

Pedestrian Safety: National and International status

^[1]Mrs Smita V Pataskar, ^[2]Mr Sangmesh Ghale
^{[1][2]}Asst Prof. Department of Civil Engineering
^{[1][2]}D Y Patil College of Engineering, Akurdi, Pune 44
^[1]svpataskar@gmail.com, ^[2]sangmeshghale@gmail.com

Abstract :- With the increase in growth of urbanization and automotive sector, India has to face the side effects in the form of increasing the number of road accidents. Out of various causes of accidental deaths, 34.8% of deaths are due to road accidents. According to the report published by Ministry of Road transport and Highways, one person dies every 3.7 minutes in road accident. Out of these, pedestrians, cyclists and two wheeler drivers are most vulnerable. Various countries are taking steps to reduce these accidents. World Health Organization has published a Pedestrian Safety Manual which encompasses method of assessing pedestrian safety and preparing for action plan by implementing pedestrian safety interventions. IRC:103-2012 states the guidelines for pedestrian facilities which covers necessities of pedestrians with various disabilities. In the Urban street design guidelines published by Pune Municipal Corporation, street designs at intersections, foot walks and cross walks are standardized. Various researches are been conducted around the world to decrease the accidents and make travel safer. This paper covers the national and international status related to pedestrian safety.

Keywords: - pedestrian safety, safety codes, safety manuals, construction sites

I. INTRODUCTION

According to the report by World Health Organization, more than 2.7 lacs of people lose their lives on road accidents, 22% of it are the pedestrians. Increase in urbanization has brought many ill effects on the mankind. Accidents on roads are one of most severe of it as it takes away lives of the people with or without mistakes. Pedestrians are one of such most vulnerable road users due to following reasons

1. Speedy vehicles
2. Use of alcohol by drivers
3. Lack of safe road infrastructure for pedestrian
4. Inadequate visibility on roads

It is stated if a pedestrian is hit by a motor vehicle traveling 40 mph, the risk of dying increases to 85 percent. This highlights the traffic calming provisions to be made on the streets.

Definition of pedestrians

WHO gives the definition of pedestrian as “a person who is travelling by walking for at least part of his or her journey”. IRC 103-2012 has stated the definition of pedestrians to include people who walk, sit, stand in public spaces or use a mobility aid like walking stick, clutches or wheel chairs, be they

children, teenagers, adults, elderly persons, persons with disabilities, workers, shoppers or people watchers.

Principles of Urban Street Design Guidelines published by Pune Municipal Corporation in July 2016 are stated as follows:

1. All people should be able to move safely, smoothly and conveniently
2. Make streets safe, clean, attractive & comfortable for people to walk and drive
3. Streets to reduce impact on natural and built environment.

Various International codes / guidelines/ manuals

1.1 National Highway Authority of India

In the safety manual submitted to National Highway Authority of India by IIT Delhi (September 2010), traffic safety measure to be taken by the field engineers under construction sites. The procedures, contracts conditions are standardized while managing the construction sites that will accommodate the safety of pedestrians, cyclists, motor cyclists and vehicular traffic. Total five phases of traffic control for major projects are considered viz: planning phase, design phase, implementation, Operation & maintenance phase and closeout phase. It is to be ensured that there is no danger due to falling objects or sharp edges. Proper care should be taken to make scaffolding by providing white bands at eye level with head room of

2.1m. Kerb ramps are to be provided for the temporary footpaths. Portable traffic signs and signals are to be installed at proper locations which can be easily seen. Alternative routes must be provided taking into consideration, the needs of children and people with disabilities. Rigid barriers are to be provided to protect pedestrians from traffic, excavations, plant or materials.

1.2 Federal Highway administration of US Department of Transportation

It states the reasons in making road unsafe for pedestrians as:

1. Lack of pedestrian facilities
2. Wide and multiple lanes that are difficult to cross
3. Vehicles with high speeds
4. Wide roads with complex intersections that create long delay for pedestrian crossing
5. barren, unsafe, and unattractive environment for pedestrians

The objectives that are addressed to improve pedestrian safety and mobility that are given in the guidelines are as follows:

- Reduce the speed of motor vehicles.
- Reduce pedestrian risks at street crossing locations.
- Provide sidewalks and walkways separate from motor vehicle traffic.
- Improve awareness of and visibility between motor vehicles and pedestrians.
- Improve pedestrian and motorist behaviors.

Some good practices that involves the stakeholders such as Citizen's Pedestrian Advisory Board, "Cross the Street As If Your Life Depends On It" Education Campaign, University of North Carolina "Yield to Heels" Campus Safety Campaign, Sustainable Transportation Education Project (STEP), Gandhi walked, Get active Orlando, neighborhood speed watch program, "KEEP KIDS ALIVE, DRIVE 25" Campaign, Heed the Speed neighborhood safety program, Comprehensive Pedestrian Safety Programs are discussed.

Broadly the steps involved are

1. Planning and Designing for Pedestrian Safety by understanding pedestrian characteristics, by considering major planning, design, and policy elements that impact pedestrian safety include Street design, Street connectivity, Site design, Land use and Access management.
 1. Involving Stakeholders.

2. Collecting Data to Identify Pedestrian Safety Problems.
3. Analyzing Information and Prioritizing Concerns.
4. Selecting Safety Solutions.
5. Providing Funding.
6. Creating the Pedestrian Safety Action Plan.

It also states that, Pedestrian networks should be planned in combination with land uses to provide residential access to mixed use centres and bus routes within a 400m walk, and access to train stations within 800m of strategic and secondary activity centres. Pedestrian networks should be designed with passive surveillance and good lighting to provide an attractive and safe walking environment.

1.3 Indian Road Congress specifies the guidelines for road infrastructure.

Some of them are given as follows:

Parameter	Dimensions or provisions
Foot path width	2m to 1.5m
Dead width	0.5 m
Clear height	2.4m
Ht above Road level	150mm
Cycle track width	2m
Cross fall gradient	1:50
Provision of guard rail	√
Kerb height	150mm
Specifications of kerbs	√
Ht of median	250mm
Specifications of tactile pavers	√
Specifications of level change	√
Maintenance of footpath	√
Pedestrian crossing width	3m
Cycle crossing width	2.5m
Spacing	80 – 250 m
Specifications for zebra crossing	√
Refuge island	Mandatory on all roads with 4 lanes and more
	Width 2m min
At-grade crossing	√
Grade separated crossing	√
Uncontrolled crossing	√
Controlled crossings	√
Pedestrian facilities at roundabouts	√
Pedestrian subways	
Width	4.8m
Vertical clearance	2.75m
Specs for hump subway	√
Specs for full subway	√
Specs for steps	√
Multi functional zone	Width 1.8m
Street furniture	√
Lighting	20-30m interval At max 4m height. White lighting with 25-40 lux
Provision of wash room and toilets	√
School zone improvement	√
Parking facilities	√
Provision for physically challenged pedestrians	√

1.4 Urban Street Design Guidelines, Pune, India

Urban Street Design Guidelines, Pune Version I:2016 follows the guidelines given by IRC 103-2012. In addition, it also includes specifications for speed breakers, provisions of traffic signs, utilities and services, storm water drainage and BRT route specifications.

1.5 Public Transport Authority, Australia

In the guidelines given in Planning and designing for pedestrians, Australia, following design elements are considered.

Key design elements	Important design elements
Principles of Pedestrian Network Planning	• Connected • Comfortable • Convenient • Convivial • Conspicuous
Pedestrian Accessibility	Pedestrian networks should be planned in combination with land uses to provide residential access to mixed use centres and bus routes within a 400m walk, and access to train stations within 800m of strategic and secondary activity centres
Pedestrian Safety	Pedestrian networks should be designed with passive surveillance and good lighting to provide an attractive and safe walking environment
Minimum path widths for different pedestrians	Pedestrians in a wheelchair – 1.2m Pedestrian in wheelchair passing pram – 1.5m Two pedestrians in wheelchairs passing – 1.8m
Typical Walking Speeds	Fit adult – 1.5m/s Elderly person – 1.0m/s to 1.2m/s Typical speed used in crossing assessments – 1.2m/s
Footpath Widths	Minimum pedestrian through route width: • 1.2m over short distance (allows 1 wheelchair) • 1.8m desirable to allow 2 wheelchairs to pass (1.5m minimum), 2m near schools and small shops • At least 2.4m in commercial or shopping environments • 3m – 4m in busy CBD pedestrian area
Street Furniture	The colour of street furniture should contrast with the background Street furniture should be located in the Street Furniture Zone
Grates/ Covers	Slots should be sized and aligned to prevent canes, wheels and other mobility aids from falling through
Vertical Clearances	Vertical clearance is an absolute minimum of 2m above a footpath (2.5m for shared paths) 2.5m clearance is required under traffic signs over a path
Surfaces	Surfaces must be slip resistant, flat and even
Gradient and Ramps	Ramp gradient is 1:14 - 1:20. Landing intervals between 9m-15m, dependent on gradient
Steps and Stairs	Treads: 275mm-300mm wide Risers: 150mm-165mm high
Crossovers/ Driveways	Crossfall < 1:40
Barricades (includes chicanes and bollards)	Barricades require special consideration for people with disability and other users

Kerb Ramp Alignment	Ramps on either side of a crossing must be aligned and located perpendicular to the direction of travel
Kerb Ramp Gradient	maximum gradient is 1:10, absolute maximum is 1:8 (AS1428.1 – 2009) across a maximum length of 1.52m
Kerb Ramp Landings	Must be installed at the top and base of ramps with a maximum gradient of 1:40. Preferred minimum width is 1.5m (absolute minimum 1.33m), reduced to 1.2m where wheelchair users are not required to change direction
Cut-Throughs across Refuges and Traffic Islands	Should be used on traffic islands less than 4.5m in depth. The cut-through width should match the crossing width, absolute minimum width of 1.2m, and minimum length of 1.8m
Grab Rails	Preferred height is 0.9m Length varies from 0.6m – 1.5m depending on depth of crossing. Grab rails should not be located in medians or ramps
Audio - Tactile Facilities	Push buttons are to be placed on signal poles within 0.3m of the kerb crossing ramp & TGSI, at a height of 0.9m
Sight Lines	All crossing points must provide adequate sight distance for pedestrians and approaching vehicles
Raised and Painted Medians	Minimum desirable median width of 1.8m (1.5m minimum if pedestrian facilities are included) to provide protection to cyclists, person pushing pram, person in wheelchair Pedestrian cut-throughs or refuges should be provided at regular intervals for wheeled pedestrians, with a desirable cut-through width of 2.5m
Refuges	Require a minimum depth of 1.8m (1.5m minimum) to provide protection to cyclists, person pushing pram, person in wheelchair The desirable cut-through width is 2.5m (absolute minimum width of 1.2m), other than signalised intersections where pedestrians are not required to wait within the island / cut-through. Parking restrictions and lighting must be provided to meet visibility requirements Grab rails can be installed in refuges ≥ 2m Pedestrian warning signs should be installed on roads with speed limits ≥ 70km/h
Kerb Extensions	The depth of kerb extensions should extend to the edge of parking lanes Kerb extensions should narrow the road to 10 m where there are on-road cycle lanes, narrower on other routes to match the desired speed environment
Zebra Crossings	In addition to warrant requirements, zebra crossings can only be installed on roads with: • No more than 1 lane of traffic in each direction • Adequate sight distance • A maximum posted speed of 50km/h (excluding slip lanes), maximum 85th percentile speed of 60km/h (except at slip lanes)
Non-Signalised Intersections	Design details such as kerb radii and provision of refuges or kerb extensions can greatly influence pedestrian safety at unsignalised intersections Recommended kerb radii are 6m for local access streets and 9m for intersections with neighbourhood connectors
Signalised Intersection Crossings	Pedestrian crossing facilities should be provided at all signalised intersections, either: • Parallel pedestrian phases with partial protection (minimum of 3 seconds) • parallel pedestrian phases with full Protection •

	Exclusive pedestrian phases (allows for diagonal crossings) Zebra crossings at slip lanes should be provided
Roundabouts	Roundabouts should be designed with adequate entry curvature or deflection to reduce the speed of approaching vehicles Recommended to locate kerb ramps and median cutthroughs at least 6m from the vehicle holding line (1 - 2 car lengths) Where pedestrian volumes are high and there is speed environment $\leq 40\text{km/h}$, zebra crossings can be considered In some cases, signalised intersections may be more appropriate where pedestrian and traffic volumes are high, or there is a large proportion of children, elderly or pedestrians with disability
Grade Separated Crossings	Generally only provided along arterial roads with high traffic volumes and traffic speeds. To encourage pedestrian patronage across grade separated facilities: <ul style="list-style-type: none"> • Overpasses should be constructed with a maximum change in level of 6.5m • Underpasses should allow visibility along the length of the underpass and be constructed with a maximum change in level of 3.5m
Pedestrian and Guidance signs	Ideal sign heights are between 1.4m to 1.6m, absolute minimum height is 1m Where there are likely to be large crowds, minimum sign height is 2m Desirable sign height above pathways is 2.5m

III. CONCLUSION

In spite of the codes and guidelines designed and followed by various countries, road accidents are taking place throughout the world. These guidelines should be strictly followed by the Government, contractors, pedestrians and vehicle users. Use of public transport will reduce the accidents as the traffic intensity on roads will get reduced. Bus only routes will help to motivate commuters to use public transport by reducing time of travel.

IV. REFERENCES

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