries and deaths in road accidents. Traffic crashes in India are increasing on a steady rate. It results in property damages as well as death of road users. Black spots are the locations in a road where crashes are common or places in which road crashes results in fatal injuries. Therefore, the identification and analysis of road accident black spots regarded as one of the most effective approaches to road accidents. This paper aims to identify the accident-prone zones within Rethibowli to Moinabad route of Telangana State, using Accident Severity Index Method. For this purpose, the road accident data for the past three years 2016, 2017 and 2018 pertaining to nearby Police stations are collected. Road Safety Analysis carried out in the top accident-prone locations to find out the causes for accident.

**Keywords:** Accident Severity Index, Black Spot, Traffic crashes, Transportation

## I. INTRODUCTION

Highways are the economic backbone of the country and often facilitated development along their routes. Understanding the seriousness of issue, corrective measures taken all over the globe. In India National Road Safety Council (NRSC) is the apex body for road safety, requested all States/UTs for setting up of State Road Safety Council and District Road Safety Committees to hold their meetings, curb the menace of Road Accidents and give priority to road safety.

Black spots are the locations where a number of accidents repeatedly occur. The basic elements in traffic accidents are road users, vehicles, road condition, road geometry, environmental factors etc. The main cause of road accidents are road parameters such as road width, deficiency in super elevation, deficiency in site distance, radius of horizontal curve etc. Severity index method used for finding the hotspots. In this method, a severity value obtained for each crash location based on number of people died, number of people severely injured, and number of people who got minor injuries and so on. Thus, Accident Severity Index (ASI) is defined as a dimensionless value indicating the hazardousness of a spot in the road.

## II PROPOSED METHODOLOGY

Various methods are used for black spot analysis are as follows;

Methodology adopted mainly includes collection of existing data from Police Stations, experimental investigation on the Highways and analysis of existing data.

**2.1 Existing Data Collection:** There are two methods to identify accident black spots. By conducting physical survey considering predominant causes of accidents and other is to analyze the existing accident data of a particular stretch. Methodology includes identification of black spots by correlating the physical survey with existing accident data. Existing data collected from local Police Stations.

### 2.2 Experimental Investigation:

There are many parameters that cause accidents on highways, but only the parameters that are more predominant in the study area had to be selected. In order to determine the accident-prone locations in our area of interest, following data collected and used.

1. Chainage wise accident data obtained for SH4 along with the Nature of accident occurred, Causes and elements of accident, classification of accidents, Road features, whether condition.
2. Accident-prone locations as suggested by the Police station.
3. Experimental Investigation

**2.3 Analysis of Existing Data:** Existing data collected from Police station was to be correlated with the data collected from physical survey to identify accident black spots. It analyzed by following methods.

1. Method of Ranking and Severity Index
2. Accident Density Method
3. Weighted Severity Index
4. Accident Severity Index

### 2.3.1 Method of Ranking and Severity Index

It finds the most predominant parameter out of the available. Based on logical analysis wherein the parameter occurring most frequently is given the top rank and the parameters that have occurred rarely are given lower ranks.

#### 1. Method of ranking.

- i. For all the 10 parameters, the chainages number denoting Y were calculated (Say  $\alpha$ ).
- ii. The parameters ranked on the basis of the number of Ys. The one with most number of Ys given the top rank.
- iii. The parameters were given the weightages on the basis of their ranks. The one with top rank given the highest weightage.

#### 2. Severity Index

Severity Index shows the vulnerability of a particular spot to accidents.

Severity ( $\beta$ ) calculated by adding respective weightages of the parameters indicating Y for a particular chainage.

- i. Severity Index (SI) was calculated as shown below;  $SI = (\beta / \Sigma W) \times 100$  Where,  $\Sigma W = w_1 + w_2 + \dots + w_{10}$

#### ii. Severity Index Benchmark:

It is the severity index value above which corresponding spots are black spots. It calculated as the sum of weightages assigned to the top five parameters divided by weightage of all the parameters. The value obtained in percentage, then subtracted from 100 to obtain Severity Index Benchmark For e.g.: Summation of the weightages assigned to top five parameters

The causes of accidents were given in the existing data are,

- i. Overturning
- ii. Head on collision
- iii. Rear end collision
- iv. Skidding
- v. Vehicle out of control

These five causes chosen as parameters for method of ranking and severity index

### 2.3.2 Accident Density Method

- i. The accident density, calculated from the number of accidents per unit length for a section of highway. Sections with more than a predetermined number of accidents classified as high accident locations.
- ii. Unit length taken as 500m.
- iii. Predetermined no. of accidents calculated as average number of accidents that have occurred per unit length.
- iv. Average no. of accidents = (Total no. of accidents) / 29

### 2.3.3 Weighted Severity Index

- i. It follows a system of assigning scores based on the number and severity of accidents at that particular location.
- ii. Severity of an accident classified as Fatal (K), Grievous injuries (GI) and minor injuries (MI).
- iii. WSI is calculated by formula,  $WSI = (41 \times K) + (4 \times GI) + (1 \times MI)$
- iv. Locations having WSI more than or equal to 41 are termed as accident black spots and it should be consider for design.
- v. Criteria for choosing limit of WSI In the WSI formula a fatal accident has been given 10.02 times more weightage than grievous accident ( $4 \ll 41$ ) also minor accident has been given a unit coefficient. ( $1 \ll 41$ ). For grievous and minor accidents to be comparable with fatal accidents while calculating WSI more data is required and hence in this specific research limit of WSI is chosen as 41 i.e. coefficient of K..

### 2.3.4 Accident Severity Index (ASI)

Accident Severity Index (ASI) value was calculated based on the data collected. The black spots prioritized according to the severity of the location and road safety analysis was done in the identified hotspots. The concept of this method is that the number of fatal or injury accidents at a location is given a greater weight than property damage-only accidents. Accident Severity Index (ASI) is a dimensionless value indicating the hazardous of a location. The following equation are used:

$$ASI = N_f W_f + N_s W_s + N_m W_m$$

Where,

$N_f$	=	No. of fatal accidents at the spot in the last 3 years	
$W_f$	=	Weight assigned to fatal accident cases	= 6
$N_s$	=	No. of serious accidents at the spot in the last 3 years	
$W_s$	=	Weight assigned to serious accident cases	= 3
$N_m$	=	No. of minor accidents at the spot in the last 3 years	
$W_m$	=	Weight assigned to minor accident cases	= 1

## III PRACTICAL WORK

## 3.1 Study Area:

The study area selected was Rethibowli to Moinabad Town, as it is the common route for our college students, which we have seen number of accidents occurred in this route while coming to college and after departing from the college. Hence, we have chosen this route for our project report.

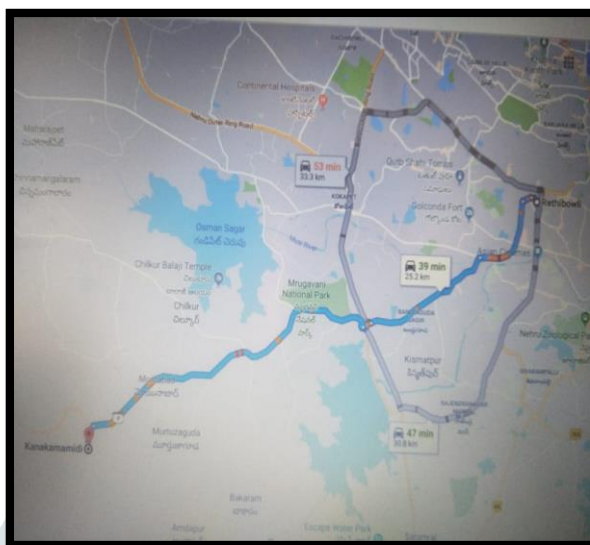


Fig 3.1: The route map from Rethibowli to Moinabad (kanakamamidi)

**3.2 Data collection:** The road accident details of past three years (2016-2018) collected from city police records. The spots with higher number of accidents identified. Following are the data collected from the police stations (langar house, Rajendra nagar, Moinabad) Accident details.;

## 3.2.1 Data collected in langar houz police station

Table 3.1: Langar Houz Police Station data

S. NO	Spot	Fatal	Non-fatal	Total no of accidents	Number of people died
<b>2016</b>					
1	Rethibowli	14	33	47	15
2	Nanal Nagar	01	14	15	01
3	Langar Houz	02	11	13	02
4	Tippu Khan Bridge	00	03	03	0
5	Total	17	61	78	18
<b>2017</b>					
1	Rethibowli	05	34	39	07
2	Nanal nagar	03	06	09	03
3	Langar Houz	01	04	05	01
4	Tippu Khan Bridge	05	08	13	05
5	Total	14	52	66	16
<b>2018</b>					
1	Rethibowli	11	23	34	13
2	Nanal Nagar	02	04	06	02
3	Langar Houz	05	09	14	06
4	Tippu Khan Bridge	01	04	05	01
5	Total	19	40	59	22

## 3.2.2 Data collected from Moinabad police station.

Table 3.2: Moinabad police station data.

S. No	Spot	Fatal	Non-fatal	Total no of accidents	Number of people died
<b>2016</b>					
1	Moinabad	12	32	44	12
2	Aziz Nagar	05	06	11	05
3	Himayath Nagar	01	11	12	01
4	Chilkur	01	04	05	01
5	Gandipet Y-Junction	0	01	01	0
6	Total	19	54	73	19
<b>2017</b>					
1	Moinabad	04	03	07	04
2	Aziz Nagar	02	01	03	02
3	Himayath Nagar	03	02	05	04
4	Chilkur	01	02	03	02
5	Gandipet Y-Junction	01	03	04	02
6	Total	11	11	22	14
<b>2018</b>					
1	Moinabad	04	14	18	05
2	Aziz Nagar	04	06	10	05
3	Himayath Nagar	02	08	10	02
4	Chilkur	00	04	04	00
5	Gandipet Y-Junction	00	04	04	00
6	Total	10	36	46	10

## 3.2.3 Data Collected In Rajendra Nagar Police Station;

Table 3.3: Rajendra Nagar police station data

S. NO	Spot	Fatal	Non-fatal	Total no of accidents	Number of people died
<b>2016</b>					
1	Bandlaguda	1	0	1	1
<b>2017</b>					
1	Bandlaguda	1	6	7	1
<b>2018</b>					
1	Bandlaguda	0	4	4	0

## IV CALCULATIONS

Using Accident Severity Index (ASI);

Table 4.1: Accident Severity Index;

Place Of Accident	Accident severity index
Rethibowli	450
Nanal Nagar	108
Lungar House	120
Tippu Khan Bridge	81
Bandlaguda	42
Gandipet Y-Junction	30
Aziz Nagar	105
Himayath Nagar	99
Chilkur	42
Moinabad	267

#### 4.1 Ranking of black spot




For each location, the equation applied and calculated. After obtaining those severity values, the hotspots were ranked according to these values. The places are arranged in ascending order of the severity value.

Table 4.2: Ranking of black spot






Place	Rank
Rethibowli	1
Moinabad	2
Lungar House	3
Nanal Nagar	4
Aziz Nagar	5
Himayath Nagar	6
Tippukhan Bridge	7
Bandlaguda	8
Chilkur	8
Gandipet Y- Junction	9

#### 4.2 Detailed survey

Detailed survey or secondary survey is carried out by visiting the spot, which are located in between to Moinabad to Rethibowli Places .A brief discussion about each spot is as follows

Place of Detailed Survey	Image	The reasons for causing accidents are as follows:
Moinabad Town		<ol style="list-style-type: none"> <li>1 .There is no divider</li> <li>2. over speed vehicles</li> <li>3. Negligence of driver</li> <li>4. Sudden right turn</li> <li>5. out of control, of the vehicles</li> </ol>
JBIT College		<ol style="list-style-type: none"> <li>1 .There is no divider</li> <li>2. over speed vehicles</li> <li>3. Negligence of driver</li> <li>4. Out of control, of the vehicles</li> </ol>
langar Houz		<ol style="list-style-type: none"> <li>1. over speed vehicles</li> <li>2. out of control of vehicles</li> <li>3.Narrow carriage width</li> </ol>



<p><b>Gandipet Y-Junction</b></p>		<ol style="list-style-type: none"> <li>1. over speed vehicles</li> <li>2. out of control of vehicles</li> <li>3. No proper, Super elevation</li> </ol>
<p><b>VJIT College</b></p>		<ol style="list-style-type: none"> <li>1. over speed vehicles</li> <li>2. Vehicles standing on the road, causing obstruction.</li> <li>3. Less carriageway width</li> </ol>
<p><b>Tippu khan bridge</b></p>		<ol style="list-style-type: none"> <li>1. over speed vehicles</li> <li>2. Confusion in the drivers.</li> <li>3. Improper Super elevation.</li> <li>4. No Traffic Signals to monitor the Traffic.</li> </ol>
<p><b>NanaL Nagar</b></p>		<ol style="list-style-type: none"> <li>1. Confusion Traffic &amp; Rash Driving.</li> <li>2. Sudden left turn</li> <li>3. Heavy Traffic</li> </ol>
<p><b>Rethibowli</b></p>		<ol style="list-style-type: none"> <li>1. Less carriageway width</li> <li>2. Vehicles parking on the road</li> <li>3. Sudden Right turning Vehicles.</li> <li>4. Rash driving</li> </ol>

## V RESULT AND CONCLUSIONS

The study was an attempt to find out the black spots in Hyderabad area. To rank the accidents spots or locations, the Accident Severity Index (ASI) method is used. This method found to be effective in identifying the black spots. As the result given in map format, it is easy to interpret result. Based on the analysis, Rethibowli signal was identified as most vulnerable accident prone area and Road Site safety analysis was conducted at all the hotspots to know the condition of the road. Road Safety analysis is used to find out factors influencing crashes and hence to give remedial measures.

## References

- [1] R.R Sorate, "Identification of Accident Blackspots on National Highway 4", IOSR Journal of Mechanical and Civil Engineering, Vol.12, Issue 3, pp 61-67.
- [2] Michael Sorensen, "Injury Severity Based Black Spot Identification", Annual Transport Conference at Aalborg University 2007.
- [3]. Jain, S.S., Parida, M., Chauhan, M.P.S. , 2004, —Identification of Hazardous Locations on National Highways, International Conference on Transportation Systems Planning and Operation (TRANSP0 2004), Chennai.
- [4]. Sarin, S.M., 1998, —Road Traffic Safety in Indian Issues and Challenges Ahead, Indian Highways, Vol. 26, No.6., pp 26-38.
- [5]. Singh, H.N., and Sharma, M., 2002, —Report on Road and Traffic Safety, COTE, IIT-Roorkee.
- [6]. Gopala Raju SSSV., 2011, —Vehicular Growth and Its Management in Visakhapatnam City – Case Study, Indian Journal of Science and Technology, Vol. 4, No. 8 , pp 903 – 906.
- [7]. Garber, N.J., Hoel, L.A., 2002, —Traffic and Highway Engineering, Third Edition, Thomson Publishing Company, New York, pp.131-172.
- [8]. Reshma, E. K., "Prioritization of accident black spots using GIS", International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, Vol.2 (9), pp.117 – 120, 2012.
- [9]. Nagarajan, M., and Cefil, M., "Identification of Black Spots & Accident Analysis on NH-45 Using Remote Sensing & GIS", International Journal of Civil Engineering Science, Vol. 1, pp.1-7, 2012.

