

## STUDY of PEDESTRIAN ACCIDENTS on NATIONAL HIGHWAY-5 using POLICE STATION SURVEY in VISAKHAPATNAM

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### Abstract

In India where pedestrian fatalities constitute around 50-60% of total fatalities, 30-40% of all reported road accidents occur on National Highways. Pedestrian safety study would provide a useful input to design roads accordingly so as to prevent pedestrian fatalities at urban areas in India. In comparison with other road user groups, pedestrians are involved in a significant number of fatal and injury accidents due to various reasons. Today with new appreciation for the value of a balanced transportation system, planners and designers are paying more attention to pedestrian travel.

Walking is the glue that holds our urban transportation system together. It is a necessity to take care of pedestrian safety in a fully fledged way rather than controlling the pedestrians. It is more accurate to assess pedestrian safety by how many people actually walk on streets and what factors improve or worsen pedestrian safety.

This project aims to study about the facilities provided and safety for the pedestrians on National Highway-5 from Akkayapalem to Madhurawada stretch in comparison to the Highway Safety Manual and FHWA Safety. Various surveys are carried and analysed for the better safety to pedestrians on the study stretch. The study area is so selected that it is a highway and also consists of residential and non-residential areas connecting to it. This new report can help to decide how to enhance pedestrian safety by giving more detailed information about where the enhancements are best applied.

**Keywords— Pedestrians, pedestrian safety, facilities, behaviour, surveys**

### I. INTRODUCTION

People walk for many reasons: to go to a neighbour's house, to run errands, for school, or to get to a business meeting. People also walk for recreation and health benefits or for the enjoyment of being outside. Some pedestrians must walk to transit or other destinations if they wish to travel independently. It is a public responsibility to provide a safe, secure, and comfortable system for all people who walk.

Road traffic accidents are considered one of the most important problems facing modern societies. It is estimated that India loses around Rs. 3000 crores annually due to road accidents. Of all the deaths in India, road accidents constitute the highest percentage around 22 percent. Pedestrians having highest percentage in accident rate compared to other vehicular traffic.

Pedestrians and bicyclists are the most vulnerable road users. Pedestrian accidents are mainly due to driver inattention, struck while crossing an intersection, motorist exceeding safe speed, struck from behind while using the carriageway for walking. In this scenario, pedestrian safety should be given prior importance. To minimize risk and severity of accidents and to inculcate the important of safety in expressway design, safety study on roads is necessary.

### OBJECTIVES

- To investigate facilities provided for pedestrian movement is adequate or not.
- To analyze the traffic volume data and pedestrian accident data and enlighten the various reasons for the cause of pedestrian accidents.
- To enlighten the experience of pedestrians while moving and crossing in the study stretch and to investigate the draw-backs.
- To analyze and identify data to suggest best practices to improve the pedestrian safety under suggested guidelines and standards.
- To enhance walkability of local districts and create safe comfortable welcoming environment for pedestrians.

### Factors Affecting Pedestrian Demand

The demand for pedestrian facilities is influenced by a number of factors of which some of the most important are

- **The nature of the local community-** Walking is more likely to occur in a community that has a high proportion of young people.
- **Car ownership** -The availability of the private car reduces the amount of walking, even for short journey.
- **Local land use activities-** Walking is primarily used for short distance trips. Consequently the distance between local origins and destinations (e.g. homes and school, homes and shops) is an important factor influencing the level of demand, particularly for the young and elderly.
- **Quality of provision-** If good quality pedestrian facilities are provided, then demand will tend to increase.
- **Safety and security-** It is important that pedestrians perceive the facilities to be safe and secure. For pedestrians this means freedom from conflict with motor vehicle, as well as a minimal threat from personal attack and the risk of tripping on uneven surfaces.

## II. STUDY AREA

- The Area Proposed For The Study Of Pedestrian Safety Is In Visakhapatnam.
- Visakhapatnam Is The Largest City In The Indian State Of Andhra. It Is The Third Largest City On The East Coast Of India (After Chennai And Kolkata). It Is A Port City On The Southeast Coast Of Bay of Bengal And Often Called As "The Jewel Of The East Coast" And "The City Of Destiny". As Of 2011, The Population Was Recorded As 2,091,811 And Occupying 681.96 Km<sup>2</sup>.
- The study area is a part of Asian Highway-45, National Highway-5 and also acts as a Major District Road connecting to various main parts of the city.
- The rising number of pedestrian disasters in the area and the minimum pedestrian facilities made to consider the study of pedestrian safety in the proposed study area.

## III. METHODOLOGY

The present study is to identify the accident-prone locations and to improve it on priority basis; a cursory look at the existing accident situation and traffic flow parameters becomes a prime necessity. Accident data will be collected from the police stations falling under the jurisdiction of the project road. Various traffic surveys will be carried out during the study.

The broad scope of activities identified for the present study includes the following:

- Accident data collection
- Traffic volume survey
- Pedestrian volume survey
- Public Audit
- Identification of Black Spots

### Traffic volume and count survey

Knowledge of the traffic volume its characteristics on a road stretch is important to understand the efficiency at which the system works and the general quality of service offered to road users. Knowing the flow characteristics it would be easily decided whether a particular section of the road is handling traffic at, above or below its capacity. Traffic volume count survey will be carried out at sections in the selected locations to know the total volume of traffic, composition of traffic etc.

### Pedestrian survey

Pedestrians are an important component of road users. Pedestrian volume survey will be carried out at the selected accident-prone locations, where high pedestrian activities are observed. Based on the analysis of this data, suitable proposals will be formulated to improve the safety of pedestrians.

### Accident Data

The accident data for the past five years from 2010-2014 were collected from the police stations falling under the jurisdiction of the project road in the city of Visakhapatnam (i.e., from Akkayapalem to Madhurawada). The various accident data collected as listed below.

- Distribution of accidents according to severity
- Month wise variation of accidents
- Location wise distribution of accidents

TABLE I  
YEAR WISE DISTRIBUTION OF ACCIDENTS ACCORDING TO SEVERITY TYPE.

YEAR	DIED	GRIEVOUS INJURY	INJURED
2010	26	28	36
2011	23	22	32
2012	20	22	28
2013	15	18	20
2014	11	13	18

TABLE III  
MONTH WISE DISTRIBUTION OF ACCIDENTS ACCORDING TO SEVERITY TYPE

MONTH	NUMBER OF			TOTAL
	DIED	GRIEVOUS INJURY	INJURED	
JANUARY	11	10	13	34
FEBRUARY	8	12	5	25
MARCH	9	13	12	34
APRIL	12	8	10	30
MAY	8	5	12	25
JUNE	5	7	13	25
JULY	7	6	14	27
AUGUST	6	10	12	28
SEPTEMBER	7	9	10	26
OCTOBER	11	8	13	32
NOVEMBER	6	7	9	22
DECEMBER	5	8	11	24

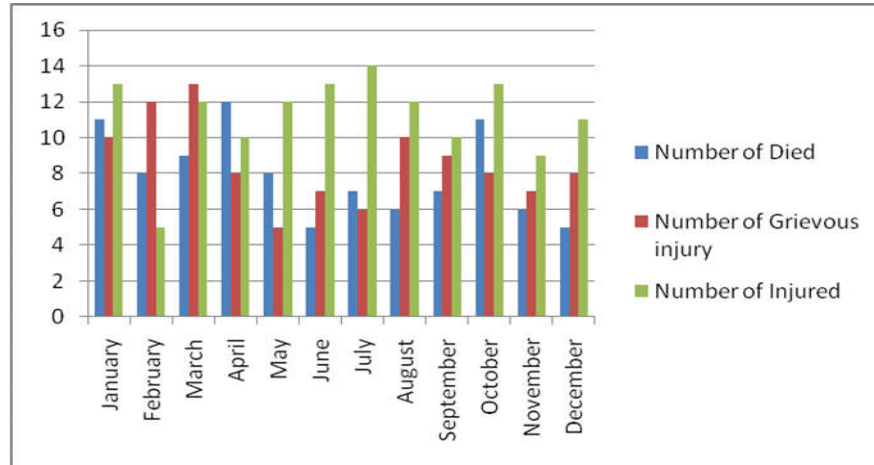


TABLE IIIII  
LOCATION WISE DISTRIBUTION OF ACCIDENTS ACCORDING TO SEVERITY TYPE

S.No.	LOCATION	NO. OF ACCIDENTS			TOTAL
		SIMPLE	GRIEVOUS	FATAL	
1	AKKAYYAPALEM – 4 <sup>TH</sup> TOWN	15	9	7	31
2	4 <sup>TH</sup> TOWN – GURUDWARA	18	12	13	43
3	GURUDWARA – SATYAM JN.	13	8	9	30
4	SATYAM JN. – MADDILAPALEM	12	10	8	30
5	MADDILAPALEM – ISUKATHOTA	21	15	12	48
6	ISUKATHOTA – VENKOJIPALEM	13	7	10	30
7	VENKOJIPALEM - HANUMANTHAWAKA	15	8	13	36
8	HANUMANTHAWAKA – DAIRY FARM	11	9	6	26
9	DAIRY FARM - ENDADA	12	7	8	27
10	ENDADA – P.M.PALEM	20	14	15	49
11	P.M.PALEM – MADHURAWADA	15	13	9	37

#### IDENTIFICATION OF ACCIDENT BLACK SPOTS IN THE STUDY AREA STRETCH

Analysis of existing accident scenario is required for the identification of accident-prone locations on the selected stretch. There are several methods, which have been applied in developed countries to determine accident-prone locations. However, in the present study, two methods of accident-prone locations analysis were considered for identifying and prioritizing the accident-prone locations.

#### Quantum of Accident Method

Higher the number of accidents on any stretch, higher would be the accident proneness of the stretch. It has been put forward that two accidents in a year may be due to minor design defects while three or more accidents in a year definitely indicate serious deficiencies in geometric of road stretch. Therefore all the stretches with 11 or more accidents during five-year period were considered accident-prone stretches. Table 7.1 gives the list of total accidents within the study corridor.

Based on the Quantum of accident method the above nine are the accidents prone stretches with total accidents for the five years greater than 11 were selected for detailed investigation. The accident-prone locations identified for detailed investigation are listed below in the order based on the accident data given in Table III.

- P.M.Palem – Endada
- Maddilapalem - Isukathota
- 4<sup>th</sup> town – Gurudwara
- Akkayyapalem – 4<sup>th</sup> town
- P.M.Palem - Madhurawada
- Isukathota – Venkojipalem
- Gurudwara – Satyam junction
- Satyam junction – Maddilapalem
- Dairy Farm – Endada
- Hanumanthawaka – Dairy Farm

#### Accident risk index (ARI):

Under the ARI method following three components of accidents was considered:

1. Consistency
2. Tendency and
3. Level

The above three components of accidents have been formed into four groups. Each component and group have been assigned certain points as explained below

ACCIDENT COMPONENTS	POINTS
<b>CONSISTENCY (MAX POINTS 30)</b> ONE OR MORE THAN ONE ACCIDENT EVERY YEAR	30
<b>TENDENCY (MAX POINTS 30)</b> NO INCREASE	10
<b>LEVEL (MAX POINTS 40)</b> NUMBER OF ACCIDENTS IN THREE YEARS IS 6 OR MORE THAN 6	40
TOTAL	80

#### Rating of Accident Components

Accident Components	Points
<b>1. Consistency (max points 30)</b>	
i. One or more than one accident every year	30
ii. One or more than one accident for two years	20
iii. One or more than one accident for one year only	10
iv. No accident in three years	0
<b>2. Tendency (max points 30)</b>	
i. Two times increase in three years	30
ii. One time increase in three years	20
iii. No increase	10
iv. No accident in three years	0
<b>3. Level (max points 40)</b>	
i. Number of accidents in three years is 6 or more than 6	40
ii. Number of accidents in three years between 3 and 5	30
iii. Number of accidents in three years between 1 and 2	20
iv. No accidents in three years	0

Each stretch of the road has to be analysed by using the above three components. Total score of each stretch has to be computed and compared. Higher the total score, higher is the accident proneness, which varied between 0 and 100. Road stretches having a score more than 90 have to be given priority in improvement. From the above computed values, accident proneness locations were listed below.

- Endada - P.M.Palem
- Maddilapalem - Isukathota
- 4th Town - Gurudwara
- P.M.Palem - Madhurawada
- Venkojipalem – Hanumanthawaka
- Akkayapalem - 4th Town
- Isukathota – Venkojipalem
- Gurudwara – Satyam junction
- Satyam junction – Maddilapalem
- Dairy Farm – Endada
- Hanumanthawaka – Dairy Farm

#### IV. CONCLUSIONS

##### Shoulders:

1. Peak hour pedestrian walks on the road causing obstruction to the vehicles which may lead to confusion to the driver of vehicle and lead to accident.
2. Due to the lack of shoulders pedestrians walk on the road which is very dangerous during peak hours.
3. Shoulders should be provided for better movement of pedestrians and their safety.

##### Bus stops:

1. Bus stop catchment area is adequately provided, but the fast moving vehicles and autos enter this area creating an unsafe environment to the pedestrians leading to accidents
2. Bus stop facilities like declinators and high intensity lights must be provided for better safety of pedestrians and must be provided with accurate and useful sign boards.
3. Bus stop height must be provided so as to provide safety to those who board the bus from the other moving vehicles.

**Road curving:** The curved roads present at some junctions must be provided with appropriate warning sign boards and must have a speed limit so that a vehicle when crosses the curved path has enough stopping sight distance in order to avoid accidents on seeing some obstructions.

##### Pedestrian crossing:

1. Zebra crossings are provided at various junctions both at signalized and un-signalized and some at median separations. These zebra crossings must be made visible by using proper declinators.
2. Declinators must be provided at every junction required and at the roads edges so as to ensure safety of both pedestrians and vehicles. These must be provided at zebra crossings, pedestrian refuge islands, etc for safety of pedestrians.

**Road geometrics :** The road geometrics must be so taken that they don't cause an obstruction to the vehicles and do not minimize the stopping sight distance. At some areas the road geometrics are so unbalanced that they result in fatal accidents.

**Sign boards :** Sign boards are of various types such as informatory, warning, etc. These sign boards must be situated at every junction, median separation, zebra crossing, etc so as to facilitate the pedestrians and the vehicle drivers and provide safety on roads. These sign boards are not situated at required places which cause trouble to the vehicles and the pedestrians resulting in accidents.

**Highway fencing :** The highway fencing is so bad that at some places it is hardly in proper shape. Fencing should be provided at both the lanes so as to prevent accidents.

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