

PEDESTRIAN POLICY & DESIGN GUIDELINES FOR PUNJAB



The Urban Unit

Urban Sector Planning & Management Services Unit (Pvt.) Ltd.



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FOREWORD

Urban transport systems are designed to facilitate access to goods, services, and opportunities, enabling people to engage fully in civic and social life. However, disparities in access due to insufficient or inadequate infrastructure can lead to social exclusion, particularly for vulnerable and disadvantaged groups. Investments in transport infrastructure often fail to address the mobility needs of these populations if they are not tailored to ensure equitable access.

One of the most significant challenges for delivering efficient and sustainable urban transport services is the diversity of urban populations and the spatial distribution of social and economic activities. It is essential to provide all-inclusive transport infrastructure that includes non-motorized modes, especially pedestrian pathways to meet the mobility needs of all residents. Walking forms the foundation of every journey, and a lack of pedestrian-friendly infrastructure contributes to car dependency, deteriorates urban cohesion, and imposes additional costs on commuters. Research shows that deficiencies in the pedestrian network disproportionately affect the urban poor, for whom walking is a critical link to socio-economic opportunities.

In Punjab, recent interventions have focused on mass transit systems and the introduction of basic bus routes in urban centres. However, these efforts have not yielded the anticipated benefits, largely because land use planning has not been integrated with transport infrastructure through the provision of pedestrian walkways. Moreover, there is currently no policy or design framework in place to guide the development of pedestrian pathways across the province. In response, a pedestrian policy for Punjab is being drafted to highlight the importance of walking as a sustainable, non-motorized mode of transport and to ensure that pedestrian infrastructure is prioritized in urban planning and development.

EXECUTIVE SUMMARY

Road infrastructure plays a crucial role in economic development and is often used as a key tool to drive progress. High-density transport networks and well-connected economic hubs are closely linked with high levels of development. In Punjab, millions of rupees are spent annually on constructing new roads and rehabilitating existing ones. However, the designs for these roads have traditionally neglected pedestrian pathways and non-motorized transport modes.

The Pedestrian Policy and Design Guidelines for Punjab is a comprehensive document that aligns with international standards, offering clear guidance on the provision of infrastructure for pedestrians. It establishes that all road designers and planners in Punjab must adhere to these guidelines to ensure that pedestrian needs are prioritized in road development. Given the province's current socio-economic and environmental challenges, it is critical to design cities where walking is a primary mode of transport, contributing to economic prosperity. This can only be achieved by providing well-designed, connected, integrated, safe, and comfortable pedestrian facilities.

The policy places pedestrians at the top of the mobility hierarchy, recognizing their vital role in the public realm and the minimal environmental impact of walking. It outlines how to plan, design, build, operate, and maintain cities where walking not only promotes socio-economic inclusion but also serves as a preferred mode of transport. Key pedestrian needs highlighted in the policy include connectivity, integration, convenience, obstruction-free routing, walking space, safety, and security. The document also emphasizes pedestrian comfort and accessibility, which are essential to the success of any pedestrian infrastructure.

The design guidelines delve into the specific needs of pedestrians, addressing the characteristics and service levels required for a well-functioning pedestrian network. Efficient network planning is central to ensuring safe, comfortable, and seamless mobility for pedestrians. Once these needs are identified, they are assessed against demand, leading to the design of pedestrian facilities. These

guidelines offer detailed instructions for creating pedestrian infrastructure, covering aspects such as signage, road markings, and pedestrian signals.

Ultimately, this policy and design manual reinforces the significance of walking as a meaningful, non-motorized mode of transportation. It is envisioned that the document will guide provincial departments, development authorities, and local governments in adopting standardized design practices. By doing so, it aims to support the creation of safe, efficient, and sustainable pedestrian infrastructure across Punjab.

TABLE OF CONTENTS

DISCLAIMER.....	2
ACKNOWLEDGMENT	3
FOREWORD.....	4
EXECUTIVE SUMMARY	5
TABLE OF CONTENTS	7
LIST OF FIGURES	11
LIST OF TABLES.....	12
ABBREVIATIONS	13
UNIT CONVERSION FACTORS	13
GLOSSARY.....	14
1. PREAMBLE.....	18
2. ESSENTIAL REQUIREMENTS FOR PEDESTRIANS.....	20
2.1. CONNECTIVITY	21
2.2. INTEGRATED AND SUPPORTIVE INFRASTRUCTURE	22
2.3. CONVENIENCE	22
2.4. WALKING SPACE.....	23
2.5. OBSTRUCTION-FREE ROUTING.....	24
2.6. SAFETY AND SECURITY PERCEPTION	26
3. BUILDING BLOCKS OF PEDESTRIAN POLICY	27
3.1 SAFETY.....	27
3.2 COMFORT	27
3.3 DESTINATION	28
4. PEDESTRIAN POLICY OF PUNJAB.....	29
4.1. POLICY VISION.....	29
4.2. POLICY OBJECTIVES.....	29
4.3. POLICY PRINCIPLES	30
4.3.1. Connectivity	30

4.3.2. <i>Integrated and Supportive Infrastructure</i>	30
4.3.3. <i>Convenience</i>	30
4.3.4. <i>Pedestrian Space</i>	31
4.3.5. <i>Obstruction-Free Routing</i>	31
4.3.6. <i>Safety and Security Perception</i>	32
4.4. IMPLEMENTATION FRAMEWORK	32
4.4.1. <i>Collaboration and Governance</i>	33
4.4.2. <i>Public Participation</i>	33
4.4.3. <i>Monitoring and Evaluation</i>	33
4.4.4. <i>Funding and Resources</i>	33
5. DESIGN CONSIDERATIONS FOR A PEDESTRIAN FACILITY	34
5.1 PEDESTRIAN NETWORK PLANNING	34
5.1.1 <i>Principles of Pedestrian Network Planning</i>	34
5.2 PEDESTRIAN CHARACTERISTICS	35
5.2.1 <i>Fit Ambulant</i>	35
5.2.2 <i>Young Children</i>	35
5.2.3 <i>Pedestrians with Prams</i>	36
5.2.4 <i>Elderly People</i>	36
5.2.5 <i>Vision or Cognitive Impairment Pedestrians</i>	37
5.2.6 <i>Blind Pedestrians</i>	38
5.2.7 <i>Hearing Impairment Pedestrians</i>	38
5.2.8 <i>Limited Walking Ability</i>	39
5.2.9 <i>Wheelchair Users</i>	39
5.2.10 <i>Typical Walking Speed</i>	40
5.3 PEDESTRIAN LEVEL OF SERVICE	41
5.3.1 <i>Level of Service A</i>	42
5.3.2 <i>Level of Service B</i>	42
5.3.3 <i>Level of Service C</i>	42
5.3.4 <i>Level of Service D</i>	43
5.3.5 <i>Level of Service E</i>	43
5.3.6 <i>Level of Service F</i>	44
5.4 EFFECTIVE WIDTHS OF SIDEWALK.....	44
6. PEDESTRIAN FACILITY DEMAND ASSESSMENT	46

6.1	PEDESTRIAN LATENT DEMAND MODEL	46
6.2	ROADSIDE PEDESTRIAN CONDITIONS MODEL	49
7.	PEDESTRIAN FACILITY DESIGN GUIDELINES	52
7.1	MINIMUM DESIGN CRITERIA FOR A SAFE PEDESTRIAN FACILITY	52
7.2	MINIMUM DESIGN CRITERIA FOR A COMFORTABLE PEDESTRIAN FACILITY ...	53
7.3	MINIMUM DESIGN CRITERIA FOR A DESTINATION PEDESTRIAN FACILITY	54
7.4	FOOTPATH PROVISION	55
7.5	SIDEWALK ZONES	56
7.5.1	<i>Kerb Zone</i>	<i>57</i>
7.5.2	<i>Planter/Furniture Zone</i>	<i>57</i>
7.5.3	<i>Pedestrian Zone.....</i>	<i>57</i>
7.5.4	<i>Frontage Zone</i>	<i>58</i>
7.6	GRADES AND CROSS SLOPES.....	58
7.7	SIDEWALK RAMPS.....	58
7.8	KERB CONFIGURATION.....	60
7.9	PEDESTRIANS WITH VISUAL IMPAIRMENTS.....	63
7.10	STREET FURNITURE	64
7.10.1	<i>Placement of Street Furniture</i>	<i>64</i>
7.10.2	<i>Colour</i>	<i>64</i>
7.10.3	<i>Seating.....</i>	<i>64</i>
7.10.4	<i>Bins.....</i>	<i>65</i>
7.10.5	<i>Street Trees and Vegetation</i>	<i>65</i>
7.10.6	<i>Bus Stop Shelter and Signs.....</i>	<i>65</i>
7.11	GRATES/COVERS.....	65
8.	PEDESTRIAN ROAD TRAFFIC SIGNAGE	66
8.1	PEDESTRIAN ENTRY PROHIBITION SIGN.....	66
8.2	COMPULSORY FOOTPATH SIGN.....	66
8.3	ADVANCED PEDESTRIAN CROSSING SIGN	67
8.4	PEDESTRIAN CROSSING SIGN	67
8.5	ADVANCED CHILDREN CROSSING SIGN	67
8.6	CHILDREN CROSSING SIGN	68
8.7	SCHOOL ADVANCE SIGN	68

8.8 SCHOOL CROSSING SIGN	69
9. ROAD MARKING FOR PEDESTRIAN	70
9.1 CROSSWALK MARKINGS	70
9.1.1 Crosswalk at Intersections	70
9.1.2 Non-Intersection Crosswalk	70
9.2 TYPES OF PAVEMENT MARKING USED FOR PEDESTRIAN	73
9.2.1 Normal Dotted Line Marking	73
9.2.2 Dashed Line Marking	74
9.2.3 Junction Box Marking	75
10. PEDESTRIAN TRAFFIC SIGNALS	77
10.1 PEDESTRIAN SIGNALS	77
10.1.1 Pelican Crossings	77
10.1.2 Puffin Crossings	78
10.1.3 Toucan Crossings	79
10.2 PEDESTRIAN SIGNAL HEADS	80
10.2.1 Size, Design, Illumination of Pedestrian Signal Head Indication ..	80
10.2.2 Location and Height of Pedestrian Signal Heads	82
10.3 WARRANTS FOR PEDESTRIAN TRAFFIC SIGNAL	83
BIBLIOGRAPHY	87

LIST OF FIGURES

FIGURE 2-1 MODIFIED TRANSPORTATION HIERARCHY	21
FIGURE 2-2 COUNTDOWN TIMERS	23
FIGURE 2-3 NO ROOM FOR PEDESTRIANS ON FOOTPATH	24
FIGURE 2-4 ELECTRIC POLE INSTALLED ON FOOTPATH.....	25
FIGURE 2-5 UNEVEN SURFACE ON FOOTPATH	25
FIGURE 2-6 OPEN DRAIN IN FOOTPATH	26
FIGURE 5-1 DIFFERENT TYPES OF PEDESTRIANS	35
FIGURE 5-2 YOUNG CHILDREN	36
FIGURE 5-3 ELDERLY PEDESTRIAN	37
FIGURE 7-1: SIDEWALK ZONES.....	57
FIGURE 7-2: KERB RAMP ELEMENTS.....	59
FIGURE 7-3: KERB RAMP	60
FIGURE 7-4: VERTICAL KERB.....	60
FIGURE 7-5: SLOPING KERBS	62
FIGURE 8-1: PEDESTRIAN ENTRY PROHIBITION SIGN.....	66
FIGURE 8-2: COMPULSORY FOOTPATH SIGN	66
FIGURE 8-3: ADVANCED PEDESTRIAN CROSSING SIGN.....	67
FIGURE 8-4: PEDESTRIAN CROSSING SIGN.....	67
FIGURE 8-5: ADVANCED CHILDREN CROSSING SIGN	68
FIGURE 8-6: CHILDREN CROSSING SIGN	68
FIGURE 8-7: SCHOOL ADVANCE SIGN	69
FIGURE 8-8: SCHOOL CROSSING SIGN.....	69
FIGURE 9-1: CROSSWALK WITH TRANSVERSE LINES	71
FIGURE 9-2: CROSSWALK WITH LONGITUDINAL LINES.....	72
FIGURE 9-3: MARKING ON ROADS FOR PEDESTRIAN.....	73
FIGURE 9-4: NORMAL DOTTED LINE MARKING	74
FIGURE 9-5: DASHED LINE MARKING	75
FIGURE 9-6: JUNCTION BOX MARKING	76
FIGURE 10-1: TYPICAL PELICAN CROSSING	78
FIGURE 10-2: TYPICAL PUFFIN CROSSING.....	79
FIGURE 10-3: TYPICAL TOUCAN CROSSING	79
FIGURE 10-4: PEDESTRIAN SIGNAL HEAD INDICATIONS	81

FIGURE 10-5: MUTCD WARRANT 4, PEDESTRIAN FOUR HOUR VOLUME	84
FIGURE 10-6: MUTCD, WARRANT 4, PEDESTRIAN PEAK HOUR.....	84
FIGURE 10-7: MUTCD, WARRANT 4, PEDESTRIAN FOUR-HOUR VOLUME.....	85
FIGURE 10-8: MUTCD, WARRANT 4, PEDESTRIAN PEAK HOUR	85

LIST OF TABLES

TABLE 5-1: RECOMMENDED DISTANCE LIMIT WITHOUT A REST– DFT, (2005)	41
TABLE 5-2: PEDESTRIAN LEVEL OF SERVICE CLASSIFICATION	41
TABLE 5-3: EFFECTIVE WIDTH OF SIDEWALK	45
TABLE 6-1: PEDESTRIAN LATENT DEMAND MODEL SCORES.....	46
TABLE 6-2: ROADSIDE PEDESTRIAN CONDITION MODEL SCORES	49
TABLE 7-1: FOOTPATH PROVISION W.R.T LAND USES.....	56
TABLE 7-2: RECOMMENDED KERB HEIGHT BASED ON ROAD TYPE	63

ABBREVIATIONS

CBD	Central Business District
cm	Centimetre
C&WD	Communications & Works Department
GFA	Ground Floor Area
GoP	Government of Pakistan
GoPb	Government of Punjab
LOS	Level of Service
m	Meter
P&DD	Planning and Development Department
ROW	Right of Way
Sq. Ft	Square Feet
Sq. m	Square Meter
TD	Transport Department
TMA	Tehsil/Town Municipal Authority
TOD	Transit-Oriented Development
UPU	Urban Policy Unit
UU	Urban Unit, Punjab

UNIT CONVERSION FACTORS

1 Meter	=	3.28084 Foot
1 Foot	=	0.3048 Meter
1 Sq. Meter	=	10.7639 Sq. Foot
1 Sq. Foot	=	0.092903 Sq. Meter
1 Inch	=	2.54 Centimetre
1 Centimetre	=	0.393701 Inch

GLOSSARY

Arterial Road	A main road through an area that carries traffic from one area or suburb to another.
Blended Crossing	A crossing of the Kerb where the roadway and the footpath are at the same level.
Clear Zone	An area alongside a roadway, free of potential hazards that are not frangible or breakaway.
Cognitively impaired Pedestrian	A pedestrian whose ability to negotiate the walking environment is hampered by a learning difficulty, such as difficulty in reading signs.
Collector road	A non-arterial road that links local roads to the arterial road network, as well as serving neighbouring property.
Community Walking Plan	A walking strategic plan for improving the walking environment specific to a defined community area that identifies the area's issues, difficulties and proposed remedial actions.
Cross Fall	The slope of the footpath perpendicular to the direction of travel.
Crossing Point	Any point on the road network that has been designed to assist pedestrians to cross the roadway.
Cut-through	A section of a traffic island or raised median where the height has been reduced to the level of the roadway to make an area where pedestrians can wait before crossing another part of the roadway.
Electric Wheelchair	A wheel chair powered by an electric motor that is used by mobility impaired person.
Footpath	The part of road or other public place built and laid out for pedestrian use solely.
Frontage Zone	The part of the footpath that pedestrians tend not to enter, next to adjoining land or on the opposite side to the roadway.
Grade Separation	The separation of pedestrians from other road users by a difference in heights usually through use of an overhead or an underpass.
Gradient	The slope parallel to the direction of travel.
Grates	Items such as manhole covers or drainage grates placed along the pedestrian path of travel
Kerb	A raised border of rigid material formed between the roadway and the footpath.

Kerb Crossing	A place designed to facilitate convenient pedestrian access between the footpath and roadway, at a kerb ramp or, if at the same level, at a blended kerb crossing.
Kerb Extension	A localized widening of the footpath at an intersection or mid-block, which extends the footpath into and across parking lanes to the edge of the traffic lane.
Kerb Ramp	A localized area where part of the footpath is lowered to the same level as the road way next to it to facilitate convenient entry to the roadway.
Kerb Zone	The part of the footpath next to the roadway.
Landing	A flat area at the top or bottom of a ramp.
Local Road	A road or street used mainly for access to neighbouring properties with little through traffic.
Manual Wheelchair	A chair on wheels used by a mobility impaired person, and propelled by the muscular energy of the user or pushed by another person.
Median	A continuous painted or raised strip along the centre of the roadway.
Mid-block Pedestrian Signals	Traffic signals installed not at intersections that stop traffic to permit pedestrians to cross the roadway.
Mobility Impaired Pedestrian	A pedestrian whose ability to walk is hampered by a temporary or permanent loss of ability. It includes those using mobility aids, those carrying difficult parcels or accompanying small children, and those with temporary conditions such as a broken limb.
Mountable Kerb	A kerb designed to define the edge of a roadway but which may be mounted or driven across, if the need arises, with little risk of damage to a vehicle.
Older Pedestrian	A pedestrian who may be physically or cognitively less able than others due to aging.
Overhead Clearance	The height above the footpath within which there should be no obstructions for pedestrians.
Passing Place	A short section of widened footpath to allow one group of pedestrians to pass another easily
Pedestrian	Any person on foot or who is using a powered wheelchair or mobility scooter or a wheeled means of conveyance propelled by human power, other than a cycle.
Pedestrian Crossing Point	Provision at a place to assist pedestrians to cross the roadway.

Pedestrian Fence	A fence that channels pedestrian movement. It offers no protection from vehicles that leave the roadway, but provides physical separation from a hazard.
Pedestrian Island	A raised area within the roadway that provides a place for pedestrians to wait before crossing the next part of the road.
Pedestrian Permeability	The extent to which pedestrians can walk by direct routes to their desired destinations.
Pedestrian Platform	A raised area of roadway that slows traffic and assists pedestrians to cross the road.
Pedestrian Precinct	An area set aside for pedestrians only. Some vehicles may be permitted under specified conditions, such as for deliveries, or cyclists exercising care.
Pram	A type of wheeled transport used for babies and toddlers.
Rest area	A flat area, part-way through a ramp or steps, at which pedestrians can recover from their exertions.
Sensory-Impaired Pedestrian	A pedestrian whose ability to walk is hampered by the partial or full loss of a sense, mainly sight or hearing. It may include those who are colour blind.
Shared Zone	A residential street that has been designed to slow traffic and give priority to pedestrians. The shared zone sign means that traffic is required to give way to pedestrians but pedestrians must not unreasonably impede traffic.
Shoulder	The part of the road corridor outside the main traffic lanes.
Sight Distance	The distance, measured along the roadway, between a pedestrian about to enter the roadway and an approaching driver, or between two drivers, or between a driver and an object on the roadway.
Street Furniture	Equipment within the footpath such as signal poles, lighting columns, signs, parking meters, benches, landscaping etc.
Street Furniture Zone	The part of the footpath between the through route and kerb zone primarily used for street furniture.
Through Route	The central part of the footpath designed as the place where pedestrians have a continuous and accessible path of travel.
Traffic Calming	Changes to the road environment to reduce driver speeds.

Trail Signs	Markings (often metal studs, colored tiles or painted markings) set directly onto the footpath that pedestrians follow to reach their destinations.
Travel Plan	A package of measures tailored to particular sites, such as schools or businesses, to promote active and environmentally friendly travel choices and reduce reliance on the private motor car.
Vision Impaired Pedestrian	A pedestrian whose vision is reduced and cannot be adequately corrected by spectacles or contact lenses, and who may use tactile, visually contrasting and audible cues when walking
Vulnerable Pedestrian	Pedestrians at greater risk than others of being involved in a crash, or more susceptible to serious injury. It includes older people, impaired people and children.
Walkability	The extent to which the built environment is walking friendly.
Walking	The act of self-propelling along a route, whether on foot or on small wheels, or with aids.
Workplace Travel Plan	A travel plan tailored to a particular business, workplace or group of workplaces sharing a common location, influencing travel choices of staff and visitors.
Young Pedestrian	A pedestrian whose physical and cognitive development means their abilities have not reached those of normal adults.
Zebra Crossing	A pedestrian crossing point with longitudinal markings, where traffic is required to give way to pedestrians on the crossing. Legally they are called pedestrian crossings.

1. PREAMBLE

The population of Punjab has surged from 73.62 million in 1998 to 109.99 million in 2017, reaching 127.69 million by 2023, with an average annual growth rate of 2.53%. This rapid growth is most evident in urban areas. The urban population of Punjab increased from 23.02 million (31.27%) in 1998 to 40.55 million (36.71%) in 2017 and further to 51.97 million in 2023, reflecting an annual growth rate of 4.24%. The pace of urbanization, along with migration from rural areas in search of better socio-economic opportunities, has placed significant pressure on city infrastructure, far exceeding the original design capacity. As a result, existing urban infrastructure is under immense strain to meet the growing demands associated with rapid urbanization.

The transport sector in Punjab faces a similar challenge. The scarcity of new infrastructure, combined with the inadequacy of existing systems, has exacerbated congestion, fatalities, and accidents. Motorization has compounded the negative impacts of unplanned urbanization, consuming acres of fertile land for residential and commercial purposes, and contributing to environmental degradation.

Recent efforts by the government have sought to address these issues through administrative responses, such as reducing the cost of transport services, enhancing transport accessibility via improved land-use integration, upgrading vehicle fleets to reduce environmental externalities, and promoting non-motorized transport. However, a clear policy dilemma persists regarding the prioritization and implementation of these measures. Despite substantial investment in road construction and rehabilitation, pedestrian pathways and non-motorized transport modes continue to be neglected. Similarly, while there is an emphasis on mass transit and public transport systems, there is no strategy for integrating these with land use or developing a pedestrian network. Additionally, there is no comprehensive data on the extent and ratio of pedestrian pathways to the overall road network.

A review of successful global practices reveals that non-motorized modes, particularly pedestrian pathways, form the foundation of urban mobility. Properly designed footpaths not only facilitate basic mobility and accessibility

but also help transform urban land use by creating pedestrian precincts and restricting vehicular traffic. In contrast, in Punjab, pedestrian pathways are often deprioritized in urban planning, with no clear policies or regulations governing their design or implementation. Each development authority operates under its own set of rules, which do not align with a cohesive vision for the city or promote sustainable development.

Various laws in Punjab, such as the Punjab Land Use Rules 2020, Punjab Development Authorities Private Housing Schemes and Land Subdivision Rules 2021, and the Punjab Private Housing Schemes and Land Subdivision Rules 2022, mandate the provision of footpaths on major roads. However, these regulations lack detailed guidance on design elements, roadside furniture, and pedestrian safety. Similarly, the Punjab Local Government Act (PLGA) 2022 does not provide specific planning guidelines for pedestrian pathways. The Punjab Housing and Town Planning Agency (PHATA) Building and Zoning Regulations, 2020, only address arcades as footpaths, leaving out detailed pedestrian pathway regulations.

The Lahore Development Authority (LDA) Private Housing Schemes Rules 2014 (updated in 2020) mandates footpaths along roads but lacks enforcement mechanisms to ensure compliance. The LDA Land Use Rules 2020 mention transport plans for pedestrian and cycling networks in redevelopment projects, but again, do not specify how footpaths should be provided. This inconsistency across development authorities highlights the lack of a unified policy and legal framework for pedestrian infrastructure in Punjab.

Rapid urbanization and motorization have led to road widening without provisions for pedestrians, resulting in dangerous pedestrian-vehicle interactions. Unregulated and unsafe pedestrian crossings have become a leading cause of accidents and fatalities. The Global Status Report on Road Safety 2023 by the World Health Organization (WHO) ranks Pakistan among the highest in road traffic fatalities, with Punjab leading the provinces in traffic accidents. The report also highlights that 40% of trips (up to 1 kilometer) in Pakistan are made on foot, yet there are no policies to support walking or cycling as viable transport modes. Data from Safe Communities Pakistan's Road Traffic Accident Diary, based on Rescue 1122 Emergency Services,

show an average of 1,152 accidents daily in Punjab, with 15% involving pedestrians.

Thus, the absence of comprehensive policies, infrastructure, and enforcement mechanisms continues to contribute to pedestrian accidents and fatalities. A robust pedestrian policy is urgently needed to address critical questions regarding the design, implementation, and maintenance of footpaths. These solutions must consider social factors, including age, physical disabilities, gender, and safety concerns, to ensure that pedestrian infrastructure serves all segments of society.

The underlying Pedestrian Policy and Design Guidelines for Punjab aim to develop a holistic policy and its required framework that addresses the mobility needs of pedestrians, based on global best practices adapted to local social contexts. However, before drafting or implementing any policy recommendations, it is of utmost importance that pedestrian needs within Punjab be identified to ensure the policy is effective and inclusive for all.

2. ESSENTIAL REQUIREMENTS FOR PEDESTRIANS

Irrespective of how, when, where, and by which mode people travel, at a given point of a journey whether approaching a private mode or embarking a public transport, they opt for walking to complete that journey; thus, making them pedestrian during that part of journey. The transportation hierarchy adopted from Pedestrian Policy and Need Report, City of Calgary, 2008, and modified for Punjab visibly depicts the aforementioned principle (see Figure 2-1 below). Pedestrians have the highest priority in a journey because of their vitality in the public realm and low environmental impact; therefore, their needs should be studied accordingly.

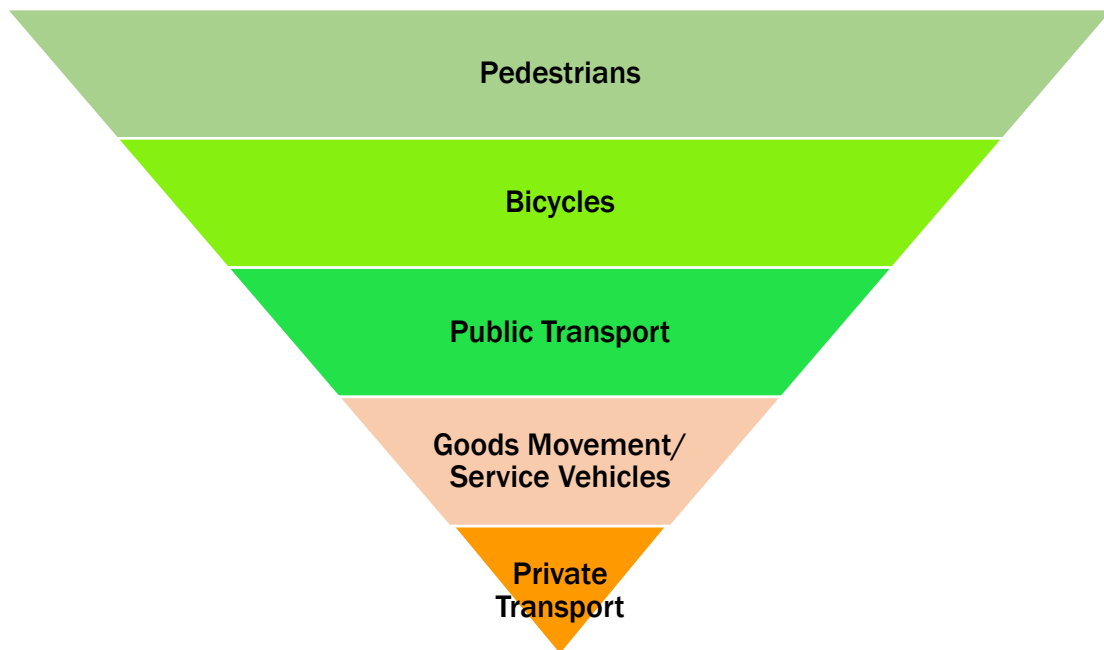


Figure 2-1: Modified Transportation Hierarchy

Pedestrians are generally defined as persons walking or jogging, using wheelchairs or mobility aids, walking their dogs, and people with prams. The basic requirements of the pedestrians from any network to be designed for them include;

- i. Connectivity
- ii. Integrated & Supportive
- iii. Convenience
- iv. Waking space
- v. Obstruction-free routing
- vi. Safety and security perception

2.1. Connectivity

Connectivity refers to the integration/ linkage of the pathway with the surrounding land use and desired activity places. A walking route should be direct to the destination. It is because a connected pedestrian network not only offers better access to more places but also provides mode choice. The ability to choose among various modes including walking promotes behavioural

changes in trip patterns. Further, a connected network facilitating people to access various activity locations in an urban environment promotes social inclusion.

In the context of Punjab, connectivity is of utmost importance. This is because the prevailing pedestrian infrastructure in cities is in patches. There is no completely connected network.

2.2. Integrated and Supportive Infrastructure

Integrated and Supportive refers to the integration of the pedestrian network with other means of mobility. Supportive pedestrian networks promote the usage of allied means of transport. Likewise, integrated pedestrian networks allow hindrance-free transition among various modes of a journey, particularly to public transport. Non-integration of public transport stops/ stations with the pedestrian network not only serves as a major safety concern but also results in a preference for alternate modes.

The prevailing pedestrian infrastructure in Punjab is neither integrated nor supportive. This is even evident from infrastructure intervention done under Mass Transit projects carried out in major cities of Punjab. The bus stops of feeder service and other conventional bus services are not properly linked with Metro service etc.

2.3. Convenience

Convenience refers to the ability of pedestrians to make a journey without any hindrances. A convenient pedestrian network is the result of actions such as keeping sidewalks open during building construction or providing clearly marked detour routes if sidewalks must be closed for a minimum duration of time.



Figure 2-2: Countdown Timers

Likewise, pedestrians are to be benefited at intersections, by adjusting traffic signal timing, devices and operations, such as pedestrian countdown timers shown in Figure 2-2 and scramble crossings, to increase convenience and safety for pedestrians by reducing delay times.

2.4. Walking Space

Walking space refers to spatial allocation for the movement of pedestrians. Pedestrians often travel side by side in pairs and do not travel in line. They tend to move from side to side within the clear width whereas the width required for their movement varies for prevailing land use and pedestrian activity levels. Accordingly, space required for pedestrian movement shall be respected within all types of pedestrian infrastructure, including pedestrian/bicycle overpasses, vehicle bridges, multi-use pathways, walkways, etc.

In Punjab, the pedestrian paths usually only available in major cities are heavily encroached on by street hawkers and vendors as shown in Figure 2-3.



Figure 2-3: No room for pedestrians on footpath

2.5. Obstruction-Free Routing

Obstruction-free routing refers to the clear passage needs of the pedestrian. Physical obstructions for pedestrians include signage, traffic control equipment, utility elements, landscaping, street furniture, gates, and fences if they are located within the pedestrian space. Also, an uneven walking surface can present a tripping hazard. Likewise, if elevation changes are too steep or too long, they hinder people's mobility.

In major cities of Punjab, poor planning and designing of infrastructure often results in fixing of poles and street infrastructure in the pedestrian passage as shown in Figures 2-4 and 2-5 respectively



Figure 2-4: Electric pole installed on footpath



Figure 2-5: Uneven surface on footpath

2.6. Safety and Security Perception

The design of a pedestrian environment needs special attention to facilitate and encourage the establishment of safe and lively urban spaces. Well thought and designed streets and pathways promote walking as a mode of transport. It is because these enhance the safety perceptions of the pedestrians i.e., they can walk freely while feeling secure and safe. Concerns for pedestrian safety include lack of illumination on the pathways, dark alleys, black spots due to blind corners, and the risk of injury by tripping, slipping, falling, or being in a collision with traffic. Importantly, safety should be inherent to the design of pedestrian facilities.



Figure 2-6: Open drain in footpath

Often poor design of the footpaths creates serious safety hazards for the pedestrians in cities. This is evident from the Figure 2-6.

The purpose of the policy is to provide people safe, convenient, and integrated walking facilities which shall serve as a destination; therefore prior to policy formulation, it is necessary to define its building blocks.

3. BUILDING BLOCKS OF PEDESTRIAN POLICY

3.1 Safety

The primary characteristic of any pedestrian facility should be safety. This policy document includes guidelines and standards to make all pedestrian facilities safe for all people including disabled persons. As per international practices following are the minimum levels of safety that should serve as the minimum threshold for any pedestrian facility:

- A defined walkway for exclusive pedestrian use of preferably 6-feet width
- A walkable surface that is clear of impediments;
- Ramps for guiding and accessibility purposes
- Physical or horizontal separation from vehicular traffic
- Lit roadway crossings and passages

There are several elements of design, ramps, driveway crossings, and median crossings that, if the project is new, should be built to the standards meeting minimum safety requirements for all especially disabled pedestrians.

3.2 Comfort

The second component should be comfort. It is very important to make pedestrian facilities comfortable as well. Here comfort refers to inconvenience caused by poor infrastructure provision; therefore, in addition to the safety minimums, there are design considerations that can make a pedestrian area comfortable; thus, encouraging walk as an alternate mode of travel. These include:

- Wider and Lower Walkways
- Less Driveway Crossings
- Sufficient Resting/Sitting Places
- Detached Walkways from Traffic
- Traffic Calming Features

3.3 Destination

The third component of the policy shall be to make safe and comfortable pedestrian area strategically a destination itself. People walk to and walk within destination pedestrian facilities.

Destinations are places where walking is considered a predominant, if not the only, mode of transportation. Also, they have extensive amenities which include specialty paving, themed signs and site furnishings, decorative lighting fixtures, street vendors, and an active street.

The prime goal for underlying pedestrian policy is to ensure sustainable pedestrian infrastructure availability that shall promote social and economic interaction. Therefore, the policy must advocate for convenient, connected, obstruction-free, and accessible pedestrian infrastructure to all regardless of age, gender, income, culture, and ability.

4. PEDESTRIAN POLICY OF PUNJAB

This Pedestrian Policy for Punjab aims to create a walkable, safe, and sustainable urban environment that prioritizes walking as a core mode of transport. Inspired by global best practices, the policy envisions pedestrian infrastructure that enhances mobility, reduces reliance on motorized transport, and integrates walking into urban planning for the well-being of residents. The key principles of the policy include connectivity, integration, convenience, adequate walking space, obstruction-free routes, and safety.

4.1. Policy Vision

To establish a pedestrian-friendly urban landscape in Punjab that promotes walking as a primary, safe, and efficient mode of transport, facilitating socio-economic inclusion, environmental sustainability, and enhanced public health.

4.2. Policy Objectives

- Prioritize walking and pedestrians shall have the first right to pass among all types of traffic
- Promote walking as a sustainable, accessible, and inclusive mode of transportation.
- Create a well-connected pedestrian network that links residential, commercial, and recreational areas with transit hubs and other key destinations.
- Ensure integration of pedestrian infrastructure within urban planning, land use, and public transport systems.
- Provide a safe, convenient, and obstruction-free walking environment for all users, including children, the elderly, and people with disabilities.
- Enhance public health, reduce carbon emissions, and encourage non-motorized transportation.

4.3. Policy Principles

4.3.1. Connectivity

The pedestrian network should offer seamless connectivity between major urban zones, including residential areas, commercial districts, transport hubs, and public amenities. A connected network will encourage walking and ensure that it is a viable option for everyday commuting.

Key Actions:

- Develop continuous pedestrian paths linking key destinations, including schools, workplaces, shopping areas, and recreational sites.
- Provide safe, accessible pedestrian crossings at regular intervals, with priority at intersections, public transport stops, and high-traffic areas.
- Facilitate pedestrian access to public transportation nodes such as bus stops and train stations to ensure last-mile connectivity.

4.3.2. Integrated and Supportive Infrastructure

Pedestrian infrastructure must be integrated into broader urban planning and transport strategies, ensuring that walkability supports sustainable urban development, economic activity, and environmental goals.

Key Actions:

- Align pedestrian pathways with land use, public transportation, and urban development plans, reducing car dependency and fostering a balanced transport system.
- Ensure new developments prioritize walkability by connecting them to existing pedestrian infrastructure.
- Promote pedestrian precincts and low-traffic zones within high-density areas to enhance walkability and improve air quality.

4.3.3. Convenience

Pedestrian pathways should be designed for user convenience, ensuring that walking is comfortable, accessible, and appealing. This includes providing

direct routes, minimizing detours, and integrating street amenities such as seating and lighting.

Key Actions:

- Design direct, accessible pedestrian routes with minimal detours to promote efficient walking commutes.
- Install amenities like benches, trash bins, drinking water stations, and public toilets along pedestrian routes, especially in high-use areas.
- Ensure pathways are well-lit and shaded, enhancing comfort for pedestrians in various weather conditions.

4.3.4. Pedestrian Space

Adequate space for pedestrians is essential to ensure a comfortable walking and waiting experience. Sidewalks and footpaths should be designed to accommodate varying pedestrian volumes and diverse users, such as people with disabilities and those using strollers or mobility aids.

Key Actions:

- Establish minimum sidewalk widths based on anticipated pedestrian volumes, ensuring sufficient space for walking, resting, and passing without obstruction.
- Implement universal design principles that guarantee accessibility for all, including wheelchair users and the elderly.
- Prioritize pedestrian zones along major streets and in urban centers, ensuring sidewalks are spacious, unobstructed, and comfortable to navigate.

4.3.5. Obstruction-Free Routing

Pedestrian pathways should be free from obstacles that can hinder movement or compromise safety. The route should be clear of encroachments such as parked vehicles, street vendors, and unnecessary street furniture.

Key Actions:

- Implement strict regulations to prevent the encroachment of vendors, parked vehicles, or illegal structures on pedestrian paths.
- Regularly maintain and inspect pedestrian infrastructure to ensure clear and safe walkways, addressing issues such as damaged pavements, debris, or vegetation overgrowth.
- Designate pedestrian-only streets or zones in congested urban areas to minimize conflicts with vehicular traffic.

4.3.6. Safety and Security Perception

Safety, both real and perceived, is critical to encouraging walking. Pedestrian infrastructure should be designed to reduce the risk of accidents and enhance personal security through well-lit, visible, and patrolled pathways.

Key Actions:

- Implement traffic-calming measures such as speed bumps, raised crossings, and pedestrian signals at key intersections to reduce vehicle speeds and enhance pedestrian safety.
- Ensure pedestrian paths are well-lit, particularly in high-crime areas or routes used during early morning or evening hours.
- Integrate passive surveillance techniques, such as active street frontages, and install CCTV cameras in high-risk zones to increase perceived safety.
- Educate the public and enforce traffic laws to minimize pedestrian-vehicle conflicts, particularly in high-density urban centers.

4.4. Implementation Framework

The implementation framework to be adopted by all relevant departments including but not limited to City Development Authorities and local Government Entities at the District and Tehsil Level and purpose-built authorities responsible for infrastructure development include;

4.4.1. Collaboration and Governance

Establish a cross-sectoral steering committee consisting of transport planners, urban designers, local government representatives, and public safety officials to oversee the implementation of pedestrian policies and ensure consistency across the province.

4.4.2. Public Participation

Engage local communities in the planning and development of pedestrian infrastructure through public consultations, workshops, and feedback mechanisms to address their specific needs and preferences.

4.4.3. Monitoring and Evaluation

Set up a comprehensive monitoring framework to evaluate the success of pedestrian infrastructure projects, track pedestrian usage data, and assess the impact of policy implementation on safety, health, and environmental outcomes.

4.4.4. Funding and Resources

Allocate dedicated budget lines for pedestrian infrastructure development, maintenance, and upgrades. Encourage public-private partnerships (PPPs) to enhance investment in pedestrian-friendly urban spaces.

The aforementioned Pedestrian Policy for Punjab represents a commitment to making cities more walkable, sustainable, and inclusive. By adopting global best practices while drafting, this policy lays the foundation for safe, connected, and accessible pedestrian infrastructure that will contribute to the well-being of all citizens, reduce environmental impacts, and promote a healthier, more vibrant urban life.

5. DESIGN CONSIDERATIONS FOR A PEDESTRIAN FACILITY

5.1 Pedestrian Network Planning

Efficient network planning is a key to safe, comfortable and hurdle free mobility of pedestrian. Inadequate provision of pedestrian networks and crossing facilities can have a large impact on overall 'connectivity' and therefore 'walkability' of a route.

Pedestrian networks should be planned to:

- Have minimum walking distance between developments / land uses
- Provide a clear route to entrances of large developments (rather than surrounding car park areas)
- Avoid conflicts with vehicular movements where possible
- Provide appropriate pedestrian crossing facilities on busy roads
- Provide paths on most streets (except for lightly trafficked local streets), preferably on both sides.

5.1.1 Principles of Pedestrian Network Planning

Following are basic principles for planning pedestrian networks:

- Connected
- Convenient
- Convivial
- Conspicuous

Evidently, all public facilities serving as nodes are integrated within an urban layout and relate to roads (links). In case of access denial imposed by any of them i.e., link or node in any form, the users are socially excluded from the society. Thus, any public facility can be classified as accessible or non-accessible based on the aforementioned characteristic while considering the level of comfort and safety provided by its surrounding network and itself.

Correspondingly, most of the pedestrian facilities are designed to accommodate normal human beings with no consideration of probable disabilities of other disabled pedestrians; whereas there is a considerable number of pedestrians who do not fall under the normal category and have

some kind of disability. For this reason, the facilities must be designed to accommodate pedestrians of all types and age groups. Following are some important characteristics of the pedestrian that should be considered while designing a pedestrian facility.

5.2 Pedestrian Characteristics

5.2.1 *Fit Ambulant*

It is difficult to characterize a 'normal or average' pedestrian. Factors such as the time of day, weather conditions, purpose of the trip and relative crowds will impact a person's cognitive and perceptual decision-making capacity. Given that a person's thought processes and behaviours are often a reaction to these factors, designing for people with disabilities can be extremely beneficial to the safety of all pedestrians.



Figure 5-1: Different Types of Pedestrians

5.2.2 *Young Children*

Young children are often considered to be smaller adults; however, they have special characteristics that require specific design considerations. In fact, their small size limits their ability to be seen and to see from the kerb. Often children do not have the perceptual or cognitive capacity to make sound judgements about traffic safety until about 12 years of age. Often a false sense of confidence and security means they are at a higher risk in the pedestrian environment.



Figure 5-2: Young Children

5.2.3 Pedestrians with Prams

Pedestrians pushing prams or other wheeled devices have several design considerations. These include;

- Pushing a wheeled device can slow walking speeds
- Kerb ramps are needed at all intersections and crossing facilities
- Path and ramp gradients impact the ease of walking
- Larger waiting space is required in refuges/ Islands and at intersections

5.2.4 Elderly People

Elderly people are often characterized as disabled pedestrians. It also includes those who are healthy and fit. The reason for this classification is that there is a higher possibility of having a disability/ disease with aging. Statistics show that by the time people are 65 years of age there is currently a 50% chance of having a disability. The disability could be mild to severe of any one disability, or a combination of any disabilities that are discussed below. It is recommended that refuge/ islands shall be located adequately upon zebra crossings to facilitate elderly people movement.

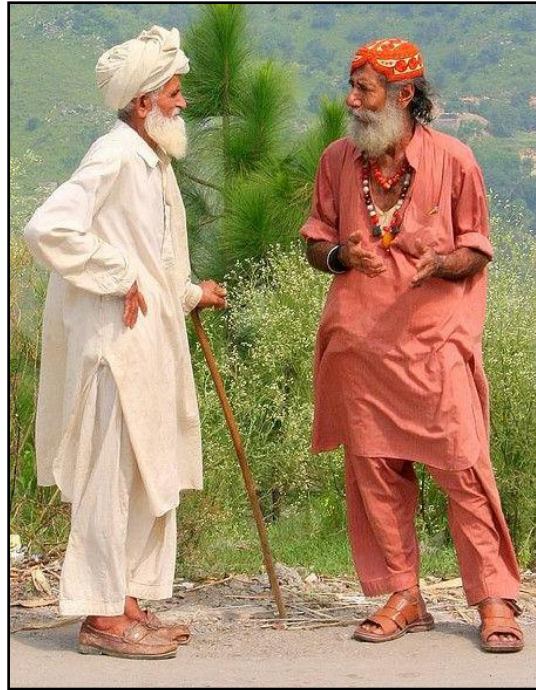


Figure 5-3: Elderly Pedestrian

5.2.5 Vision or Cognitive Impairment Pedestrians

Vision impairment is often referred to as 'low vision'. Pedestrians with vision impairment may have decreased visual acuity, blurred vision, tunnel vision, 'colour blindness' and difficulty with glare. Likewise, cognitive impairments group includes people with low vision or blindness. Overall, this group of pedestrians include conditions such as intellectual disability, acquired brain injury and some types of psychiatric disability. These people may have trouble in interpreting information, making sound judgements about their safety, processing complex information and traffic systems, or reading signs.

Each category and in fact everyone will have differing functional capabilities. It is recommended that pavement surface treatment may be carried out in areas where there is high movement of pedestrians having low vision. The correct use of tactile ground surface indicators (TGSIs) also aid in people with vision problem movement so shall be adopted.

Simple, logical, clear designs and way finding information is required to assist in negotiation of the pedestrian environment.

5.2.6 Blind Pedestrians

Pedestrians who are blind will generally be orientated to an environment before attempting to independently navigate.



Figure 5-4: Blind Pedestrian

Tools such as a guide dog, a white cane, electronic navigation devices or a sighted guide may be used. Importantly, pedestrian with blind disability require increased circulation space. It is because pedestrians who are blind maximise the use of their senses other than their vision, such as smell, hearing and touch to assist them to orientate to their environment. Therefore, surroundings that impact on other senses need to be carefully considered. Furthermore, pavement surface treatment shall be carried out in areas where there is high movement of blind pedestrians. Also, pedestrian signals with sound indication shall be used at zebra crossing.

5.2.7 Hearing Impairment Pedestrians

People who are deaf or have partial hearing may be unable to hear oncoming traffic or hear public information that is disseminated in the auditory form. They are reliant on visual information. It is therefore utmost important that signage shall be carried out adequate i.e., in such a manner that they can read

information comfortably from a safe distance and shall have sufficient time to respond to the upcoming hazards.

5.2.8 Limited Walking Ability

This group of pedestrians are easily recognisable because they do have a walking stick or walking frame. Importantly, those who use a walking stick or a walking frame will require added circulation space to move around. Moreover, pedestrian belonging to this group experience fatigue in less time than normal people; thus, require significantly more opportunities to rest than others. Other issues that people with walking disability may experience are difficulty in bending, reaching with their arms, grasping or manipulating controls, coordination, tremors, and moving the head. If slopes are too steep, those using walking frames could lose their balance when going up or down a ramp. Therefore, ramps need to be adequately designed.

5.2.9 Wheelchair Users

Wheelchairs can be either manual or battery-powered. Battery-powered scooters also fall under this class. Wheelchairs come in many styles, sizes, and designs and can perform differently in varying conditions depending on the user's specific requirements.



Figure 5-5: Wheelchair User

For example, in sports style, manual wheelchairs are much more manoeuvrable and can travel faster, requiring less energy than the other types of wheelchairs used to push a more dependent user. Some wheelchair users, depending on their disability, can experience pain when travelling over rough or uneven surfaces; therefore, surface treatment is often carried out in areas where there is high volume of wheel chair users such as hospitals, etc. The footprint or minimal clear floor space required to accommodate a single stationary wheelchair is 0.8 m in width and 1.3 m in length.

5.2.10 *Typical Walking Speed*

Walking speeds influence the distance pedestrians can comfortably travel and have a significant impact on their accessibility and mobility. It is because slow moving pedestrians require a longer gap between vehicles to safely cross a road. Moreover, participants from different social groups can only walk a certain distance without rest to reach the stop in comparison to the other groups. Thus, every person's accessibility and mobility requirements differ from each other. Consideration of pedestrian characteristics specific to each site is important.

Walking speed of a healthy adult is 1.5 metres per second (m/s). Walking speeds for elderly pedestrians or pedestrians with mobility impairments can be 1.0 m/s to 1.2 m/s. When assessing crossing sites, a walking speed of 1.2 m/s is generally adopted. However, at sites which are known to have higher proportions of slow-moving pedestrians, a walking speed of 1.0 m/s can be adopted. Following recommended distance limit without a rest for various people have been demonstrated globally: -

Table 5-1: Recommended Distance Limit without a Rest– DFT, (2005)

Group	Recommended Distance Limit Without Rest
Normal Human Being	400 Meters
Wheelchair Users	150 Meters
Visually Impaired	150 Meters
Mobility Impaired Using Stick	50 Meters
Mobility Impaired Without Walking Aid	100 Meters

5.3 Pedestrian Level of Service

Pedestrian Level of service (LOS) is based on the measurement of pedestrian flow rate and sidewalk space. The pedestrian flow rate, which incorporates pedestrian speed, density, and volume, is equivalent to vehicular flow. According to the HCM:

“As volume and density increase, pedestrian speed declines. As density increases and pedestrian space decreases, the degree of mobility afforded to the individual pedestrian declines, as does the average speed of the pedestrian stream.”

Number of Pedestrians per minute per foot (ped/min/ft) is the basic tool for the classification of pedestrian LOS. According to this measurement, on a walkway with LOS A, pedestrians move freely without altering their speed in response to other pedestrians or to a decrease in the sidewalk width. On the other hand, on a walkway with LOS F, pedestrian movement is severely restricted and forward progress is made only by “shuffling”.

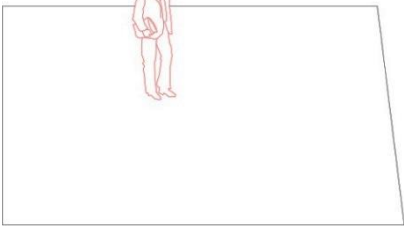
Table 5-2: Pedestrian Level of Service Classification

Level of Service	Space (ft ² /p)	Flow Rate (p/min/ft)	Speed (ft/sec)	V/C Ratio
A	> 60	≤ 5	> 4.25	≤ 0.21
B	> 40 – 60	> 5 – 7	> 4.17 – 4.25	> 0.21– 0.31
C	> 24 – 40	> 7 – 10	> 4.00 – 4.17	> 0.31 – 0.44

D	> 15 – 24	> 10 – 15	> 3.75 – 4.00	> 0.44 – 0.65
E	> 8 – 15	> 15 – 23	> 2.50 – 3.75	> 0.65 – 1.00
F	≤ 8	Variable	≤ 2.50	Variable

5.3.1 Level of Service A

At a walkway having LOS A, pedestrians move in desired paths without altering their movements in response to other pedestrians. Walking speeds are freely selected, and conflicts between pedestrians are improbable.

Picture	Feature
	Pedestrian Space > 60 ft ² /p Flow Rate = 5 p/min/ft

5.3.2 Level of Service B

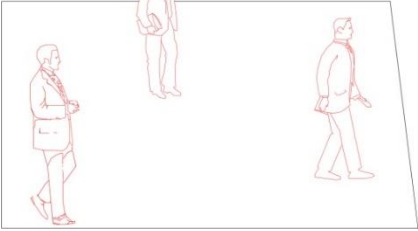
At a walkway having LOS B, there is sufficient area for pedestrians to select walking speeds freely to bypass other pedestrians, and to avoid crossing conflicts. At this level, pedestrians tend to be aware of other pedestrians, and to response to their presence when electing a walking path.

Picture	Feature
	Pedestrian Space > 40 – 60 ft ² /p Flow Rate = 5 – 7 p/min/ft

5.3.3 Level of Service C

At a walkway having LOS C, space is sufficient for normal walking speeds, and for bypassing other pedestrians in primarily unidirectional streams. Reverse-

direction or crossing movements can cause minor conflicts, and speeds and flow rate are lower.

Picture	Feature
	Pedestrian Space > 24 – 40 ft ² /p Flow Rate = 7 – 10 p/min/ft

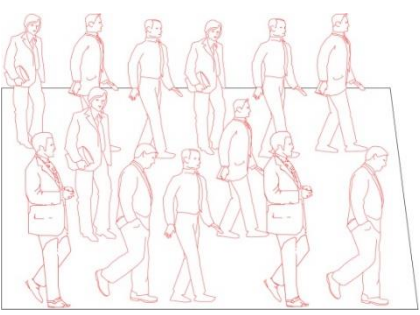
5.3.4 Level of Service D

At a walkway having LOS D, freedom to select individual walking speed and to bypass other pedestrians is restricted. Crossing or reverse-flow movements are prone to conflict i.e., requiring frequent changes in speed and position. The LOS D provides reasonably fluid flow, but friction and interaction between pedestrians is unavoidable.

Picture	Feature
	Pedestrian Space > 15 – 24 ft ² /p Flow Rate = 10 – 15 p/min/ft

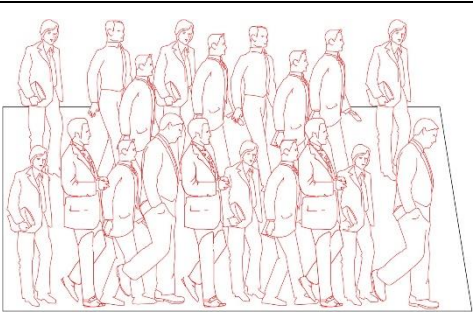
5.3.5 Level of Service E

At a walkway having LOS E, nearly all pedestrians have restricted (lower than normal) walking speed; thus, frequently adjusting their pace. At the lower range, forward movement is possible only by shuffling. Likewise, space is not sufficient for passing/crossing the slow-moving pedestrians. Cross or reverse-flow movements are possible only with extreme difficulties. In fact, the design volumes approach the limit of walkway capacity, with stoppages and interruptions in flow.

Picture	Feature
 A line drawing showing a group of approximately 15 pedestrians walking in a single file on a wide sidewalk. They are spaced out, with significant gaps between them, indicating a high level of comfort and freedom of movement.	Pedestrian Space $> 8 - 15 \text{ ft}^2/\text{p}$ Flow Rate = $15 - 23 \text{ p/min/ft}$

5.3.6 Level of Service F

At a walkway having LOS F, all walking speeds are severely restricted, and forward progress is made only by shuffling. There is frequent unavoidable contact with other pedestrians. Cross and reverse-flow movements are practically impossible. Flow is unstable; thus, the space represents more characteristic of queued amblers than of moving pedestrian streams.

Picture	Feature
 A line drawing showing a group of approximately 15 pedestrians walking in a single file on a narrower sidewalk. They are packed closely together, with very little space between them, indicating a low level of comfort and restricted movement.	Pedestrian Space $\leq 8 \text{ ft}^2/\text{p}$ Flow Rate = Varies p/min/ft

5.4 Effective Widths of Sidewalk

Effective sidewalk widths, depending upon the predicted pedestrian flow for different pedestrian levels of service (LOS) are described in Table 2-3.

Table 5-3: Effective Width of Sidewalk

Predicted Pedestrian Volumes in 15 min	Effective Width of Side Walk (feet)				
	LOS A	LOS B	LOS C	LOS D	LOS E
200	27.3	7.5	2.9	1.6	0.9
300	41.0	11.3	4.4	2.3	1.4
400	54.7	15.1	5.8	3.1	1.8
500	68.3	18.9	7.3	3.9	2.3
600	82.0	22.0	8.8	4.7	2.8
700	95.7	26.4	10.2	5.5	3.2
800	109.3	30.2	11.7	6.2	3.7
900	123.0	33.9	13.1	7.0	4.1
1000	136.7	37.7	14.6	7.8	4.6

6. PEDESTRIAN FACILITY DEMAND ASSESSMENT

Various methodologies have been used to assess pedestrian flow demands and needs; however, two methods have been widely adopted. This is because these methods include all features related to personal mobility and accessibility.

These tools have been made part of underlying pedestrian guidelines which will help in determining the type of pedestrian facility required in a specific area having different attributes. The models are as follows:

- a. Pedestrian Latent Demand Model
- b. Roadside Pedestrian Conditions Model

6.1 Pedestrian Latent Demand Model

The Pedestrian Latent Demand Model (PLDM) incorporates existing / potential land use, the socio-economic condition of the residents, and different types of services in the Traffic Analysis Zone (TAZ) to estimate pedestrian demand along segments of roadway/ corridor. It serves as a tool for decisions makers illustrating where to focus available limited resources for improving pedestrian movement/ conditions.

Table 6-1: Pedestrian Latent Demand Model Scores

Sr. No.	Characteristics	Variable	Score
1	Land Use Mix (Residential Densities, Retail, Office, Public, Quasi-Public, Industrial, Other. Agricultural and Inaccessible Open Space Not Counted as a Land Use)	5 Or More Types of Land Use	3
		2 – 4 Types of Land Uses	2
		1 Type of Land Use	1
		Agricultural or Inaccessible Open Space	0
2	Public Schools and Universities	4,000 + Students	3
		1,500 – 3,999 Students	2
		< 1,499 Students	1
		No schools	0

3	Public Facilities (Libraries, City Hall, Community Centres, etc.)	3 or More Types of Facilities	3
		2 Facilities	2
		1 Facility	1
		No Facilities	0
4	Public Parks	Regional Park	3
		Community Park	2
		Neighbourhood Park	1
		No Parks	0
5	Urban Trails and Bikeways	Regional Trail or Bikeway	3
		Community Trail or Bikeway	2
		Local Trail or Bikeways	1
		No Trails or Bikeways	0
6	Population Density (Dwelling Units per Acre – DU/ac)	8 + DU/ac	3
		4 – 8 DU/ac	2
		< 4 DU/ac	1
7	Income level (Monthly)	< 25,000	3
		25,000 – 50,000	2
		50,000 or More	1
8	Age Demographic	Area has higher number of young and/or older population	3
		Area has average number of young and/or older population	2
		Area has fewer number of young and/or older population	0
9		More than One	3
		One	2

	Bus stop	None	1
10	Employment Values within Traffic Analysis Zonal Data (jobs per square mile)	4,000 or More	3
		1,500 – 4,000	2
		< 1,500	1
11	Trailheads and Park & Ride Lots	> 100 Parking Spaces	3
		50 to 99 Parking Spaces	2
		< 50 Parking Spaces	1
		No Trailheads or Park & Ride Lots	0
12	Bus or Light Rail Transit Station	Bus and Light Rail Transit Station	3
		Bus or Light Rail Transit Station	2
		No Station	0
13	Light Rail Transit Stop	More than One	3
		One	2
		None	0
14	Bus Stop	More than One	3
		One	2
		None	0

▪ **Score of 29 – 42**

A facility/ zone having a score of 29 to 42 will have high pedestrian latent demand and wide variety of land use areas such as downtowns, retail and commercial centres, university campuses, newly built town centres etc. Facilities / zones having score of 29 to 42 can be classified as a **Destination** itself. It is because these facilities/ zones will have latent demand generated by it surrounding land use but also from various amenities (sub- facilities or zones) provided within itself.

▪ **Score of 22 – 28**

A facility/ zone having a score of 22 to 28 will have moderate pedestrian latent demand and single or limited variety of land use areas such as downtowns, retail and commercial centres or university campuses or newly built town centres etc. Facilities / zones having score of 22 to 28 can be termed as **Comfortable**. It is because these facilities/ zones will have latent demand generated by single or limited variety of land use areas.

▪ **Score 3 – 21**

A facility/ zone having a score of 3 to 21 will have low pedestrian latent demand with no variety of land use areas. Facilities / zones having score of 22 to 28 usually have low to medium latent demand generated by little to no mix of land use areas. **Safety** being the preliminary requirement is the major aspect of these type of facilities having basic pedestrian mobility facilities. Similarly, these facilities often serve as a connecting medium instead of being a destination.

6.2 Roadside Pedestrian Conditions Model

The Roadside Pedestrian Conditions Model (RPCM) is used to determine Level of Service (LOS), Safety and Comfort offered by the existing roadside pedestrian facilities. Importantly, LOS may range from A to F grade representing best and worst condition respectively. This model incorporates information regarding traffic volume, speed, percentage heavy vehicles, number of lanes, buffer features, trees and lateral separation between pedestrians and motor vehicle traffic as an input for evaluation.

Table 6-2: Roadside Pedestrian Condition Model Scores

Sr. No.	Characteristics	Variable	Score
1	Amount of Motor Vehicle Traffic	< 10,000 Average Daily Traffic (ADT)	3
		10,000 – 17,500 ADT	2
		17,501 – 30,000 ADT	1
		> 30,001 ADT	0

2	Posted Speed of Motor Vehicle Traffic	< 30 mph	3
		30 – 40 mph	2
		41 – 50 mph	1
		> 55 mph	0
3	Percentage of Heavy Vehicles (Trucks)	< 2 %	3
		2 – 4 %	2
		> 4 %	0
4	Number of Travel Lanes	1 Lane	3
		2 – 3 Lanes	2
		4 Lanes	1
		6 Lanes	0
5	Presence of a Paved Shoulder, Bike Lane, or On- street Parking	Paved Shoulder with Parking	3
		Paved Shoulder with Bike Lane	2
		Paved Shoulder of minimum 4 feet Width	1
		No Paved Shoulder	0
6	Width of Buffer (Between Sidewalk and Roadway)	50 feet	3
		11 – 49 feet	2
		5 – 10 feet	1
		< 4 feet	0
7	Trees or Other "Protective" Barriers in the Buffer	<10 feet On-centre or Continuous	3
		11 – 40 feet on-centre	2
		41 – 60 feet on-centre	1
		> 60 feet on-centre	0

The facilities based on the score achieved can be classified as follows:

- **Score of 16 – 21** Level of Service A Destination
(The Best Conditions for Pedestrians)
- **Score of 12 – 15** Level of Service B Comfort
(Above Average Conditions for Pedestrians)
- **Score of 8 – 11** Level of Service C Safety
(Above Average Conditions for Pedestrians)
- **Score of 4 – 7** Level of Service D Safety
(Below Average Conditions for Pedestrians)
- **Score of < 4** Level of Service F Safety
(Worst Conditions for Pedestrians)

7. PEDESTRIAN FACILITY DESIGN GUIDELINES

It is utmost important to define the minimum criteria for design pedestrian facilities of different levels (Safety, Comfort and Destination) for standardization purposes. In addition to the basic strategy minimums, guidelines regarding other elements are also described in this section.

7.1 Minimum Design Criteria for a Safe Pedestrian Facility

Following are the minimum design requirements to make any pedestrian walkway “safe”

- Walkway width should be 6 feet.
- Separated walkway from main traffic stream shall be provided.
- Smooth, slip resistant and without cracks, indents, or steep grades walkways shall be ensured.
- There should be no overhanging objects in the walkways.
- Ramps at entry/exit locations shall be provided for pedestrians especially for disabled people.
- Walkways that go around driveway crossings shall be provided preferably.
- The walkways shall be physically separated from vehicular traffic by at least one vertical or horizontal element.
- At least 1 foot-candle of lighting at intersections and crosswalks shall be provided from grade to 5 feet (1.5m) above the walking surface, between sunset and sunrise, at vehicular intersection, changes in grade, crosswalks, and other similar points of potential conflict.
- Defined crosswalks for pedestrian at crossings shall be provided.
- The pedestrian traffic signals shall be timed for a walking speed of 3.0 feet per second or slower to calculate the clearance time.
- Minimum 50% shade coverage along the route and at gathering nodes shall be provided.

7.2 Minimum Design Criteria for a Comfortable Pedestrian Facility

Comfortable pedestrian facility is the next level after safety. The design minimums to have a comfortable pedestrian facility are as follows: The walkways shall have a 7 to 12 feet width and be separated visually and functionally from the path of vehicles.

- Smooth, slip resistant and without cracks, indents, or steep grades walkways shall be provided.
- There shall be no overhanging objects in the path of pedestrians.
- All changes in elevation shall have ramps and intersection corners shall have kerb cuts for both directions or one broad cut serving both crosswalks for pedestrian convenience and mobility.
- The walkway shall be physically separated from vehicular traffic by at least two vertical or horizontal element.
- For lighting purposes, at least 1 foot-candle of lighting at intersections and crosswalks shall be provided from grade to 5 feet (1.5m) above the walking surface, between sunset and sunrise, at vehicular intersection, changes in grade, crosswalks, and other similar points of potential conflict. The lights shall be placed in such a manner that there is spot to spot illumination facilitating user movement comfortably between light to light.
- Defined crosswalks for pedestrian crossings shall be provided which may also include an activated signal, median refuge or other such element.
- Traffic calming improvements shall be introduced to slow vehicular speeds in appropriate areas off arterial streets.
- The pedestrian traffic signals shall be timed for a walking speed of 3.0 feet per second or slower to calculate the clearance time.
- Signs pertaining walk/don't walk signs, auditory signals or other such elements information shall be installed.
- Minimum 60% shade coverage along the route and at gathering nodes shall be provided.

7.3 Minimum Design Criteria for a Destination Pedestrian Facility

Following design minimums refers to the most efficient pedestrian facility that is safe, comfortable, and a destination.

- At least walkways having the width of 20 feet shall be provided.
- Straight and flat walkways with minimum driveway crossings shall be preferably provided to avoid conflicts.
- Separated walkways from the main traffic stream with four vertical or horizontal elements shall be ensured.
- Smooth, slip resistant and without cracks, indents, or steep grades walkways with architectural theme work shall be provided.
- There shall be no overhanging objects in the path of pedestrians.
- For pedestrian facilities classified as Destination the walkway shall serve as an environment with a pedestrian scale and pleasing building height ratio shall be ensured preferably.
- No driveway crossings shall be allowed.
- All changes in elevation shall have ramps and there will be no intersections with vehicles.
- At least 1 foot-candle of continuous lighting shall be provided for uniform illumination. Pedestrian lights can be provided by poles shorter than street lights having length 10 to 15 feet or bollard signs.
- Defined crosswalks for pedestrian crossings shall be provided with appropriate signage.
- The pedestrian traffic signals shall be timed for a walking speed of 3.0 feet per second or slower to calculate the clearance time.
- Ample services for the pedestrian shall be provided within a destination type of facility.
- Minimum 75% shade coverage along the route and at gathering nodes shall be provided for pedestrian convenience.
- There should be two to three seating opportunities per block available within the destination type of facility.
- Site furnishings that could include trash receptacles, telephones, drinking fountains, or restrooms shall be available.

- Sufficient number of traffic signs shall be installed pertaining to way finding and direction for pedestrian convenience and mobility.
- Destination type facilities being a transit point wherein pedestrian can take rest usually include public art.
- Pocket parks and planting opportunities can be explored for landscaping purposes.

7.4 Footpath Provision

Pedestrian movement must be considered while designing any new roads, except limited access roads.

For commercial, industrial and education centres where new roads are to be constructed, footpath shall be provided on the both sides of the road. For existing land use such as commercial and industrial centre, there shall be footpath on both sides of the roads. For existing education centres, footpath on both sides of the road is preferred; however, there shall be foot path on side of the road with sufficient road crossing points.

Likewise, for arterial, collector and secondary roads of a new residential area, foot path provision shall be made on both sides. For existing centres, footpath on both sides of the road is preferred; however, there shall be foot path on side of the road with sufficient road crossing points.

Following Table 4-1 describes the guidelines for footpath provisions, either on one side or both, with respect to different land uses and type of roads around residential zones.

Table 7-1: Footpath Provision w.r.t Land Uses

Land Use Type	Footpath Provision			
	New Roads		Existing Roads	
	Preferred	Minimum	Preferred	Minimum
Commercial	Both Sides		Both Sides	
Industrial	Both Sides		Both Sides	
Educational	Both Sides		Both Sides	One Side
Residential				
Arterials	Both Sides		Both Sides	
Collectors	Both Sides		Both Sides	
Local Roads	Both Sides		Both Sides	One Side
Urban Residential Areas	Both Sides	One Side	One Side	Shoulders on Both Sides
Rural Residential Areas	One Side	Shoulders on Both Sides	One Side	Shoulders on Both Sides

7.5 Sidewalk Zones

Defining sidewalk zones is utmost important to have an efficient and obstruction free pedestrian walking area. Usually, sidewalks are classified into four zones as shown in Figure 7-1:

- The kerb zone,
- The furniture (or planter) zone,
- The pedestrian (or walking) zone,
- The frontage zone

The zoning system helps in increasing quality of pedestrian facilities as each sidewalk zone has unique impact on the walking quality. Moreover, this system assists in accommodating people with disabilities because dedicated space can be allotted for their movement.

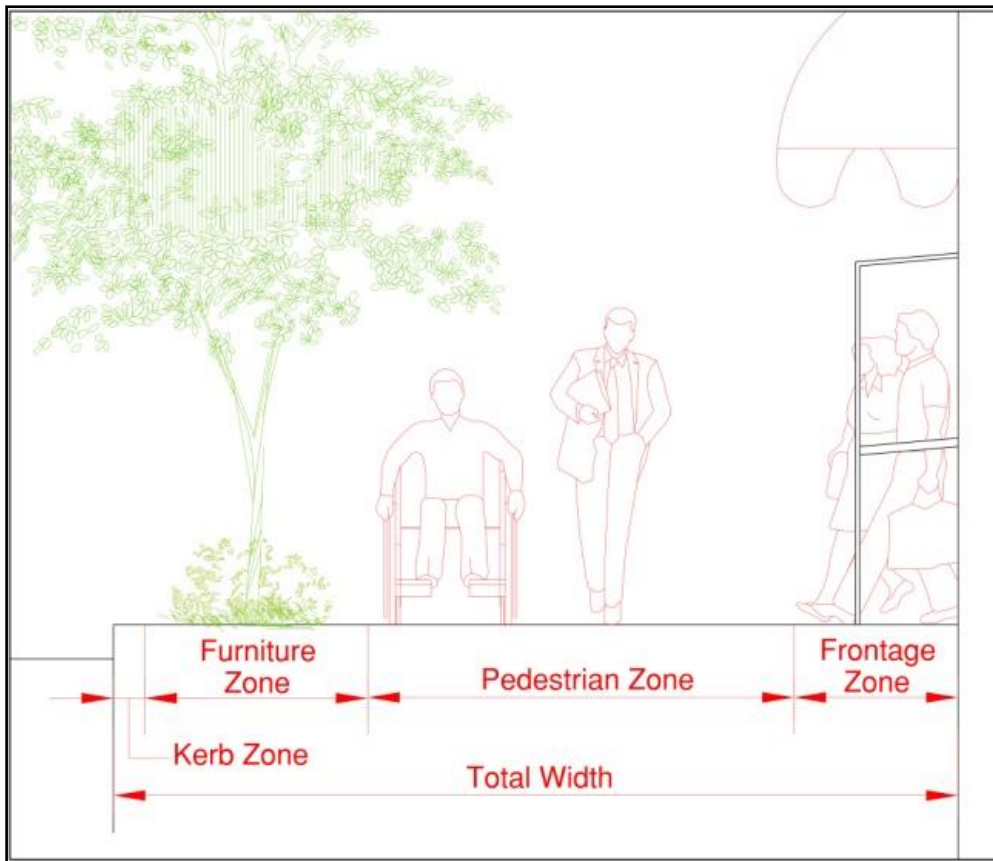


Figure 7-1: Sidewalk Zones

7.5.1 Kerb Zone

Kerbed zones facilitate drainage and restricts parking on walkways. It also assists pedestrians with vision impairment regarding boundary of footpath and driveway. The width of the kerb zone is usually 6 inches however this can vary depending upon the type of kerb stone used.

7.5.2 Planter/Furniture Zone

The zone between kerb and pedestrian zone is known as furniture zone. The furniture zone should be 5 feet wide or more as required. This zone houses planation and utilities, such as traffic poles and fire hydrants, and pedestrian amenities, such as benches and bus shelters. The purpose of the planter/furniture zone is to ensure that the pedestrian zone is free of obstacles.

7.5.3 Pedestrian Zone

This zone is intended to be used by the pedestrian for walking purposes. The minimum recommended width of pedestrian zone is 6 feet allowing two people

or wheelchair users to walk and pass each other safely. In extreme cases, depending upon the circumstances, 5 feet wide pedestrian zone is acceptable; however, at no point should the pedestrian zone be less than 4 feet wide at pinch points such as around poles.

7.5.4 Frontage Zone

The area between pedestrian zone and the building line is termed as frontage zone. It is usually occupied by window shoppers and visitors, entering or exiting the building. The suggested width of frontage zone is 2 to 3 feet or greater depending upon the type of land use. Minimum of 2 feet shy distance is needed from vertical barriers such as buildings, sound walls, retaining walls and fences.

7.6 Grades and Cross Slopes

Grades on sidewalks should not exceed 5% when not adjacent to a travel way. There should be enough sidewalk cross slope to allow for adequate drainage, however the maximum shall be no more than 2% to facilitate the peoples with disabilities. Edge drop-offs should be avoided. When drop-offs cannot be avoided, they should be shielded.

To account for disable pedestrians, American Disability Act (ADA) requires that the grade of building access ramps and separated pathways not exceed 5%.

7.7 Sidewalk Ramps

Kerb ramps provide critical access between the sidewalk and the roadway for people with mobility impairments. Without Kerb ramps, wheelchairs users cannot access the sidewalk. Kerb ramps are most commonly found at intersections but may also be used at mid-block crossings and medians.

Kerb ramps should be designed to minimize the grade, cross-slope, and changes in level experienced by users. The slope of a kerb ramp should not exceed 8.33%, and the cross-slope should not exceed 2%. The slope between 8.33 % and 10 % for a maximum rise of 150 mm (6 in) is recommended.

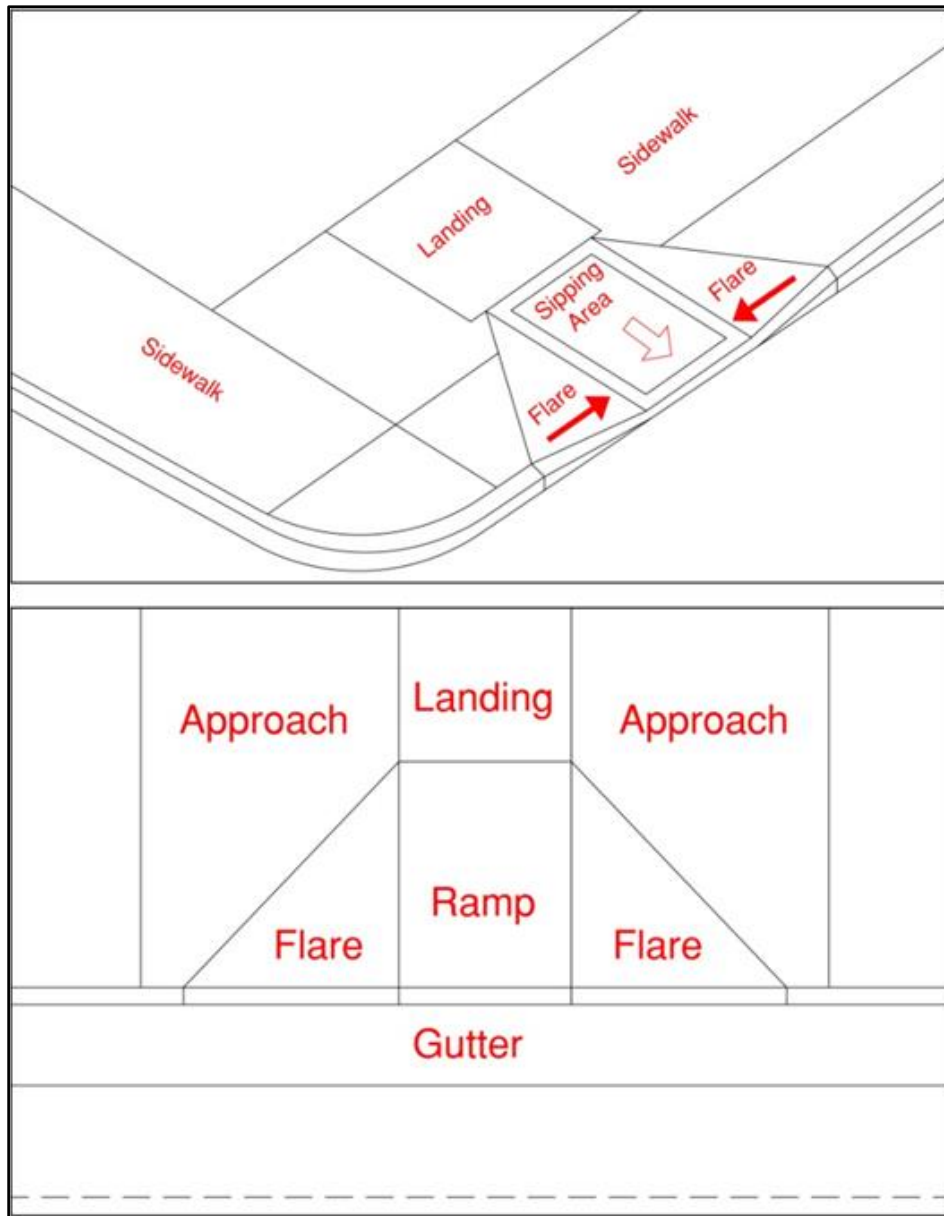


Figure 7-2: Kerb Ramp Elements

Kerb ramps should be at least 0.915 m (36 in) wide, not including the width of the flared sides. A minimum of 1.0 m (39 in) width or of the same width as the approach sidewalk should be provided at crosswalks. Kerb ramp landings allow people with mobility impairment to move completely off the kerb ramp and onto the sidewalk. Kerb ramps without landing force wheelchair users entering the ramp from the street, as well as people making turning at corners, to travel on the ramp flares. The flared sides of the kerb ramps provide a graded transition between the ramp and the surrounding sidewalks. Flares are not considered an accessible path of travel because they are generally steeper than the ramp and

often feature significant cross-slopes with excessive rate of change of cross-slope.

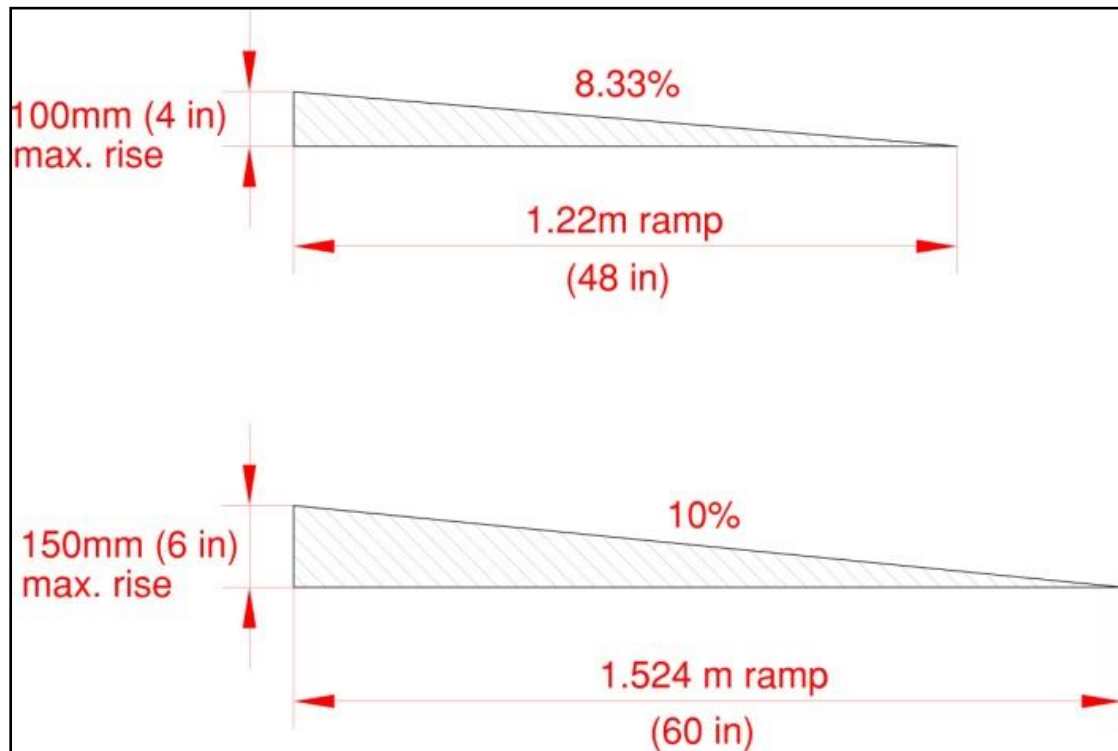


Figure 7-3: Kerb Ramp

7.8 Kerb Configuration

Two basic types of kerbs are defined in the AASHTO Green Book: Vertical Kerbs and Sloping Kerbs. Vertical kerbs usually have a vertical or nearly vertical face (As shown in Figure 7-4). Such kerbs usually serve several purposes, including discouraging vehicles from leaving the road and providing drainage, walkway edge support, and pavement edge delineation.

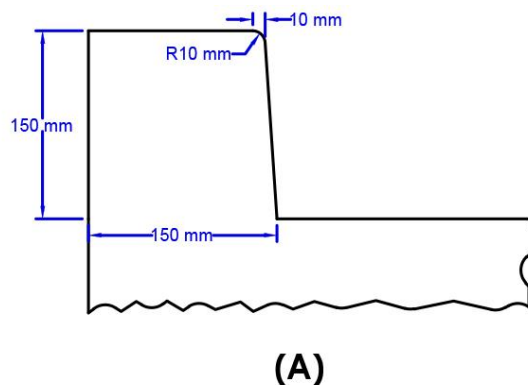
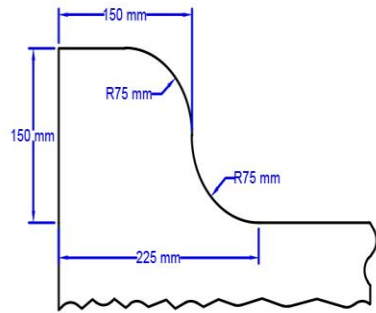


Figure 7-4: Vertical Kerb

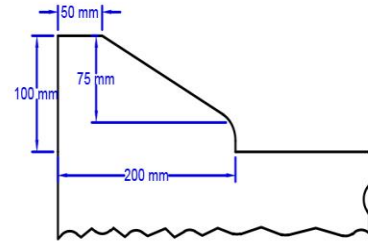
Vertical kerbs have some ability to redirect errant vehicles, as the impacting wheel is steered by the kerb in a direction parallel to the travelled way. If the impact velocity and angle are modest, this steering action is all that may be required to prevent the vehicle from leaving the roadway. If the speed and encroachment angle are higher, then the steering action of the kerb alone is not sufficient to redirect the vehicle. Because the vehicle centre of gravity is much higher than the top of the kerb, a high-speed impact with the kerb will introduce a roll moment. This roll moment will in turn introduce instability into the vehicle trajectory and may even be great enough to cause the vehicle to roll over. As kerbs are often used primarily for drainage purposes, they are often found in conjunction with steep side-slopes where a rollover would be even more likely. For these reasons, vertical face kerbs are usually restricted to low-speed facilities where vehicles are to be discouraged from leaving the roadway.

Sloping kerbs, as illustrated in Figure 7-5, have a sloped face and are configured such that a vehicle can ride up and over the kerb. These kerbs are designed so that they do not significantly redirect a vehicle. They are usually used in situations where redirecting a possibly damaged and out-of-control vehicle back into the traffic stream is undesirable. Sloping kerbs are often used primarily for drainage purposes but are also used on median islands and along shoulders of higher speed roadways for delineation and other reasons.

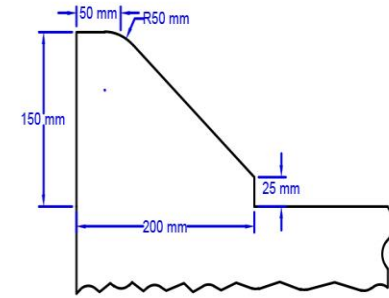
Sloping kerbs provide drainage control while also allowing vehicles access to the roadside in emergency situations. It is often necessary to use a kerb for drainage or other reasons at a location that also warrants a traffic barrier. For example, approaches to bridge structures (e.g., overpasses) are often built on fills with steep slopes. An approach guardrail is required both to shield the end of the bridge railing and to shield errant motorists from the steep side slope approaching the structure. If surface water could drain from the roadway down the steep slope next to the bridge, an erosion problem could develop. A Kerb is usually required to channel the runoff into a catch basin or some other drainage structure. Both the Kerb and the traffic barrier are important functional features of the roadside in this situation (NCHRP, 2005).



(B)



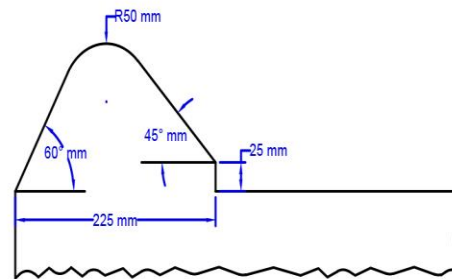
(C)



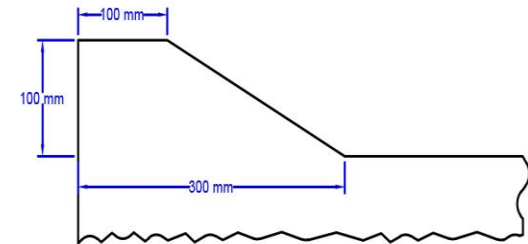
(D)



(E)



(F)



(G)

Sloping Curb

Figure 7-5: Sloping Kerbs

According to the Federal Highway Administration (FHWA) guidelines (FHWA, 2001), the geometry of Kerbs has an impact on their functionality, and therefore, the FHWA recommends Kerb heights as indicated in Table 7-2.

Table 7-2: Recommended Kerb height based on road type

Road Type	Max. Grade (%) Level/ Roll/ Mount	Cross-Slope (%)	Kerb Height (inch)
Urban Local	Consistent w/ terrain <15.0/<8.0	1.5 – 6.0	4 – 9
Rural Local	8.0/11.0/6.0	1.5 – 6.0	n/a
Urban Collector	9.0/12.0/14.0	1.5 – 3.0	5 – 9
Rural Collector	7.0/10.0/12.0	1.5 – 3.0	n/a
Urban Arterial	8.0/9.0/11.0	1.5 – 3.0	5 – 9
Rural Arterial	5.0/6.0/8.0	1.5 – 2.0	n/a
Recreational	8.0/12.0/18.0	n/a	n/a

7.9 Pedestrians with Visual Impairments

Sidewalks should be designed in such a manner that people with vision impairments can find their way via a clear delineated edge, without hitting obstructions. Separated sidewalks usually satisfy this basic requirement. Sidewalks must be built with no protruding objects within the paved area; the specific requirements are:

- 80 inches minimum vertical clearance.
- No objects protruding from wall more than 4 inches at a height greater than 27 inches.
- Any object protruding more than 4 inches at a height greater than 27 inches must be detectable with a kerb or other detectable feature on the ground.

The visually impaired may have difficulty locating the crosswalks where the crossing points are not readily apparent, for example at a corner with a large

radius or diagonal ramp. There are several techniques that enhance the walking environment for the vision-impaired:

- Keeping intersections tight and square to limit long and skewed crosswalks.
- Placing crosswalks in areas where they are expected (in line with ramps and sidewalks).
- Keeping crosswalks straight across the street.
- Providing accessible pedestrian signals.
- Using detectable warnings at ramps to identify the transition from the sidewalk to the street.

7.10 Street Furniture

It refers to the objects and pieces of equipment installed on streets and roads for various purposes. It includes benches, traffic barriers, bollards, post boxes, phone boxes, streetlamps, traffic lights, traffic signs, bus stops, tram stops, taxi stands, public lavatories, fountains, watering troughs, memorials, public sculptures, and waste receptacles. An important consideration in the design of street furniture is how it affects road safety.

7.10.1 Placement of Street Furniture

Ideally all street furniture should be placed in the Furniture Zone within the footpath cross section to keep the pedestrian route free from obstruction.

7.10.2 Colour

Street furniture should be designed with a significant colour contrast to the background and having a luminance factor of not less than 0.3 (30 percent), i.e., having considerable assistance to pedestrians with low vision.

7.10.3 Seating

Seating should be located off the path of travel, with at least 500 mm from the front of the seat to the pedestrian path.

7.10.4 Bins

Most people can access bins when they are approximately 1000 mm high with the receptacle no further than 400 mm from the outer edge. Any lids must be carefully considered to allow access by those having limited mobility skills.

7.10.5 Street Trees and Vegetation

Overhanging bushes or trees can also act as a visual barrier or obstruction to a path. The regulatory authority should regularly upkeep paths and act on hazard reports, to maintain the usability and safety of paths.

7.10.6 Bus Stop Shelter and Signs

A standard-size bus shelter requires a 6 feet x 10 feet pad; with the shelter offset at least 4 feet from the kerb for wheelchair clearance. The adjacent sidewalk must have a 4 feet clear-zone (6 feet preferred) behind or in front of the shelter for sidewalk traffic. Orientation of the shelter should consider prevailing winter winds. Bike racks may be provided at bus stops in urban fringe areas; however, these shall not impede pedestrian movements or bus stop user's circulation at the stop.

7.11 Grates/Covers

When grates are placed along a path of travel to provide drainage; they must be flush with the adjacent ground surface and have gaps no greater than 150 mm long and 13 mm wide to prevent wheelchair castors and canes from becoming trapped. Ideally, the longer gap is to run perpendicular to the direction of travel; however, where slotted openings are less than 8 mm, the length of the slots may continue across the width of paths of travel.

8. PEDESTRIAN ROAD TRAFFIC SIGNAGE

8.1 Pedestrian Entry Prohibition Sign

The Pedestrian Entry Prohibition Signs are used to prohibit pedestrian entry from any road section not considered fit for their use. These signs are placed for mitigating hazards likely to occur because of pedestrian-pedestrian or vehicle-pedestrian conflicts.



Figure 8-1: Pedestrian Entry Prohibition Sign

8.2 Compulsory Footpath Sign

Compulsory Footpath Signs are used where pedestrians are required to use only that part of the roadway specifically provided for them.



Figure 8-2: Compulsory Footpath Sign

8.3 Advanced Pedestrian Crossing Sign

The Advance Pedestrian Crossing Sign should be used to alert vehicle operators to unexpected entries into the roadway by pedestrians.



Figure 8-3: Advanced Pedestrian Crossing Sign

8.4 Pedestrian Crossing Sign

The Pedestrian Crossing Sign is intended to warn the motorist of the existence of a pedestrian crossing on the road ahead.



Figure 8-4: Pedestrian Crossing Sign

8.5 Advanced Children Crossing Sign

The Advance Children Crossing Sign should be used to alert vehicle operators to unexpected entries by children into the roadway. The crossing may be relatively confined, or may occur randomly over a substantial distance of roadway.



Figure 8-5: Advanced Children Crossing Sign

8.6 Children Crossing Sign

The Children Crossing Sign is intended to warn the driver of the existence of a road crossing frequently used by children, such playground, etc.



Figure 8-6: Children Crossing Sign

8.7 School Advance Sign

The School Advance Sign should be installed in advance of locations where school buildings or grounds are adjacent to the highway. The School Advance Sign shall be used in advance of School Crossing sign and supplemented with the legend “AHEAD”.



Figure 8-7: School Advance Sign

8.8 School Crossing Sign

The School Crossing Sign is intended for use at established crossings used by pupils. The School Crossing Sign placement is regulated by speed and is used after the speed restriction and stop sign. Importantly, only crossings which are adjacent to schools and those on established school pedestrian routes shall be signed. The sign when used shall be erected at the crosswalk.



Figure 8-8: School Crossing Sign

9. ROAD MARKING FOR PEDESTRIAN

9.1 Crosswalk Markings

Crosswalk markings provide guidance for pedestrians by defining and illuminating their paths approaching to and within signalized intersections, and other intersections where traffic stops and at non-intersection locations designated for pedestrian crossing.

9.1.1 *Crosswalk at Intersections*

Crosswalks should be marked at all intersections where there is substantial conflict between vehicle and pedestrian movements. Cross walk markings at intersections, whether controlled by a signal or stop sign, serve primarily to guide pedestrians in the proper paths and warn the motorist of a pedestrian crossing point.

9.1.2 *Non-Intersection Crosswalk*

Marked crosswalks should also be provided at other appropriate points of pedestrian concentration, such as at loading islands, or where pedestrians would not otherwise recognize the proper place to cross. At non-intersection locations, these markings legally establish the crosswalk. Non-intersection crosswalk markings should not be used indiscriminately. A careful engineering study should be carried out before they are installed at locations away from traffic signals or STOP signs.

Since non-intersectional pedestrian crossings are generally unexpected by the motorist, warning signs should be installed and adequate visibility be provided by parking prohibition. The space between the stripes marking a pedestrian crossing should be at least equal to the width of the stripes and not more than twice that width and the minimum width of a space. If used, the longitudinal lines should be 30 cm wide and spaced 60 cm apart. Marked crosswalks should not be less than 1.8 m (6 ft) wide.

There are two types of crosswalk marking:

- Crosswalk with Transverse Lines
- Crosswalk with Longitudinal Lines

Crosswalk with Transverse Lines

These lines shall be solid white lines, marking the edges of the crosswalk. They shall be 30 cm wide and overall width shall not be spaced at less than 1.8 meters. Under special circumstances where no advance stop line is provided or where vehicular traffic speed exceeds 50 Km per hour, or where the crosswalks are unexpected, it may be desirable to increase the width of the lines to 50 cm. The lines on both sides of the crosswalk should extend to the full width of the pavement.



Figure 9-1: Crosswalk with Transverse Lines

Crosswalk with Longitudinal Lines

This type of marking is intended for use at locations where substantial number of pedestrian cross without any other traffic control device. These can also be used at locations where physical conditions are such that added visibility of the crosswalk is desired or at places where a pedestrian crosswalk might not be expected.

The area of the crosswalk may be marked with white longitudinal lines at a 90° angle to the line of the crosswalk. These lines should be 30 cm wide and spaced 60 cm apart. When longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted. Care should be taken to ensure that

crosswalks with longitudinal lines used at some locations do not weaken or detract from other crosswalks (where special emphasis markings are not used).

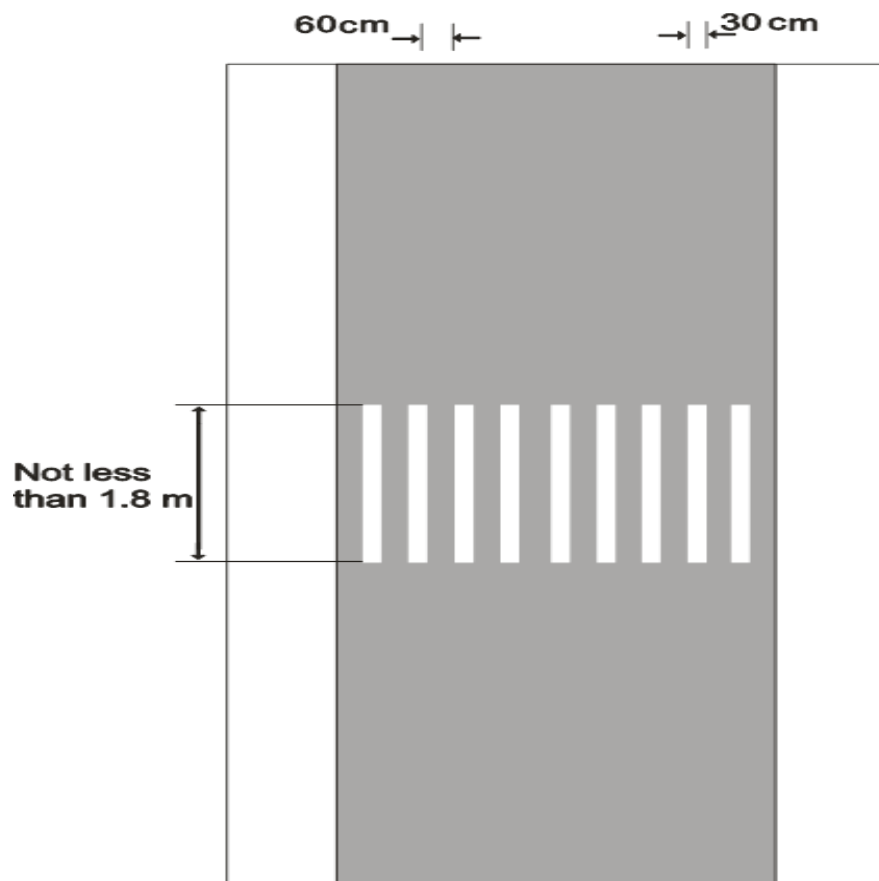


Figure 9-2: Crosswalk with Longitudinal Lines

When an exclusive pedestrian phase signal, which permits diagonal crossing, is installed at an intersection, a unique marking may be used for the crosswalk. A typical sign highlighting crossing approaching pedestrians to look right in case of traffic flow from right side is shown below in Figure 9-3.



Figure 9-3: Marking on Roads for Pedestrian

9.2 Types of Pavement Marking Used for Pedestrian

9.2.1 *Normal Dotted Line Marking*

A Normal Dotted Line may be used to delineate the extension of a line through an intersection or interchange area. The line shall be of the same colour as the line it extends.

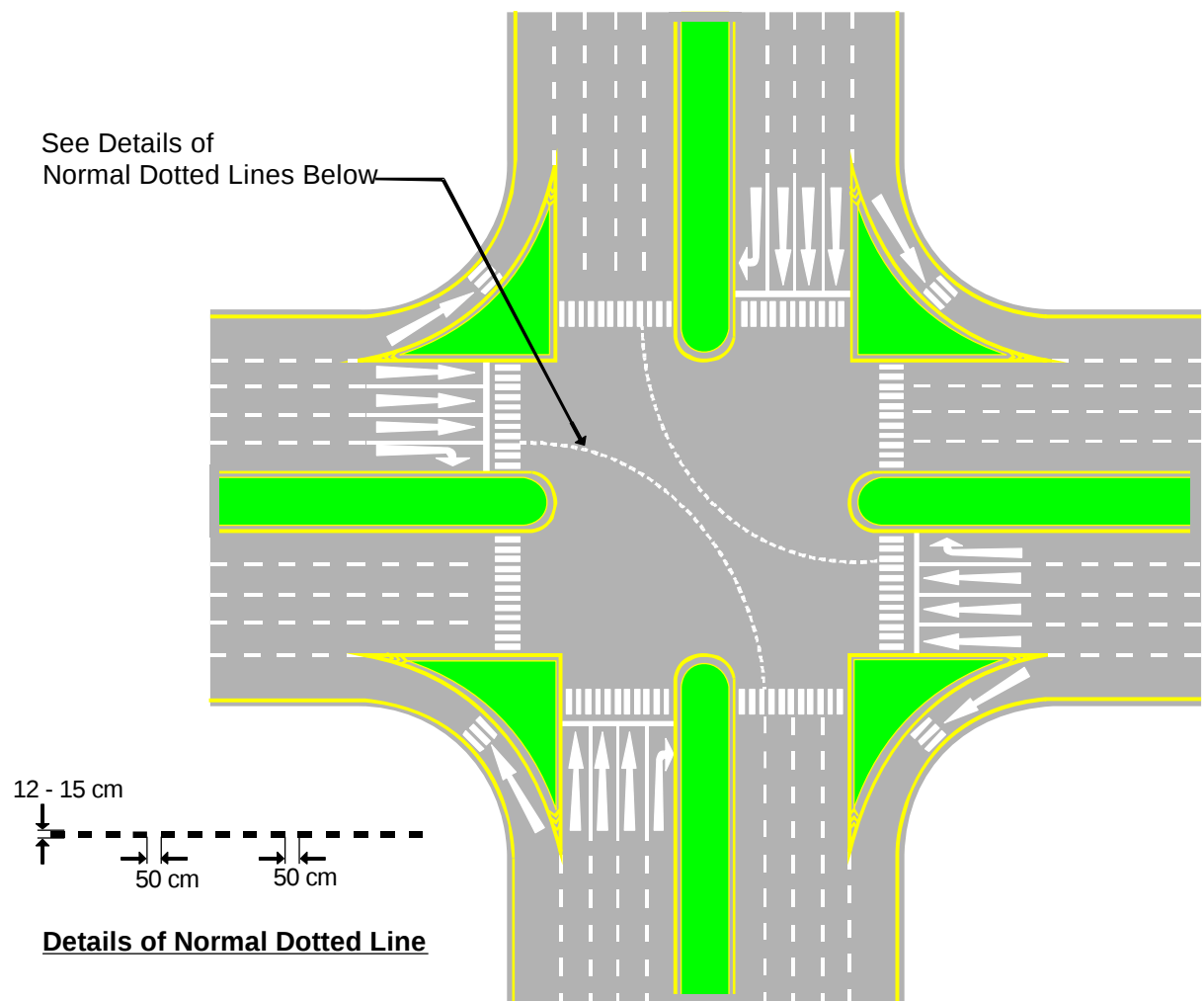


Figure 9-4: Normal Dotted Line Marking

9.2.2 Dashed Line Marking

Dashed Line is used for the edge continuation at exit or entrance ramp separation.

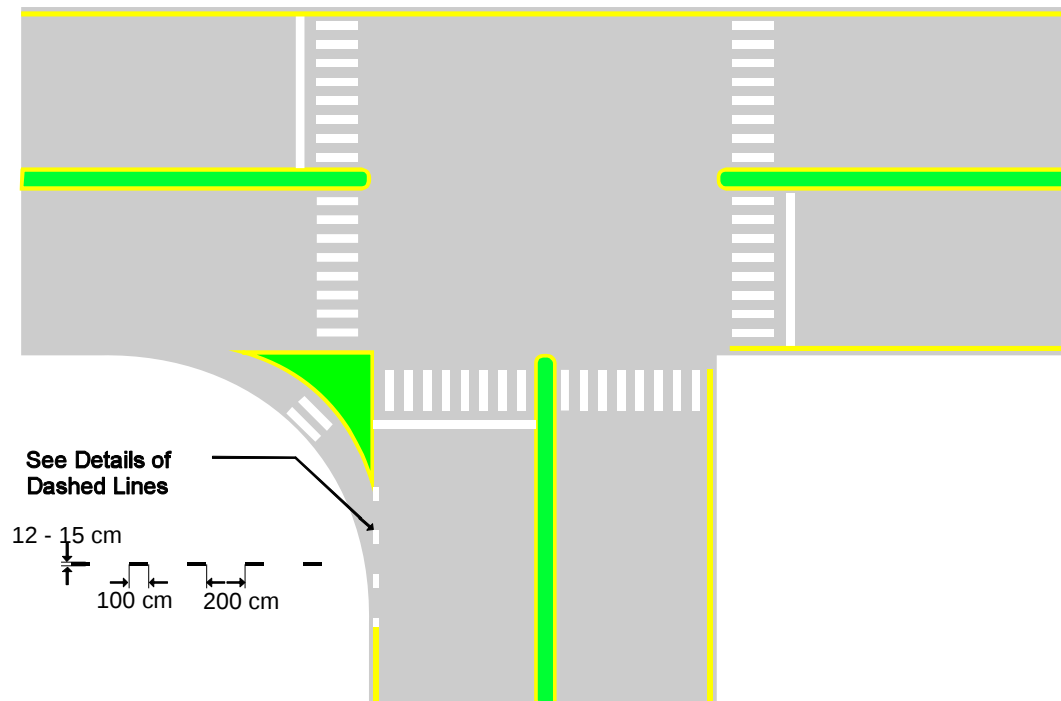


Figure 9-5: Dashed Line Marking

9.2.3 Junction Box Marking

A Box Junction Marking indicates a restriction of the traffic entering a junction unless the crossing is clear from all traffic and a motorist is sure that his entrance in the junction would not cause obstructions in the traffic. Box Junction Lines are yellow solid lines in the form of a square in the centre of the junction and diagonal lines (odd in numbers) crossing each other at 90°. The size of the central yellow square shall be variable according to the size of the junction.

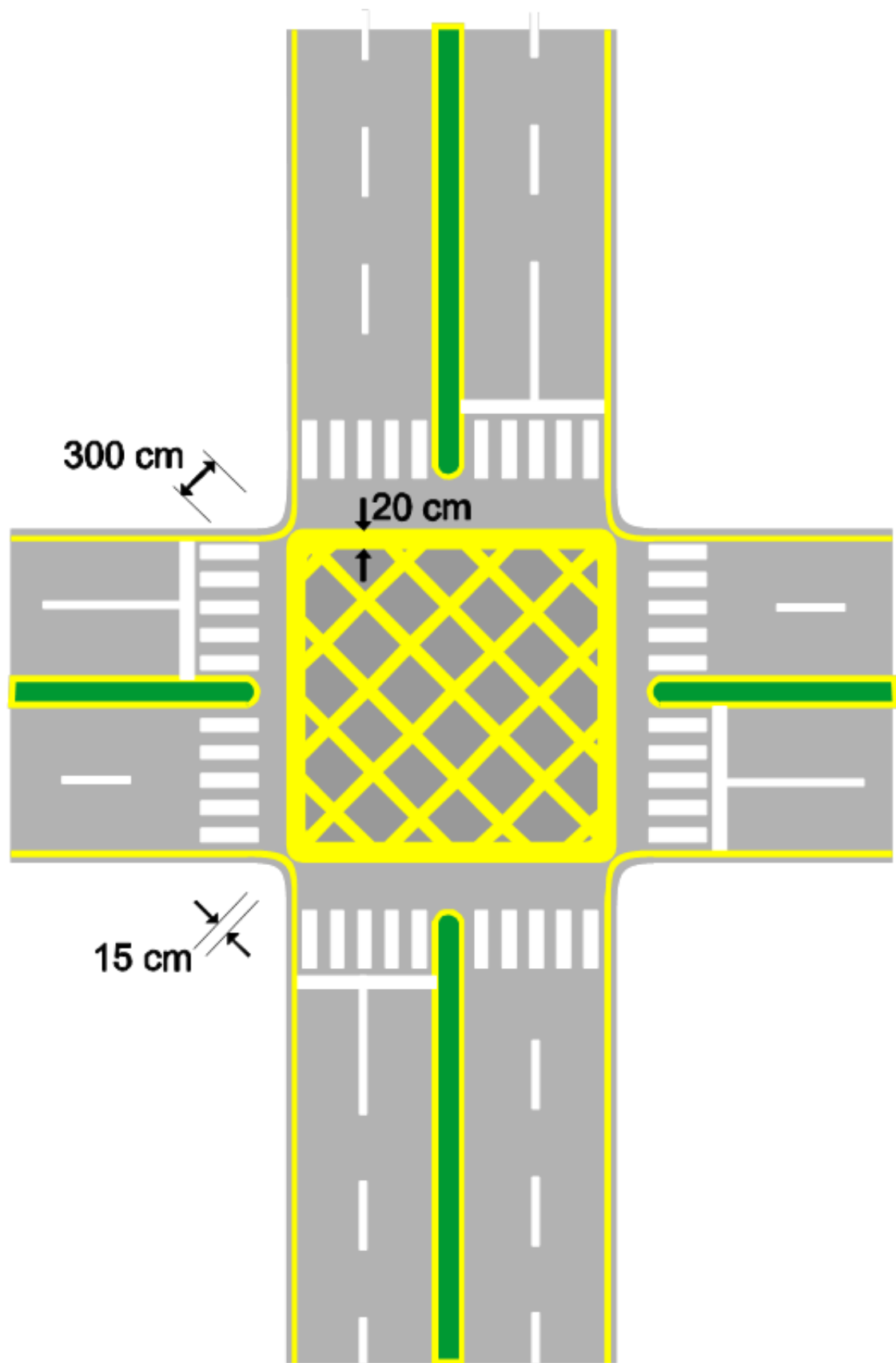


Figure 9-6: Junction Box Marking

10. PEDESTRIAN TRAFFIC SIGNALS

The Pedestrian signal is intended for application where the traffic volume on a major street is high resulting in unnecessary delay pedestrian movement while crossing the major street.

10.1 Pedestrian Signals

Pedestrian-actuated traffic controls require the users to push a button to activate a walk signal. Pedestrian-actuated traffic controls are usually installed:

- When a traffic signal is installed under the Pedestrian Volume or School Crossing warrant.
- When an exclusive pedestrian phase is provided.
- When vehicular indications are not visible to pedestrians.
- At any established school crossings with a signalized intersection.

Various types of pedestrian signals used are as follows:

10.1.1 Pelican Crossings

Pelican crossings (shown in Figure 10-1) have red/amber/green signals facing drivers, and red man/green man signal heads on the opposite side of the road to the pedestrians waiting to cross. A pedestrian push button unit is required to operate these types of crossings. When the steady red man is lit pedestrians should not cross. Likewise, when the steady red signal to traffic is lit then drivers must stop. The steady green man will then light for pedestrians and they should, having checked that it is safe to do so, cross the road. When the green man begins to flash pedestrians should not start to cross although there is still enough time for those on the crossing to finish their journey safely. At all Pelican crossings (apart from staggered crossings) have a bleeping sound to indicate to the visibility impaired when the steady green man is lit¹.

¹ <http://www.2pass.co.uk/crossing.htm>

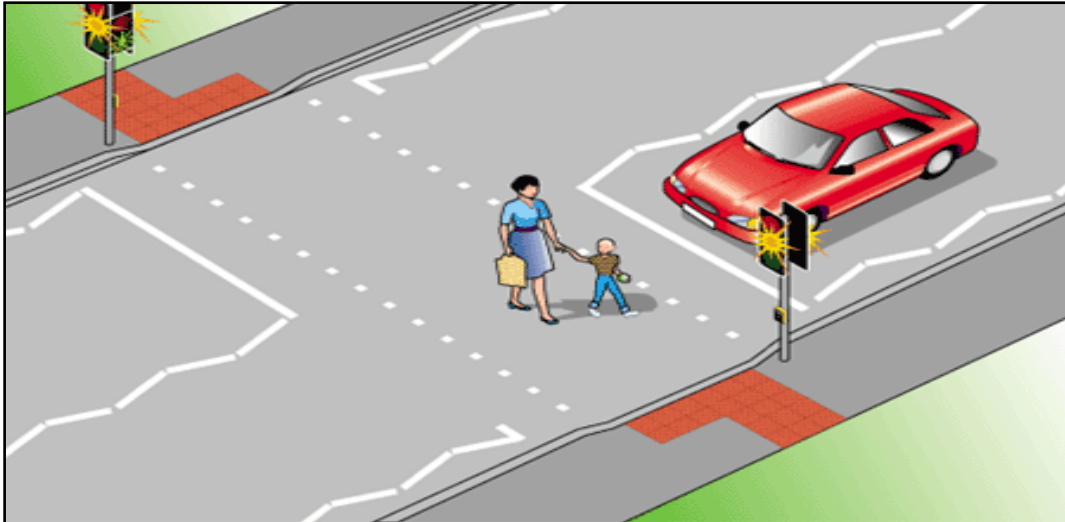


Figure 10-1: Typical Pelican Crossing

10.1.2 Puffin Crossings

Puffin crossings shown in Figure 10-2 differ from Pelican crossings as they do not have a flashing green man/flashing amber signal. The overall crossing time is established each time by on-crossing pedestrian detectors. The demand for the crossing is still triggered by the push button unit but kerb-side pedestrian detectors are fitted to cancel demands that are no longer required. At the latest Puffin crossings, the red man/green man signals are above the push button unit on the pedestrians' side of the road. This layout encourages pedestrians waiting at the crossing to look at the approaching traffic at the same time as looking at the red man/green man signal².

² <http://www.burystedmundsdrivingschool.net/pedestrian-crossings.html>



Figure 10-2: Typical Puffin Crossing

10.1.3 Toucan Crossings

Toucan crossings shown in Figure 10-3 are designed for both pedestrians and cyclists and are typically used adjacent to a cycle-path (Cyclists are not allowed to cross the road using Zebra, Pelican or Puffin crossings). There is a green cycle symbol alongside the green man. At the latest Toucan crossings, the crossing time is established each time by on-crossing detectors in the same way as Puffins crossings.

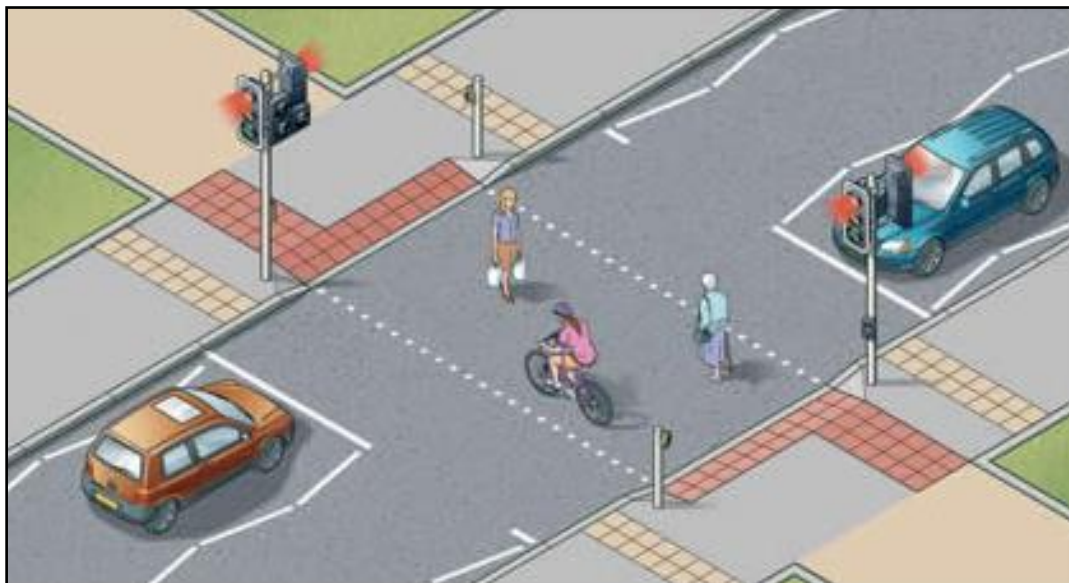


Figure 10-3: Typical Toucan Crossing

10.2 Pedestrian Signal Heads

Pedestrian signal heads provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a GREEN WALKING PERSON (symbolizing WALK) and an UPRAISED HAND or RED WALKING PERSON (symbolizing DONT WALK) as shown in Figure 10-4. Engineering judgment should determine the need for separate pedestrian signals.

10.2.1 Size, Design and Illumination of Pedestrian Signal Head Indication

Following should be considered while finalizing the size, design, and illumination of pedestrian signal head indications:

- All new pedestrian signal head indications shall be displayed within a rectangular background and shall consist of symbolized messages.
- Each pedestrian signal head indication shall be independently illuminated and emit a single color.
- The UPRAISED HAND (symbolizing DONT WALK) signal section shall be mounted directly above or integral with the WALKING PERSON (symbolizing WALK) signal section.
- The WALKING PERSON (symbolizing WALK) signal indication shall be white, with all except the symbol obscured by an opaque material.
- The UPRAISED HAND (symbolizing DONT WALK) signal indication shall be Portland orange, with all except the symbol obscured by an opaque material.
- When not illuminated, the WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK) symbols shall not be readily visible to pedestrians at the far end of the crosswalk that the pedestrian signal head indications control.
- For pedestrian signal head indications, the symbols shall be at least 150 mm (6 in) high. The light source of a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall be flashed continuously at a rate of not less than 50 nor more than 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total flash cycle.

- Pedestrian signal head indications should be conspicuous and recognizable to pedestrians at all distances from the beginning of the controlled crosswalk to a point 3 m (10 ft) from the end of the controlled crosswalk during both day and night.
- For crosswalks where the pedestrian enters the crosswalk more than 30 m (100 ft) from the pedestrian signal head indications, the symbols should be at least 225 mm (9 in) high.

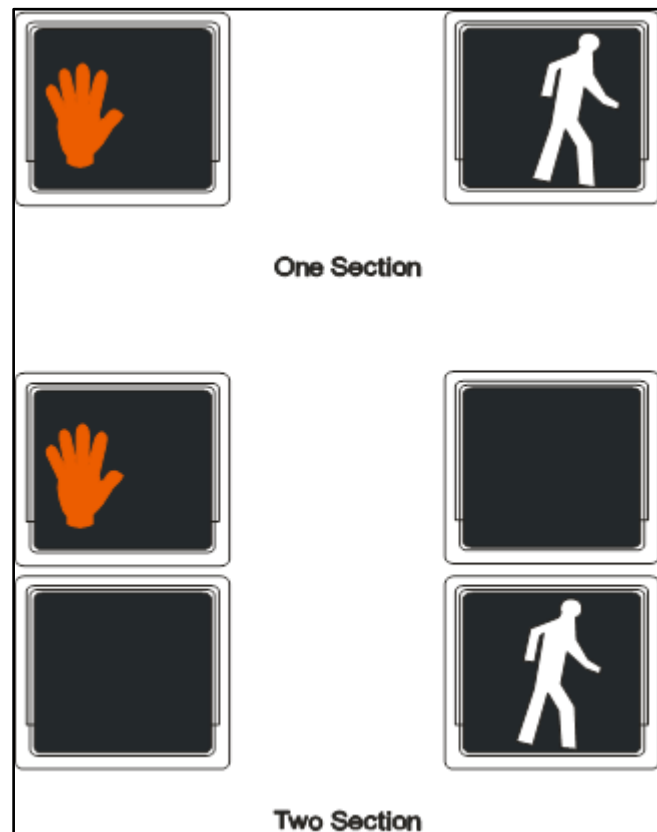


Figure 10-4: Pedestrian Signal Head Indications

The installation of pedestrian signals should be based on an engineering study, which should consider the following factors:

- Potential demand for accessible pedestrian signals
- A request for accessible pedestrian signals
- Traffic volumes during times when pedestrians might be present, including periods of low traffic volumes or high turn-on-red volumes
- Complexity of traffic signal phasing
- Complexity of intersection geometry

10.2.2 Location and Height of Pedestrian Signal Heads

Pedestrian signal heads shall be mounted with the bottom of the signal housing including brackets not less than 2.1 m (7 ft.) nor more than 3 m (10 ft.) above sidewalk level, and shall be positioned and adjusted to provide maximum visibility at the beginning of the controlled crosswalk. If pedestrian signal heads are mounted on the same support as vehicular signal heads, there shall be a physical separation between them.

Application of Pedestrian Signal Heads

Pedestrian signal heads shall be used in conjunction with vehicular traffic control signals under any of the following conditions:

- If a traffic control signal is justified by an engineering study and meets required Traffic Warrant or Pedestrian Volume or in case of specialized Crossing such as School or Hospital etc.
- If an exclusive signal phase is provided or made available for pedestrian movements in one or more directions, with all conflicting vehicular movements being stopped.
- Where engineering judgment determines that multiphase signal indications (as with split-phase timing) would tend to confuse or cause conflicts with pedestrians using a crosswalk guided only by vehicular signal indications.

10.3 Warrants for Pedestrian Traffic Signal

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

- **Criteria A**

For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 10-5.

- **Criteria B**

For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings).

Note: If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 7-7 may be used in place of Figure 7-5 to evaluate Criterion A and Figure 7-8 may be used in place of Figure 7-6 to evaluate Criterion B.

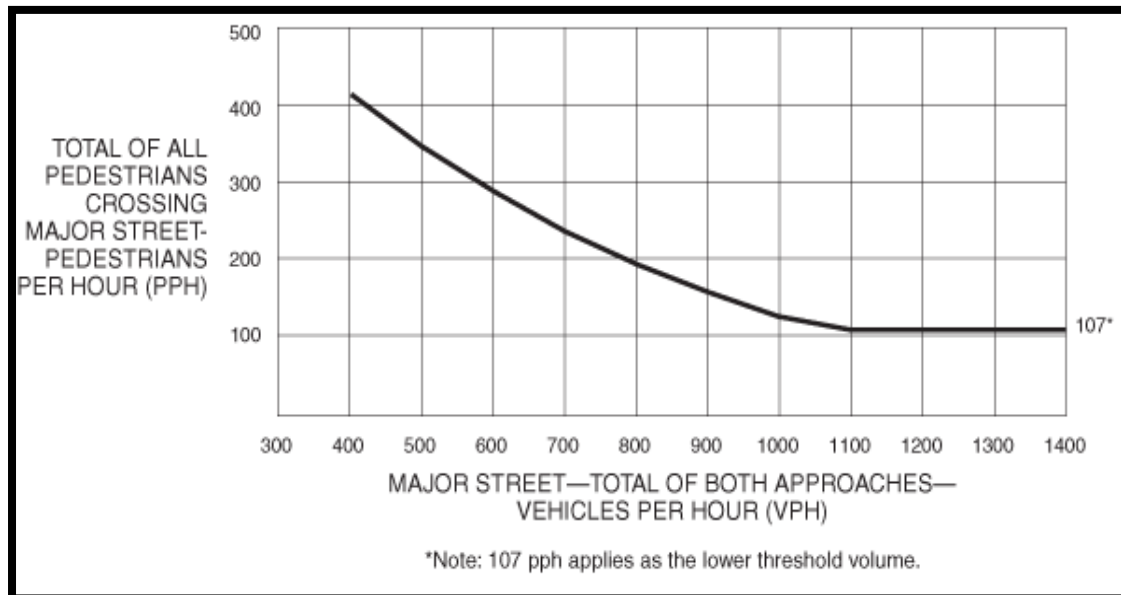


Figure 10-5: MUTCD Warrant 4, Pedestrian Four Hour Volume

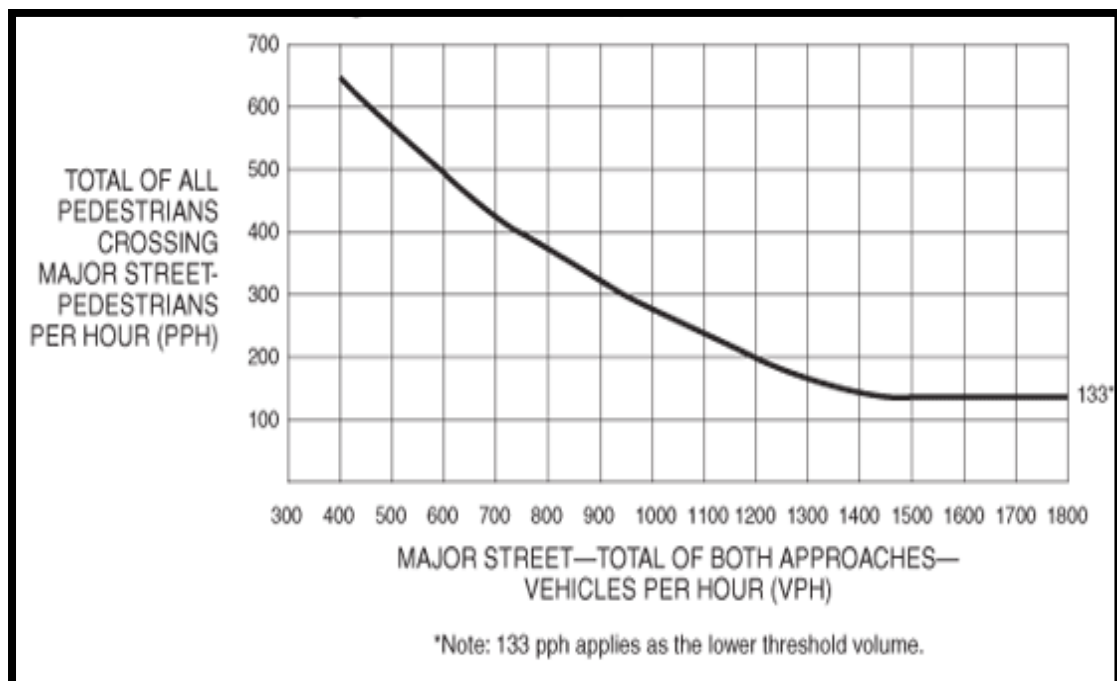


Figure 10-6: MUTCD, Warrant 4, Pedestrian Peak Hour

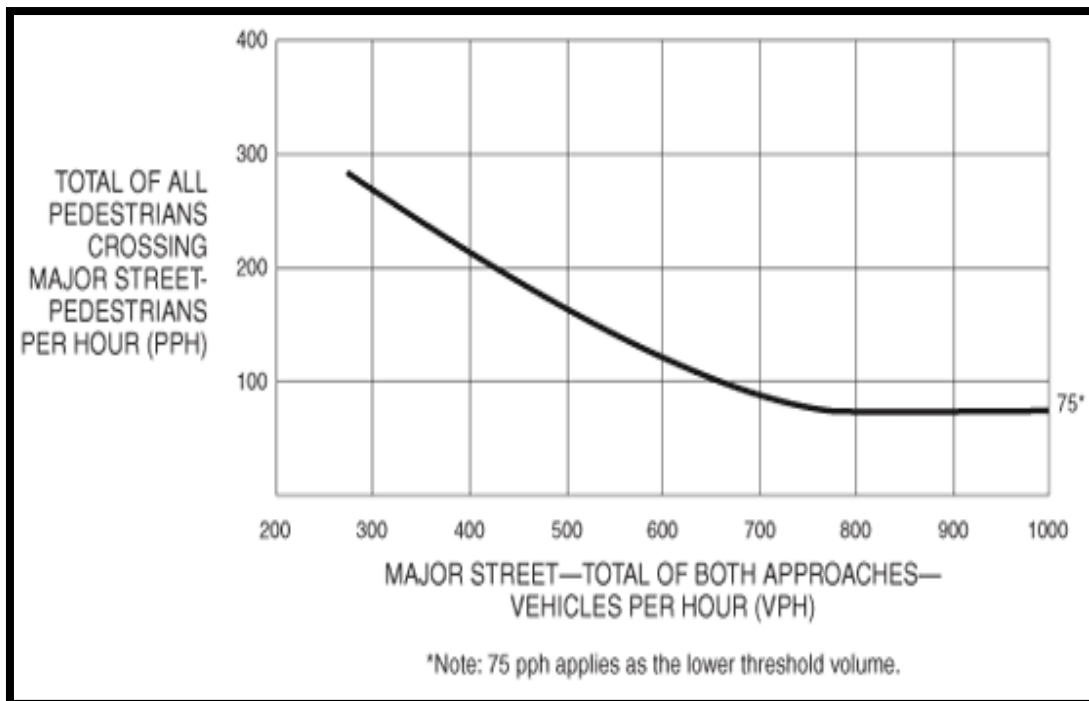


Figure 10-7: MUTCD, Warrant 4, Pedestrian Four-Hour Volume (70% Factor)

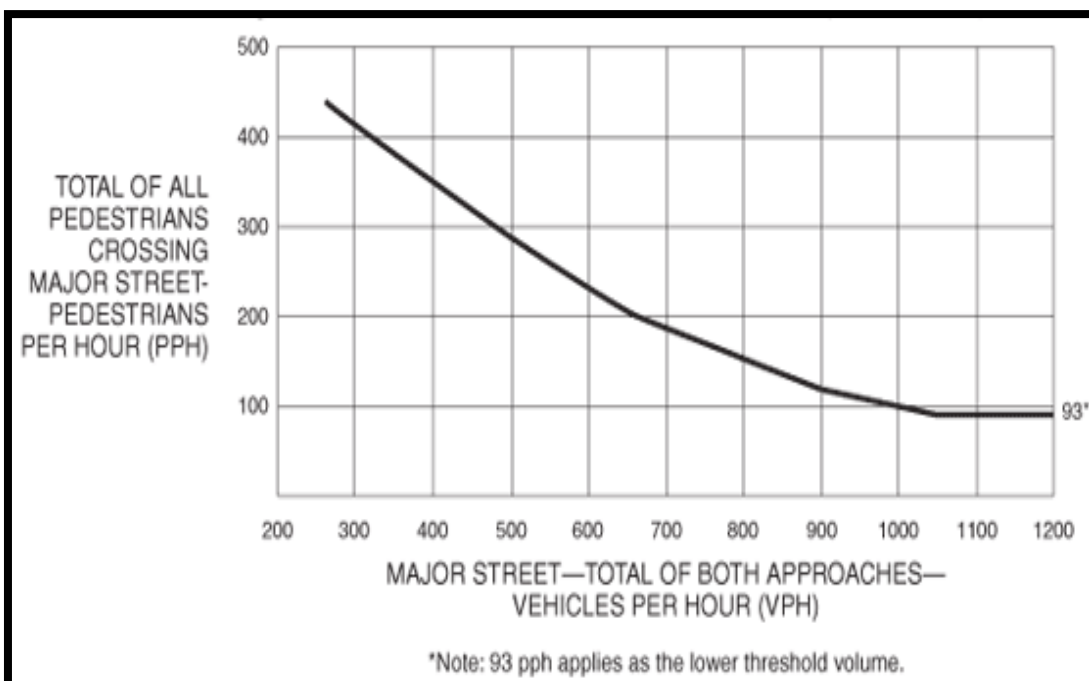


Figure 10-8: MUTCD, Warrant 4, Pedestrian Peak Hour (70% Factor)

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic. If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads. Furthermore, the pedestrian signal heads shall be used under any of the following conditions:

- If it is necessary to assist pedestrians in making a reasonably safe crossing or if engineering judgment determines that pedestrian signal heads are justified to minimize vehicle-pedestrian conflicts;
- If pedestrians are permitted to cross a portion of a street, such as to or from a median of sufficient width for pedestrians to wait, during a particular interval but are not permitted to cross the remainder of the street during any part of the same interval; and/or
- If no vehicular signal indications are visible to pedestrians, or if the vehicular signal indications that are visible to pedestrians starting or continuing a crossing provide insufficient guidance for them to decide when it is reasonably safe to cross, such as on one-way streets, at T-intersections, or at multiphase signal operations.

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