

# Analysis of Pedestrian Safety In Relation To Urban Road Situations

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**Abstract::** Most pedestrian accidents in built-up areas occur at intersections. Even after signalized intersection, the number of accidents involving pedestrians often remains high. The area selected for this survey, is from Mehdiapatnam to Uppal of Hyderabad city, Telangana State. It is a straight long road with 30 km stretch with a heavy traffic. We followed the guidelines for pedestrian safety facilities of IRC: 103-2012. In a survey we have done with obstructions between footpaths, position of zebra crossings, pedestrian signals, condition of footpaths, kerbs, Pedestrian message signs, based on the requirements. Finding from these studies was that a crosswalk should be located less than two meters from the intersection to optimize pedestrian safety. The conclusions drawn from this study can use to improve the state of pedestrian safety in urban areas.

**Keywords:** Pedestrian, Pedestrian safety, Road accidents, Vehicular delays.

## I INTRODUCTION

Walking is one of the most important travel modes in every country. However, pedestrians are always neglected in transportation planning and management. A pedestrian can be termed as a person who travels on foot. Any person walking, running, standing or sitting on a road, in a mobility device or persons in a toy vehicle not capable of exceeding 10 Km/h known as pedestrian. Road accidents are essentially caused by improper interactions between vehicles, and other road users or roadway features. The situation that leads to interactions could be the result of the complex interplay of a number of factors such as pavement characteristics, geometric features, traffic characteristics, road users, behaviour, vehicle design, driver's characteristics and environmental aspects.

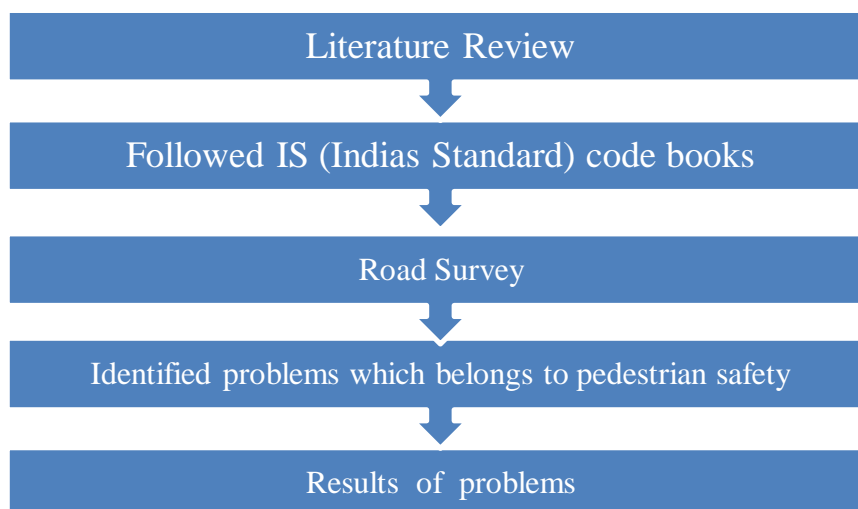
### Pedestrian Facilities Design Standards

Footpaths should be regarded as a transportation system, which is connected and continuous, just like roadways and railways. A clear height of 2.2m is required for the entire width of the footpath-walking zone. No tree branches, trees, utility poles, electric/water/telecomm boxes or signage should be placed within the clear height and width of the walking zone. The width of a footpath is fundamental to the effective functioning of the pedestrian system. Without an optimum width, footpath will not help move enough pedestrian and will discourage them from walking.

## II. METHODOLOGY

The methodology for determining the pedestrian level of service mainly includes determining the various factors which influence the pedestrians in terms of perceived safety and comfort. The factors such as pedestrian delay, number of pedestrians, number of lanes, through traffic, right turning vehicles, left turning vehicles, speed of vehicles at the intersection, corner area etc. are the main influencing factors.

Methodology for analysis of pedestrian safety in relation to urban road situations is as follows.



### Questionnaire survey

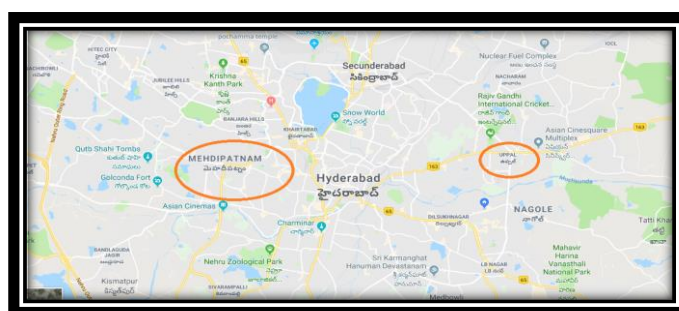
In this Questionnaire survey, pedestrian is crossing the intersection mainly surveyed to assess the pedestrian perception towards safety while crossing the road. For this purpose, we stood on one side of the road and surveyed the pedestrians who are crossing the road.

### Field survey

Field survey conducted to explore the condition of traffic, crossing facilities and pedestrian delay at intersection. The characteristics such as corner area, sidewalk width, and presence of road markings, length and width of crosswalk measured during the field survey. Video graphic technique used to determine the factors such as through traffic, number of pedestrians, left and right turning vehicles.

### III: STUDY AREA AND DATA COLLECTION

The study area selected is of Uppal to Mehdiapatnam of Hyderabad City, India. The required data of the study area obtained using video data cameras, observations of the characteristics and walking of pedestrians collected on crosswalks. Using a digital video camera, the data recorded the crosswalks at Mehdiapatnam to Uppal. The video clips were used to observe pedestrian walking behavior, including pedestrian interactions with street furniture or with other pedestrians.



**Fig 3.1:** Route map of study area from Medipatnam to Uppal Towns.

The various geometric features of intersections also measured such as Zebra crossings, pedestrian crossing signboards, width of roadway, width of sidewalks, interruptions between footpaths, bus stops, parking on footpaths, open drainages on footpaths etc.



**Fig 3.2:** Pedestrians waiting for the bus on road



**Fig 3.3:** Pedestrian crossing the road

The above figures are from sight areas of Mehdiapatnam and Uppal. We found that there is no proper busstop for pedestrians, so they are waiting for the buses on the road and that is causing disturbance to the other vehicles.

### Identification of Test Locations





The location chosen for the present study were such that they satisfied the following criteria






1. The pedestrian traffic was quite high
2. The flow was continuous i.e. there was no scope for pedestrian to halt for a longer time.
3. The pedestrian flow was of mixed type including the very young and old persons of either sex and of all possible types of pedestrians.
4. To provide higher safety to pedestrians without obstructing/hampering the inflow and outflow of traffic.
5. To provide better transportation facilities, fail to either provide pedestrian facilities on the Roadside or compromise the safety of pedestrians.

Video graphic survey conducted to explore the condition of traffic, crossing facilities and pedestrian delay at intersection. The characteristics such as corner area, sidewalk width, and presence of road markings, length and width of crosswalk measured during the field survey. Video graphic technique used to determine the factors such as through traffic, number of pedestrians, pedestrian delay, left and right turning vehicles.

## IV DATA EXTRACTION AND ANALYSIS

Table 4.1: Reasons for pedestrian accidents and its remedies at Mehdiapatnam to uppal

S.No	Image	Reasons for Concern	Solution for the Problem
1		Footpaths are encroached by Fruits shops etc...	All types of shops should keep far away from the footpaths.
2		Dust and other construction materials were poured on the Footpaths, causing inconvenience to the pedestrians.	Footpath need to be clear without any obstacles.
3		Along with Zebra crossing, signboards should also be present.	The cautions boards need to place their indicating pedestrian crossing.
4		Religious construction in the middle of the road. This creates a blind spot to the vehicular and may cause the accidents to the pedestrians.	Speed reduction signboards need to place indicating the pedestrians flow.

<p>5</p>		<p>However, there is a bus stop, but people are waiting on road for boarding the buses.</p>	<p>The awareness camps need to do to give clear idea about the purpose of bus stops.</p>
<p>6</p>		<p>There is no seating facility in bus stops. This makes people stand on the road causing obstruction to the road traffic.</p>	<p>Seating facility need to provide and well maintenance of the bus stop need to do.</p>
<p>7</p>		<p>GHMC dustbins are in between the pedestrian's walkways and on parking areas.</p>	<p>This causes a great hazard to the vehicular traffic and the pedestrians too.</p>
<p>8</p>		<p>Footpath is not clean and is occupied by nurseries.</p>	<p>All types of shops need to keep far away from the footpaths.</p>
<p>9</p>		<p>Zebra crossing were faded.</p>	<p>The zebra crossings have to be definitely marked to give the pedestrians safety.</p>

10		Bad Footpath with dust and bushes.	A new and clean footpath need to construct and maintain.
11		No proper bus stop, pedestrians standing on the carriageway.	The bus stops should be constructed/placed wherever required.

We registered the pedestrian traffic flow during normal day traffic hour 7.00am to 10:00 am in each road segment and for each side in the month of February 2019. We were equipped with a street map, a camera and reflecting jackets for our own road safety. Simultaneously, collected photos and registered the pedestrians' walking behaviour, examined legal and two illegal movements. By the above said elements, the pedestrians are facing many problems, and pedestrians are walking on roads instead of footpaths and they were injured. Pavements were encroached by private persons or government agencies across the city. It is impossible to walk on a footpath for a kilometre due to hindrances such as temporary shops, footpath dwellers, bus stops or public toilets. Even new roads laid do not have enough space for people to walk safely.

## V RESULT AND ANALYSIS

The required data, which collected from different surveys and methods, are put down here.

S.No	Element	Reason For Concern	Engineering Measures	Occurrence
1	Footpath	Blocking of footpath for commercial use lead the pedestrians to come in the road. Which leads to the accidents	Footpaths are to be used by pedestrians only and construction of footpath to be done where ever required.	31
2	Zebra crossing	Due to the lack of zebra crossing and improper signboards on road for pedestrians, it makes them confused and creates accident-prone.	The zebra crossing have to be painted on road at every busy signal and proper caution boards have to be kept	17
3	Bus Stops	Bus stop is the major disturbance for the pedestrians, due to unavailability of proper bus stops, footpath used as waiting hall.	If possible, we need to allot the maximum place for bus stop.	15
4	GHMC Trash Cans	The GHMC is widely using the pedestrian walkways for trashcans, which causes interruption for pedestrians.	Make use the trashcans placed at any other place, not on walkways.	4

5	Parking	The walkways used for parking, so vehicles jam the space and people are using the road for walking.	Separate parking facilities have to be made for vehicles, nearby bus stops and other commercial areas	10
6	Current Poles And Interruptions In Between Footpaths	These things are reducing the width of the footpath and congested leading to the pedestrians to use the carriageway.	The placement of current poles need to be rearranged away from the footpaths.	3
7	Open Drainages	Drainage is open along the roadside and garbage is thrown on roadside.	GHMC should take actions for these kind of issues	2

In this survey, we have found that at some places there is no Pedestrian signals and school zone improvements are less. The pedestrian signals will play a major role in pedestrian's life and they will reduce the pedestrian accidents.

## VI RECOMMENDATIONS FOR FACILITIES TO PEDESTRIANS

### A. Walkable Area within the Transit Area

- The maximum flow of pedestrian for public transit occurs when transit stops are within a 10-minute walking distance from source.
- Direct pedestrian path makes it easier for people to walk.

### B. Pedestrian Facilities in Transit Areas – Walkways

- Pedestrian walkways should be planned with a minimum width of 2m with accessible grade changes.
- Pedestrians should not have to walk more than 200m to a ramp or elevator to change floor level to access transit.

### C. Footpath/Footpaths

- 1.8-2m footpath/footpaths for light pedestrian traffic.
- 5m footpaths for heavy pedestrian traffic.
- To allow walking at near normal speeds, the footpaths must provide continuity without any obstacle.

### D. Crosswalks

- The crosswalk should be provided at every 30m on the pedestrian streets.
- At the zebra crossing, the width of the zebra crossing should be within the range of 2m – 4m.

### E. Bollards

- Bollards are often used to stop vehicles from entering the footpath and to keep pedestrians away from vehicular traffic. Unless positioned carefully, they can become a barrier to wheelchair users and are a particular hazard for persons with visual impairments.
- To stop use by bicycles/bikes, bollards at suitable locations should be provided with a clear gap of 1200mm between two bollards.

### F. Lighting

- Lighting shall be directed downward at all times.
- Lighting must be provided every 20-30m interval, focusing light on the pedestrian and bicycle lanes and not on the car lanes.

### H. Wash rooms and Toilets

Unisex accessible public toilets should be provided preferably at every 5km distance.

- Accessible toilets should have the international symbol of accessibility displayed outside for wheelchair access.

- The toilet door should be an outward opening door or two way opening or a sliding type and should provide a clear opening width of at least 900mm. It should have a horizontal pull-bar, at least 600mm long on the inside of the door, located so that it is 130mm from the hinged side of the door and at a height of 1000mm.

**Table 6.1:** Recommended materials for Pedestrian Facilities

S.No	Areas	Do's	Don'ts
1	Footpath	Non-skid/matt finish tiles, interlocking paving tiles, sandblasted stone, unpolished stone, checkered tiles, pavement quality concrete	Polished stone finishes
2	Kerb ramps	Anti-skid/matt finish tiles, flared sides with tactile paving, exposed cement concrete.	Polished stone finishes
3	Tactile Paving	Vitrified unglazed pavers in bright colour contrast to the flooring surface	Stainless steel or metal pavers in dull/slippy finish
4	Signage	Bright colour contrast big font signage on non-glare surface acrylic, retro reflective sheets	
5	Bus stops flooring	Anti-skid/matt finish tiles with vitrified unglazed tactile pavers in bright colour contrast to the flooring surface	Glazed vitrified tiles, Granite, Polished kota stone.
6	Street lights	White colour, mercury lights- full cut off fixtures	Yellow lights
7	Light signals	Auto signals with time display	Normal light signals
8	Cycle tracks	Preferred pavement quality cement concrete	CC Pavers ties and polished finishes

## CONCLUUSION

Pedestrians are one of the most Vulnerable Road User in India. In terms of pedestrian crashes on a worldwide scale over 4, 00,000 pedestrians are killed every year and over 10,000 pedestrians are killed on Indian roads. In this Project, we gathered information regarding pedestrian facilities at Mehdiapatnam to Uppal. Pedestrian facilities selected for this study include sidewalks, paths, curb ramps, crosswalks, signals, and signs and constitute the primary set of facilities that use by pedestrians on a daily basis. Maintenance of pedestrian facilities is like day-to-day maintenance (sweeping, vegetation removal, and snow/ice removal, etc.) and structural maintenance requiring repair work (patching, wedging, minor sidewalk replacement, etc.) need to do on regular basis. Sidewalks with a suitable base course and pavement thickness with anti-skid surfaces will last longer. The placement and selection of the type of street trees will have a profound effect on how the trees' root systems will affect sidewalks and require maintenance.

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