

5.4 DESIGN PRINCIPLE OF PEDESTRIAN FACILITIES

In the design facilities we will discuss the design criteria of sidewalk, street corner, crosswalk, traffic island, overpass and underpass and other facilities like as pedestrian signals and signage.

Side walk

Sidewalks are *pedestrian lanes* that provide people with space to travel within the public right-of-way that is separated from roadway vehicles. They also provide places for children to walk, run, skate, ride bikes, and play. Sidewalks are associated with significant reductions in pedestrian collisions with motor vehicles.

1. **Width:** The minimum clear width of a pedestrian access route shall be 1220 mm exclusive of the width of curb. It varies according to pedestrian flow rate and different LOS. It is shown in following Table.

Table 2: Minimum pedestrian clear area (excluding sidewalk obstructions)

Pedestrian Flow rate (pedestrian/hour)	LOS A	LOS B	LOS C	LOS D	LOS E
< 600	1.5 m	1.2 m	1.2 m	1.2 m	1.2 m
600-1200	3.1 m	1.2 m	1.2 m	1.2 m	1.2 m
1200-2400	6.1m	1.8 m	1.5 m	1.2 m	1.2 m
2400-3600		2.8 m	1.8 m	1.5 m	1.2 m
3600-4800		3.7 m	2.5 m	1.8 m	1.2 m
4800-6000		4.6 m	3.1 m	2.1 m	1.2 m

6000-7200	Not recommend	5.5 m	3.7 m	2.5 m	1.5 m
7200-8400	ed	6.1 m	4.3 m	3.1 m	1.8 m
8400-9600		7.1 m	4.9 m	3.4 m	2.1 m
9600-10800		8.1 m	5.5 m	3.7 m	2.5 m
10800-12000		8.9 m	6.1 m	4.3 m	2.5 m

2. **Cross slope:** The cross slope of the pedestrian access route shall be maximum 1:48.
3. **Surfaces:** Surface should be firm, stable, slip resistance and prohibit openings & avoid service elements i.e. manholes etc.

A buffer zone of 1.2 to 1.8 m (4 to 6 ft) is desirable and should be provided to separate pedestrians from the street. The buffer zone will vary according to the street type. In downtown or commercial districts, a street furniture zone is usually appropriate.

Cross Walk

Marked crosswalks indicate optimal or preferred locations for pedestrians to cross and help designate right-of-way for motorists to yield to pedestrians. Crosswalks are often installed at signalized intersections and other selected locations.

1. It should be located at all open legs of signalized intersection.
2. It should be perpendicular to roadway.
3. The parallel line should be 0.2-0.6 m in width and min. length 1.8 m (standard 3m).

4. Marking may be of different type to increase visibility like as solid, standard, continental, dashed, zebra, ladder. It is shown in Fig. 13.

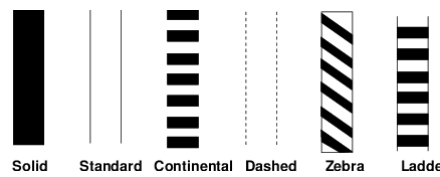


Figure: Cross walk marking pattern



Figure: Ladder pattern at intersection

Traffic Islands

Traffic islands to reduce the length of the crossing should be considered for the safety of all road users. It is used to permit safe crossing when insufficient gap in two directions traffic & helps elderly, children and disabled.

1. It works best when refuse area median is greater than cross walk width or 3.6 m, have a surface area of at least 4.6 sq.m, are free of obstructions, have adequate drainage, and provide a flat, street level surface to provide accessibility to people with disabilities.

2. The Refuge area width should be at least 1.2 m wide and depend upon traffic speed. It should be 1.5m wide on streets with speeds between 40-48 kmph, 1.8 m wide(48-56 kmph), and 2.4 m (56-72 kmph).

Pedestrian Overpass and Underpass

Pedestrian facilities at-grade and as directly as possible are always preferred. However, where grade separation is indicated, paths that are attractive, convenient and direct can become well-used and highly valued parts of a city's pedestrian infrastructure.

1. These are expensive method but eliminate all or most conflicts. These may be warranted for critical locations such as schools factory gates, sports arenas, and major downtown intersections (specially in conjunction with transit stations).
2. Overpasses are less expensive than underpass. However , vertical rise and fall to be negotiated by pedestrians is usually greater for an overpass, and it may be aesthetically inferior.
3. Minimum width is required 1.22 m, although 1.83 is preferred.
4. Ramps slopes not greater than 1:12 (8.33%) are preferable to flights of stairs to accommodate wheelchair, strollers, and bicycles and to comply with ADA.

Street Corner

Available Time-Space: The total time-space available for circulation and queuing in the intersection corner during an analysis period is the product of the net corner area and the length of the analysis period. For street corners, the analysis period is one signal cycle and therefore is equal to the cycle

length. The following equation is used to compute time-space available at an intersection corner. Intersection Corner Geometry is shown in Fig.

$$TS = C(W_a * W_b - 0.215R^2) \quad (4)$$

where, TS =available time-space (m_2 -s), W_a = effective width of Sidewalk a (m), W_b = effective width of Sidewalk b (m), R = radius of corner curb (m), and C = cycle length (s).

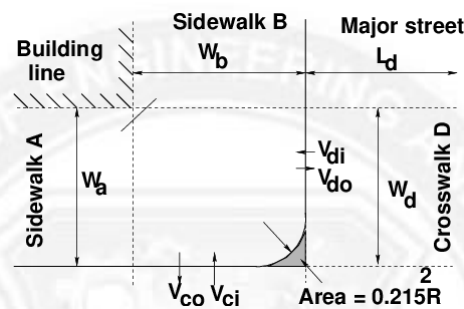


Figure: Intersection Corner Geometry

Pedestrian signals

Pedestrian signals are designed basically considering minimum time gap required for crossing the pedestrians. This minimum time gap can be calculated by using following gap equation.

$$Gs = \frac{W}{S_{ped}} + tc(N - 1) + ts \quad (5)$$

where, G_s =min time gap in sec, W = width of crossing section, t_s = startup time, t_c =consecutive time between two pedestrian, N =no of rows, and S_{ped} =pedestrian speed.

Numerical example

Calculate time gap for a platoon of 27 school children 5 in a row, consecutive time 2 sec width of crossing section is 7.5 m and walking speed of children .9 m/s start up time 3 sec. **Solution** Given $w=7.5\text{m}$; $t_c= 3$ sec $S_{ped}= 0.9\text{m/s}$ Find out N $N=27/5$ i.e. 6 row (5 containing 5 & 6th containing 2) Time gap

$$\begin{aligned} G_s &= \frac{W}{S_{ped}} + t_c(N - 1) + t_s \\ &= [(7.5/0.9) + 2(6 - 1) + 3] \\ &= 21.33\text{sec} \end{aligned}$$

Traffic signage

There are many signage used for pedestrian facilities like as in-pavement flashers, overhead signs, animated pedestrian indications and school zone symbol. These are shown below.

1. In-Pavement Flashers



Figure: In-Pavement Raised Markers with Amber LED Strobe Lighting and LED Signs

2. Overhead Signs

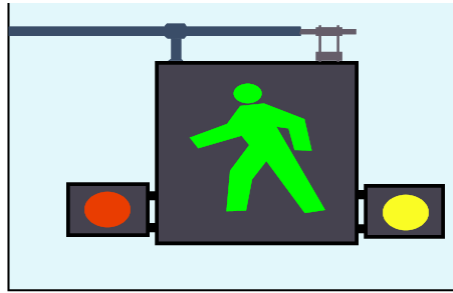


Figure: Overhead Pedestrian Signs

3. Animated Pedestrian Indications

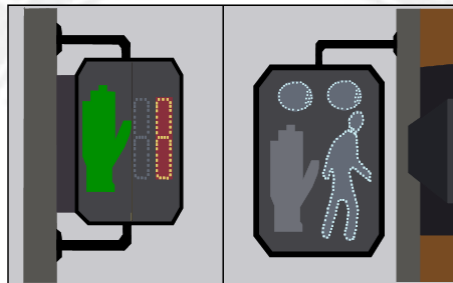


Figure: Animated Pedestrian Signals

4. School Zone Symbol



Figure: School Zone Symbol