APPENDIX F – SIDEWALK DESIGN PARAMETERS

As mentioned in Section 1.4, this Reference Manual is not intended to replace the many exhaustive sources of guidance on how to design pedestrian facilities. The resources listed in Section 1.4 will provide layman, planner and designer alike with a wealth of information on the best practices in facility design. Since each situation is unique, these guidelines are a starting point for discussions between residents, business owners and the public entities making improvements.

This appendix is designed to provide a few key concepts from design manuals prepared by the Institute of Transportation Engineers (ITE), the Federal Highway Administration (FHWA) and the New York State Department of Transportation (NYSDOT). The ITE manual *Designing Walkable Urban Thoroughfares* provides particularly exhaustive parameters, since they are customized both by type of street (boulevard, avenue or street) and by context zone (suburban, urban).

CONTENTS

- **Table 4.1 – Context Zone Characteristics** (page 49)
  This table provides further guidance on how to tell one context zone from another.

- **Table 4.2 – Thoroughfare Type Descriptions** (page 52)
  In order to apply the guidance in this manual, the user must match both the thoroughfare type and the context zone to ITE's pre-defined categories. This table helps distinguish one roadway type from another.

- **Table 4.4 – Urban Thoroughfare Characteristics** (page 54)
  Like Table 4.1, this table is designed to help the user determine how to classify a given road or roadway segment using the ITE's scheme. This table includes both general design parameters and desired operating characteristics.

- **Table 6.2 - Selected Characteristics of Walkable Thoroughfares** (page 68)
  This table summarizes the roadway characteristics covered by the ITE's guidance. The middle column ("Walkable Thoroughfares") briefly outlines the hallmarks of a pedestrian-friendly roadway.

- **Figure 8.1 - Streetside Zones** (from page 116)
  The ITE's guidance splits the public right-of-way into two pieces: the traveled way and the streetside zone. The traveled way is the area between the curbs - the area designed for use by motor vehicles (including parked cars) and bicycles. The streetside zone is made up of the public space beyond the curb, including the edge of the traveled way (edge zone), the portion dedicated to benches, trash receptacles, trees and other furnishings (furnishings zone), the portion designed for the through movement of pedestrians (throughway zone) and the interface between the throughway and the fronts of adjacent buildings (frontage zone). Note that other guidance may use different terminology, such as "buffer zone" instead of furnishings zone and "shy distance" instead of frontage zone.

- **Table 6.4 – Design Parameters for Walkable Urban Thoroughfares** (pages 70 & 71)
  This table provides the ITE's preferred dimensions for both the traveled way and streetside zone, with variations by roadway type and context zone. For example, minimum recommended sidewalk width on a commercial boulevard is six feet in the low density C-3 zone and ten feet in the more heavily developed C-5 zone. This guidance also addresses preferred speed limit, number of lanes, width of on-street parking and other elements critical to walkability. This two-page table summarizes the ITE's recommendations.

- **Table 9.4 – Recommended Practice for Midblock Crossings** (page 153)
  This table summarizes ITE's recommendations for where midblock crossings are and are not appropriate.

- **Table 10.1 – Pedestrian and Bicycle Features at Signalized Intersections** (page 181)
  A summary of the elements that should be incorporated into the design of signalized intersections in order to make them safer for cyclists and pedestrians.

- *Highway Design Manual, Chapter 18: Pedestrian Facility Design, New York State Department of Transportation (NYSDOT)*

  - **Exhibit 18-3 – Pedestrian Level-of-Service** (page 18-10)
    Level of service measures developed for motor vehicles are essentially the ratio of traffic volumes to roadway capacity. Similarly, the idea of pedestrian level of service is to measure the flow of pedestrians (pedestrians per minute per meter) and to measure the amount of space each pedestrian has on the sidewalk (square meters per pedestrian). Together, these metrics indicate whether or not additional sidewalk capacity is needed. As the Highway Design Manual points out, this is generally only an issue in central business districts. In the Study Area, it may also be an issue near Syracuse University, where large numbers of students walk between home and campus daily.

  - **Exhibit 18-4 – Guidelines for Locating Sidewalks in Developed Areas** (page 18-23)
    This is the first of three tables to be included in this appendix that provides broad parameters for the placement of sidewalks on roads based on the mix of land use and roadway characteristics. NYSDOT's guidelines associate the need for sidewalks with the presence of development. For local roads in residential areas, the only streets on which sidewalks are not recommended (on either side of the street) are in areas of low density with traffic volumes under 400 vehicles a day.

  - **Exhibit 18-9 – Sidewalk Placement within the Right-of-Way** (page 18-30)
    The two examples in this figure provide dimensions and a general design for placing sidewalks in commercial areas and residential areas. Note that, unlike the ITE guidance, this cross-section does not include an identified "edge zone".

  - **Exhibit 18-20 - Recommendations for Installing Marked Crosswalks and Other Needed Pedestrian Improvements at Uncontrolled Locations** (page 18-53)
    This table summarizes screening criteria for the installation of marked crosswalks at mid-block locations and unsignalized intersections, given the number of lanes being crossed, traffic volume and speed.

- PedSAFE, Federal Highway Administration (FHWA)

- **Table 1 – Recommended Guidelines for New Sidewalks/Walkway Installation**
  Like NYSDOT's guidance (Exhibit 18-4), FHWA's guidelines encourage sidewalks on both sides of most streets where there is dense residential development. FHWA adds a decision point for roadways with fewer than 2,000 vehicles per day in low-density residential areas.

- *Design and Safety of Pedestrian Facilities*, ITE

  - **Figure 3-4, Guidelines for Installing Sidewalks** (page 31)
    Like NYSDOT's guidance, this table from ITE addresses both new and existing streets. This guidance also ties the need for sidewalks to land use (residential, commercial, industrial), housing density and street type (major arterials, collectors, and local streets). In general, the NYSDOT, FHWA and ITE guidance all support sidewalks on major roads in residential, commercial and industrial areas. All three also support the idea that sidewalks are not needed as residential density falls below some threshold, whether it's measured as distance between houses or housing units per acre.

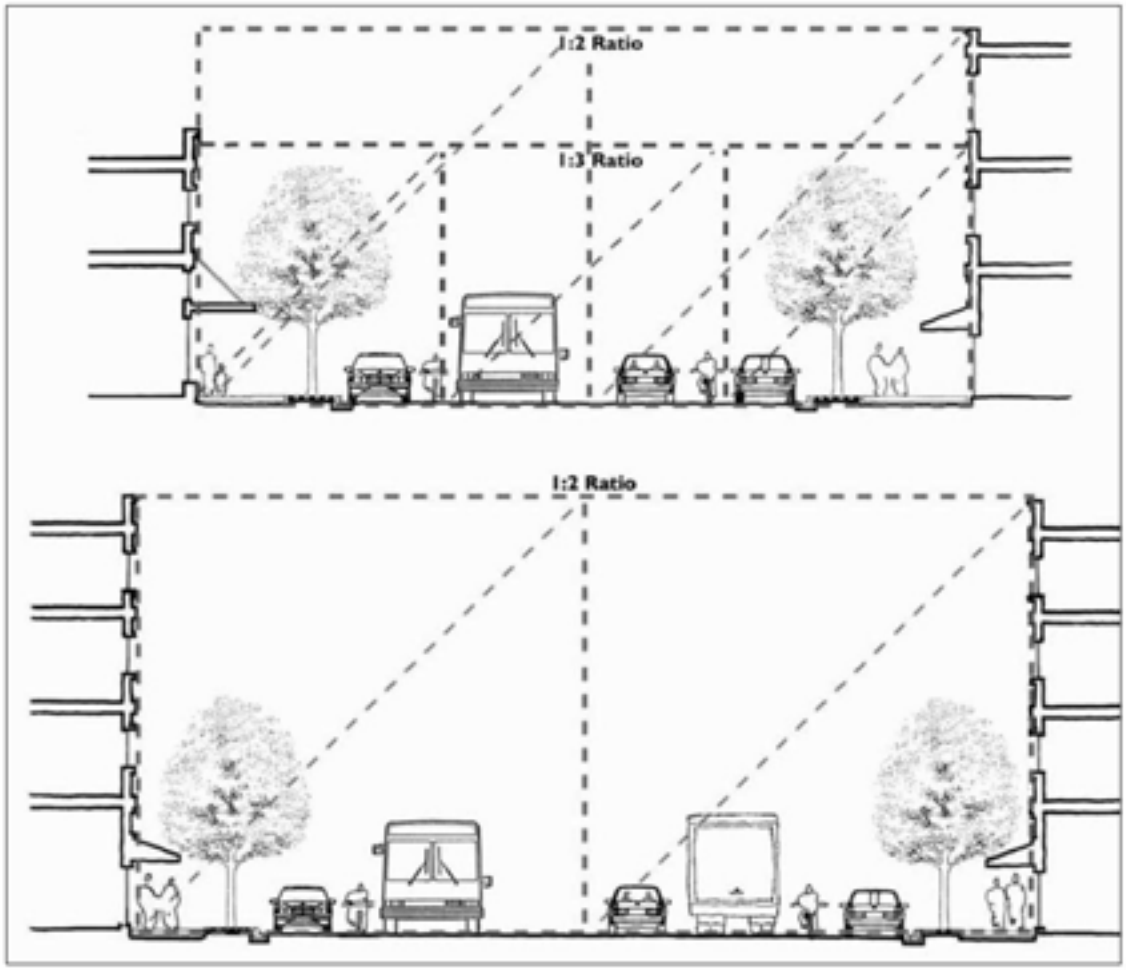


Figure 4.2 Illustration of height to width ratios that create a scale on thoroughfares that is comfortable to people and encourages walking (human scale). Human scale ratios fall between 1:3 and 1:2 as measured from the building fronts. Source: Community, Design + Architecture.

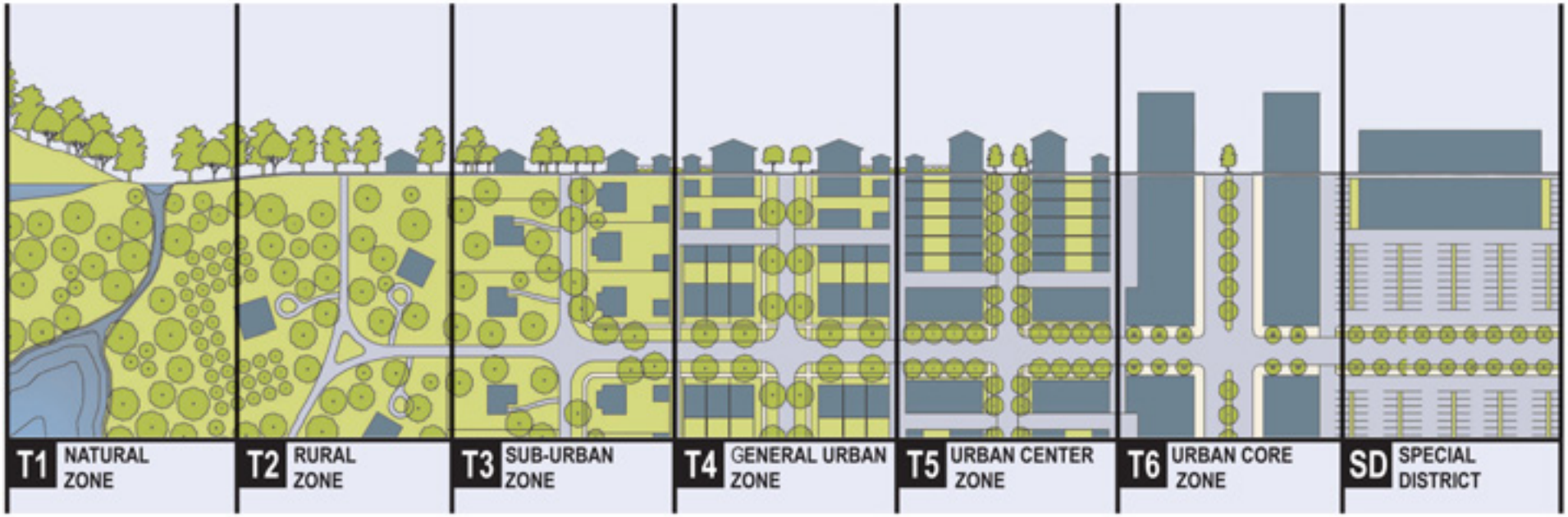


Figure 4.4 Illustration of a gradient of development patterns ranging from rural in Context Zone 1 (C-1), to the most urban in C-6. Source: Duany Plater-Zyberk and Company.

Table 4.1 Context Zone Characteristics

Context Zone	Distinguishing Characteristics	General Character	Building Placement	Frontage Types	Typical Building Height	Type of Public Open Space	Transit (Where Provided)
C-1 Natural	Natural landscape	Natural features	Not applicable	Not applicable	Not applicable	Natural open space	None
C-2 Rural	Agricultural with scattered development	Agricultural activity and natural features	Large setbacks	Not applicable	Not applicable	Agricultural and natural	Rural
C-3 Suburban	Primarily single family residential with walkable development pattern and pedestrian facilities, dominant landscape character. Includes scattered commercial uses that support the residential uses, and connected in walkable fashion.	Detached buildings with landscaped yards, normally adjacent to C-4 zone. Commercial uses may consist of neighborhood or community shopping centers, service or office uses with side or rear parking.	Varying front and side yard setbacks	Residential uses include lawns, porches, fences and naturalistic tree planting. Commercial uses front onto thoroughfare.	1 to 2 story with some 3 story	Parks, greenbelts	Local, express bus
C-4 General Urban	Mix of housing types including attached units, with a range of commercial and civic activity at the neighborhood and community scale	Predominantly detached buildings, balance between landscape and buildings, presence of pedestrians	Shallow to medium front and side yard setback	Porches, fences	2 to 3 story with some variation and few taller workplace buildings	Parks, greenbelts	Local, limited stop bus rapid transit, express bus; fixed guideway
C-5 Urban Center	Attached housing types such as townhouses and apartments mixed with retail, workplace and civic activities at the community or subregional scale.	Predominantly attached buildings, landscaping within the public right of way, substantial pedestrian activity	Small or no setbacks, buildings oriented to street with placement and character defining a street wall	Stoops, dooryards, storefronts and arcaded walkways	3 to 5 story with some variation	Parks, plazas and squares, boulevard median landscaping	Local bus; limited stop rapid transit or bus rapid transit; fixed-guideway transit
C-6 Urban Core	Highest-intensity areas in subregion or region, with high-density residential and workplace uses, entertainment, civic and cultural uses	Attached buildings forming sense of enclosure and continuous street wall landscaping within the public right of way, highest pedestrian and transit activity	Small or no setbacks, building oriented to street, placed at front property line	Stoops, dooryards, forecourts, storefronts and arcaded walkways	4+ story with a few shorter buildings	Parks, plazas and squares, boulevard median landscaping	Local bus; limited stop rapid transit or bus rapid transit; fixed-guideway transit
Districts	To be designated and described locally, districts are areas that are single-use or multi-use with low-density development pattern and vehicle mobility priority thoroughfares. These may be large facilities such as airports, business parks and industrial areas.						As applicable

(Based on transect zone descriptions in *SmartCode* Version 9.2, 2008. Source: Duany Plater-Zyberk & Company.)
Shaded cells represent Context Zones that are not addressed in this report.

Table 4.2 Thoroughfare Type Descriptions

Thoroughfare Type	Functional Definition
Freeway/Expressway/ Parkway	Freeways are high-speed (50 mph +), controlled-access thoroughfares with grade-separated interchanges and no pedestrian access. Includes tollways, expressways and parkways that are high- or medium-speed (45 mph +), limited-access thoroughfares with some at-grade intersections. On parkways, landscaping is generally located on each side and has a landscaped median. Truck access on parkways may be limited.
Rural Highway	High-speed (45 mph +) thoroughfare designed both to carry traffic and to provide access to abutting property in rural areas. Intersections are generally at grade.
Boulevard (see Chapters 8, 9 and 10 for design guidance)	Walkable, low-speed (35 mph or less) divided arterial thoroughfare in urban environments designed to carry both through and local traffic, pedestrians and bicyclists. Boulevards may be long corridors, typically four lanes but sometimes wider, serve longer trips and provide pedestrian access to land. Boulevards may be high-ridership transit corridors. Boulevards are primary goods movement and emergency response routes and use vehicular and pedestrian access management techniques. Curb parking is encouraged on boulevards.
	Multiway boulevards are a variation of the boulevard characterized by a central roadway for through traffic and parallel access lanes accessing abutting property, parking and pedestrian and bicycle facilities. Parallel access lanes are separated from the through lanes by curbed islands with landscaping; these islands may provide transit stops and pedestrian facilities. Multiway boulevards often require significant right of way.
Avenue (see Chapters 8, 9 and 10 for design guidance)	Walkable, low-to-medium speed (25 to 35 mph) urban arterial or collector thoroughfare, generally shorter in length than boulevards, serving access to abutting land. Avenues serve as primary pedestrian and bicycle routes and may serve local transit routes. Avenues do not exceed 4 lanes, and access to land is a primary function. Goods movement is typically limited to local routes and deliveries. Some avenues feature a raised landscaped median. Avenues may serve commercial or mixed-use sectors and usually provide curb parking.
Street (see Chapters 8, 9 and 10 for design guidance)	Walkable, low speed (25 mph) thoroughfare in urban areas primarily serving abutting property. A street is designed to (1) connect residential neighborhoods with each other, (2) connect neighborhoods with commercial and other districts and (3) connect local streets to arterials. Streets may serve as the main street of commercial or mixed-use sectors and emphasize curb parking. Goods movement is restricted to local deliveries only.
Rural Road	Low speed (25 to 35 mph) thoroughfare in rural areas primarily serving abutting property.
Alley/Rear Lane	Very low-speed (5 to 10 mph) vehicular driveway located to the rear of properties, providing access to parking, service areas and rear uses such as secondary units, as well as an easement for utilities.

Shaded cells represent thoroughfare types that are not addressed in this report.

Table 4.4 Urban Thoroughfare Characteristics

Urban Thoroughfare Type	Number of Through Lanes	Desired Operating Speed (mph)	Transit Service Emphasis	Median	Driveway Access	Curb Parking	Pedestrian Facilities [1]	Bicycle Facilities	Freight Mvmt. [2]
Freeway	4 to 6+	45–65	Express	Required	No	No	No	Optional separated pathway or shoulder	Regional truck route
Expressway/ Parkway	4 to 6	45–55	Express	Required	No	No	Optional separated pathway	Optional separated pathway or shoulder	Regional truck route
Boulevard	4 to 6	30–35	Express and Local	Required	Limited	Optional	Sidewalk	Bike lanes or parallel route	Regional truck route
Multiway Boulevard	4 to 6	25–35	Express and Local	Required on access lanes	Yes from access lane	Yes on access roadway	Sidewalk		Regional route/ local deliveries only on access roadway
Avenue	2 to 4	25–30	Local	Optional	Yes	Yes	Sidewalk	Bike lanes or shared	Local truck route
Street	2	25	Local or none	No	Yes	Yes	Sidewalk	Shared	Local deliveries only
Rural Road	2	25–35	Local or none	No	Yes	No	No	Shared or shoulder	Local deliveries only
Local Street	2	25	Local or none	No	Yes	Yes	Sidewalk	Shared	Local deliveries only
Alley/Rear Lane	1	5–10	None	No	Yes	No	Shared	Shared	Local deliveries only

Shaded cells represent thoroughfare types that are not addressed in this report.

Notes:

[1] Boulevard, Multiway Boulevard, Avenue, and Street thoroughfare types have sidewalks on both sides. Sidewalk width varies as a function of context zone, fronting land use and other factors.

[2] Freight movement is divided into three categories: 1) Regional truck route, 2) Local truck route and 3) Local deliveries only. Cells show highest order of truck movement allowed.

Table 6.2 Selected Characteristics of Walkable Thoroughfares

Characteristic	Walkable Thoroughfares	Vehicle-Oriented Thoroughfares
Target speed range	From Table 6.4.	25–35 mph.
Pedestrian separation from moving traffic	Curb parking and streetside furnishing zone.	Optional, typically separation achieved with planting strip.
Streetside width	Minimum 9 feet (residential) and 12 feet (commercial) to accommodate sidewalk, landscaping and street furniture.	Minimum 5 feet.
Block lengths	200–660 feet.	Up to one-quarter mile.
Protected pedestrian crossing frequency (pedestrian signals or high-visibility markings at unsignalized crossings)	200–600 feet.	As needed to accommodate pedestrian demands.
Pedestrian priority at signalized intersection	Pedestrian signals and pedestrian countdown heads, adequate crossing times, shorter cycle lengths and median refuges for very long crossings.	Vehicle priority; may have longer cycle lengths and require two cycles for slower pedestrians to cross wide streets with medians.
Pedestrian crossings	High-visibility crosswalks shortened by curb extensions where there is on-street parking.	Full street width.
Median width	6 feet minimum width at crosswalk, if used as pedestrian refuge, plus 10 feet for left-turn lane, if provided. 14 foot total width for left-turn lane if no refuge needed.	14–18 feet for single left-turn lane; 26–30 feet for double left-turn lane.
Vehicular access across sidewalks	24 feet or less, except if specific frequent design vehicle requires added width.	As needed.
Curb parking	Normal condition except at bus stops and pedestrian crossings.	None.
Curb return radius	10–30 feet; low-speed channelized right turns where other options are unworkable.	30–75 feet; high-volume turns channelized.

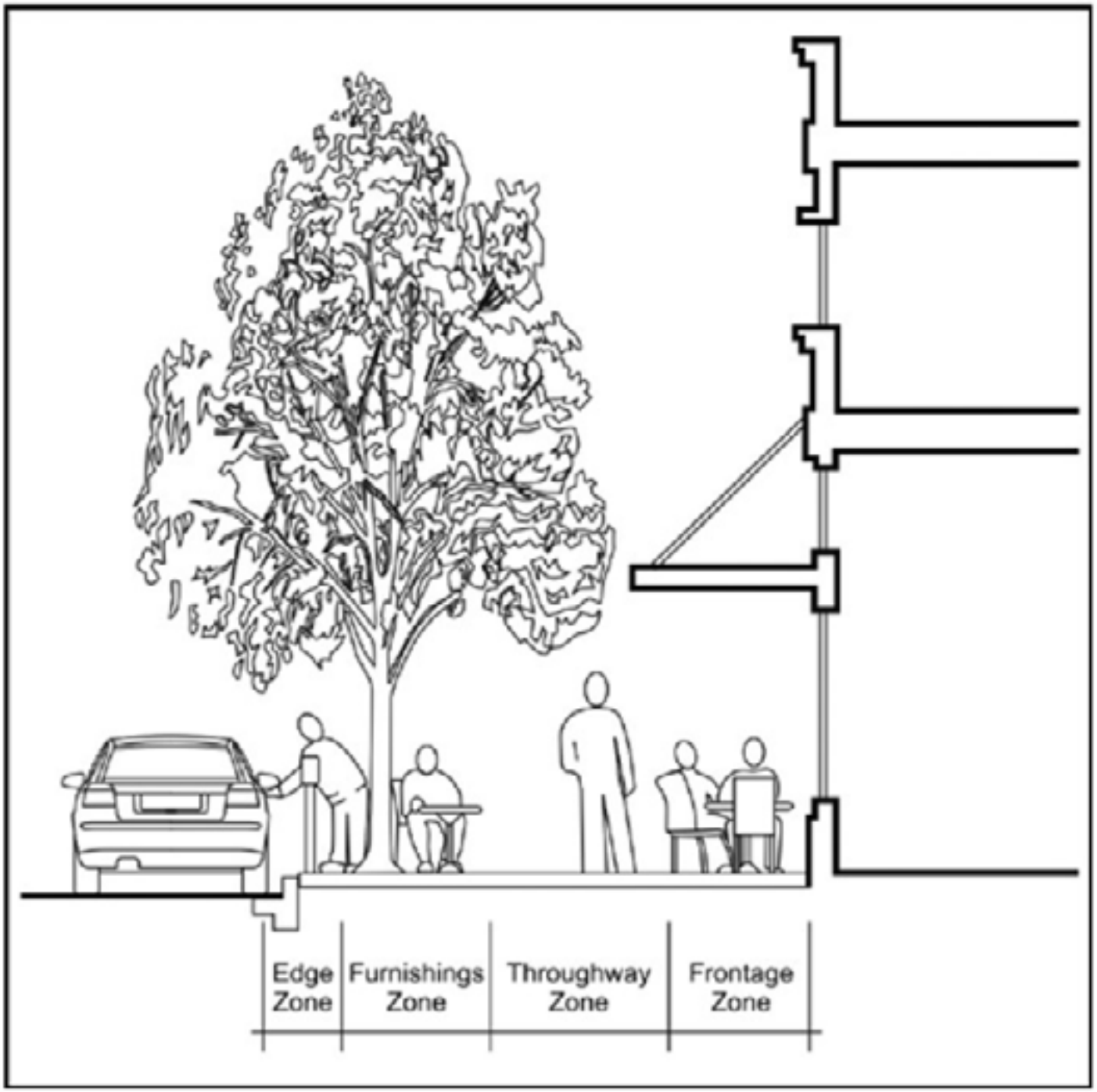


Figure 8.1 Streetside zones. Source: Concept by Community, Design + Architecture, illustration by Digital Media Productions.

Table 6.4 Design Parameters for Walkable Urban Thoroughfares

Thoroughfare Design Parameters for Walkable Mixed–Use Areas									
	Suburban (C–3)						General Urban (C–4)		
	Residential			Commercial			Residential		
	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street
Context									
Building Orientation (entrance orientation)	front, side	front, side	front, side	front, side	front, side	front, side	front	front	front
Maximum Setback [2]	20 ft.	20 ft.	20 ft.	5 ft.	5 ft.	5 ft.	15 ft.	15 ft.	15 ft.
Off-Street Parking Access/Location	rear, side	rear, side	rear, side	rear, side	rear, side	rear, side	rear	rear, side	rear, side
Streetside									
Recommended Streetside Width [3]	14.5–16.5 ft.	14.5 ft.	11.5 ft.	16 ft.	16 ft.	15 ft.	16.5-18.5 ft.	14.5 ft.	11.5 ft.
Minimum sidewalk (throughway) width	6 ft.	6 ft.	6 ft.	6 ft.	6 ft.	6 ft.	8 ft.	6 ft.	6 ft.
Pedestrian Buffers (planting strip exclusive of travel way width) [3]	8 ft. planting strip	6–8 ft. planting strip	5 ft. planting strip	7 ft. tree well	6 ft. tree well	6 ft. tree well	8 ft. planting strip	8 ft. planting strip	6 ft. planting strip
Street Lighting	For all thoroughfares in all context zones, intersection safety lighting, basic street lighting, and pedestrian-scaled lighting is recommended. See Chapter 8 (Streetside Design Guidelines) and Chapter 10 (Intersection Design Guidelines).								
Traveled Way									
Target Speed (mph)	25–35	25–30	25	25–35	25–35	25	25–35	25–30	25
Number of Through Lanes [5]	4–6	2–4	2	4–6	2–4	2	4–6	2–4	2
Lane Width [6]	10–11 ft.	10–11 ft.	10–11 ft.	10–12 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.
Parallel On-Street Parking Width [7]	7 ft.	7 ft.	7 ft.	8 ft.	7-8 ft.	7-8 ft.	7 ft.	7 ft.	7 ft.
Min. Combined Parking/Bike Lane Width	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.
Horizontal Radius (per AASHTO) [8]	200–510 ft.	200–330 ft.	200 ft.	200–510 ft.	200–510 ft.	200 ft.	200–510 ft.	200–330 ft.	200 ft.
Vertical Alignment	Use AASHTO minimums as a target, but consider combinations of horizontal and vertical per AASHTO Green Book.								
Medians [9]	4–18 ft.	Optional 4–16 ft.	None	4–18 ft.	Optional 4–18 ft.	None	4–18 ft.	Optional 4–16 ft.	None
Bike Lanes (min./preferred width)	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.
Access Management [10]	Moderate	Low	Low	High	Moderate	Low	Moderate	Low	Low
Typical Traffic Volume Range (ADT) [11]	20,000–35,000	1,500–25,000	500–5,000	20,000–50,000	1,500–35,000	1,000–10,000	10,000–35,000	1,500–20,000	500–5,000
Intersections									
Roundabout [12]	Consider urban single–lane roundabouts at intersections on avenues with less than 20,000 entering vehicles per day, and urban double–lane roundabouts at intersections on boulevards and avenues with less than 40,000 entering vehicles per day.								
Curb Return Radii/Curb Extensions and Other Design Elements	Refer to Chapter 10 (Intersection Design Guidelines)								

Table 6.4 Notes:

1. Multiway boulevards are a special form of boulevards. Generally they add one–way, 16–20 foot wide access lanes adjacent to the outer curb and separated from the through traffic lanes by a longitudinal island at least 6 ft. wide (10 ft. if accommodating transit stops). Access lanes have curb parallel parking plus one moving traffic/bike lane with a target speed of 15–20 mph. All vehicular traffic on the access lanes is local. See Chapter 6 section on multiway boulevards for additional information.
2. For all context zones with predominantly commercial frontage, this table shows the maximum setback for buildings with ground floor retail. In suburban contexts, office buildings are typically set back 5 ft. further than retail buildings to provide a privacy buffer. In general urban and urban center/core areas, office buildings are set back 0–5 ft. Setback exceptions may be granted for important civic buildings or unique designs.
3. Streetside width includes edge, furnishing/planting strip, clear throughway, and frontage zones. Refer to Chapter 8 (Streetside Design Guidelines) for detailed description of sidewalk zones and widths in different context zones and on different thoroughfare types. Dimensions in this table reflect widths in unconstrained conditions. In constrained conditions streetside width can be reduced to 12 ft. in commercial areas and 9 ft. in residential areas (see Chapter 5 on designing within constrained rights of way).
4. Desired target speeds on avenues serving C–4 and C–5/6 commercial main streets with high pedestrian activity should be 25 mph.
5. Six lane facilities are generally undesirable for residential streets because of concerns related to neighborhood livability (i.e., noise, speeds, traffic volume) and perceptions as a barrier to crossing. Consider a maximum of four lanes within residential neighborhoods.
6. Lane width (turning, through and curb) can vary. Most thoroughfare types can effectively operate with 10–11 ft. wide lanes, with 12 ft. lanes desirable on higher speed transit and freight facilities. Chapter 9 (Traveled Way Design Guidelines) (lane width section) identifies the considerations used in selecting lane widths. Curb lane width in this report is measured to curb face unless gutter pan/catch basin inlets do not accommodate bicycles, then it is measured from the edge of travel lane. If light rail transit or streetcars are to be accommodated in a lane with motor vehicles, the minimum lane width should be the

Table 6.4 Design Parameters for Walkable Urban Thoroughfares (continued)

Thoroughfare Design Parameters for Walkable Mixed–Use Areas									
	General Urban (C–4)			Urban Center/Core (C–5/6)					
	Commercial			Residential			Commercial		
	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street
Context									
Building Orientation (entrance orientation)	front	front	front	front	front	front	front	front	front
Maximum Setback [2]	0 ft.	0 ft.	0 ft.	10 ft.	10 ft.	10 ft.	0 ft.	0 ft.	0 ft.
Off-Street Parking Access/Location	rear, side	rear, side	rear, side	rear	rear	rear, side	rear	rear	rear, side
Streetside									
Recommended Streetside Width [3]	19 ft.	16 ft.	16 ft.	21.5 ft.	19.5 ft.	16 ft.	21.5 ft.	19.5 ft.	16 ft.
Minimum sidewalk (throughway) width	8 ft.	6 ft.	6 ft.	10 ft.	9 ft.	6 ft.	10 ft.	9 ft.	6 ft.
Pedestrian Buffers (planting strip exclusive of travel way width) [3]	7 ft. tree well	6 ft. tree well	6 ft. tree well	7 ft. tree well	6 ft. tree well	6 ft. tree well	7 ft. tree well	6 ft. tree well	6 ft. tree well
Street Lighting	For all thoroughfares in all context zones, intersection safety lighting, basic street lighting, and pedestrian-scaled lighting is recommended. See Chapter 8 (Streetside Design Guidelines) and Chapter 10 (Intersection Design Guidelines).								
Traveled Way									
Target Speed (mph)	25–35	25–30 [4]	25	25–35	25–30	25	25–35	25–30 [4]	25
Number of Through Lanes [5]	4–6	2–4	2–4	4–6	2–4	2–4	4–6	2–4	2–4
Lane Width [6]	10–12 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.
Parallel On-Street Parking Width [7]	8'	7–8 ft.	7–8 ft.	7 ft.	7 ft.	7 ft.	8 ft.	8 ft.	7–8 ft.
Min. Combined Parking/Bike Lane Width	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.
Horizontal Radius (per AASHTO) [8]	200–510 ft.	200–330 ft.	200 ft.	200–510 ft.	200–330 ft.	200 ft.	200–510 ft.	200–330 ft.	200 ft.
Vertical Alignment	Use AASHTO minimums as a target, but consider combinations of horizontal and vertical per AASHTO Green Book.								
Medians [9]	4–18 ft.	Optional 4–18 ft.	None	4–18 ft.	Optional 4–16 ft.	None	4–18 ft.	Optional 4–18 ft.	None
Bike Lanes (min./preferred width)	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.
Access Management [10]	High	Low–Moderate	Low–Moderate	Moderate	Low–Moderate	Low–Moderate	High	Low–Moderate	Low–Moderate
Typical Traffic Volume Range (ADT) [11]	15,000–50,000	1,500–30,000	1,000–15,000	15,000–30,000	1,500–20,000	500–5,000	15,000–40,000	1,500–30,000	1,000–15,000
Intersections									
Roundabout [12]	Consider urban single–lane roundabouts at intersections on avenues with less than 20,000 entering vehicles per day, and urban double–lane roundabouts at intersections on boulevards and avenues with less than 40,000 entering vehicles per day.								
Curb Return Radii/Curb Extensions and Other Design Elements	Refer to Chapter 10 (Intersection Design Guidelines)								

width of the transit vehicle plus 1 ft. of clearance on either side. Most modern streetcars or light rail vehicles (LRT) can be accommodated in an 11 or 12 ft. wide lane but designers need to consider the LRT vehicle's "dynamic envelope" when designing on horizontal curves and intersections.

7. An 8 ft. wide parking lane is recommended in any commercial area with a high turnover of parking.
8. For guidance on horizontal radius—see AASHTO's "green book" section on "Minimum Radii for Low Speed Urban Streets—Sharpest Curve Without Superelevation." Dimensions shown above are for noted target speeds and are found on Exhibit 3–16 (Page 151) in *A Policy on Geometric Design of Highways and Streets* (2004), assuming a superelevation of –2.0 percent reflecting typical cross slope. Depending on design vehicle, horizontal curves may require lane widening to accommodate large vehicle off–tracking. See AASHTO's section on "Traveled Way Widening on Horizontal Curves" for guidance.
9. See also Chapter 9 for additional detail on medians. For curb to curb intersection crossing distances of 60 ft. or more, medians should be at least 6 ft. wide to serve as a pedestrian refuge, otherwise the median should be at least 4 ft. wide. Where left turn lanes are to be provided, median widths should be increased by the width of the turn lane(s). Where left turn lanes are not needed (e.g., long blocks) median widths may be as little as 4 ft.
10. Access management involves providing (i.e., managing) access to land development in such a way as to preserve safety and reasonable traffic flow on public streets. Low, moderate and high designations are used for the level of access restrictions. A high level of access management uses medians to restrict mid–block turns, consolidate driveways and control the spacing of intersections. A low level of access management limits full access at some intersections, but generally uses minimal measures to restrict access.
11. These ranges of typical traffic volumes are intended to help determine the characteristics of thoroughfares. Volumes can fluctuate widely on all thoroughfare types. These ranges are not intended to establish guidelines or upper bounds for designing thoroughfares.
12. Double–lane roundabouts are not recommended in urban areas with high levels of pedestrians and bicyclists.

Table 9.4 Recommended Practice for Midblock Crossings

General
The decision to locate a midblock crosswalk will be based on numerous factors. Generally, however, consider providing a marked midblock crossing when protected intersection crossings are spaced greater than 400 feet or so that crosswalks are located no greater than 200 to 300 feet apart in high pedestrian volume locations, and meet the criteria below.
Midblock crossings may be considered when there is significant pedestrian demand to cross a street between intersections, such as connecting to major generators or transit stops.
Midblock crosswalks should be located at least 100 feet from the nearest side street or driveway so that drivers turning onto the major street have a chance to notice pedestrians and properly yield to pedestrians who are crossing the street.
Criteria
Streets with an average daily traffic volume (ADT) of 12,000 vehicles per day or less.
Multilane streets carrying less than 15,000 ADT if a raised pedestrian refuge median is provided.
Operating speeds less than 40 mph.
A minimum pedestrian crossing volume of 25 pedestrians per hour for at least four hours of a typical day.
Adequate sight distance is available for pedestrians and motorists.
Recommendations
Conform to PROWAG guidelines for the disabled and visually impaired.
Unsignalized midblock crosswalks should not be provided on streets where traffic volumes do not have gaps in the traffic stream long enough for a pedestrian to walk to the other side or to a median refuge. At locations with inadequate gaps that also meet MUTCD signalization warrants, consider a signalized midblock crossing.
Consider a signalized midblock crosswalk (including locator tone and audio pedestrian signal output as well as visual pedestrian countdown signal heads) where pedestrians must wait more than an average of 60 seconds for an appropriate gap in the traffic stream. When average wait times exceed 60 seconds, pedestrians tend to become impatient and cross during inadequate gaps in traffic. If this initial threshold is met, check pedestrian signal warrants in the MUTCD.
Provide overhead safety lighting on the approach sides of both ends of midblock crosswalks.
Provide wheelchair ramps or at-grade channels at midblock crosswalks with curbs and medians.
Provide raised median pedestrian refuge at midblock crossings where the total crossing width is greater than 60 feet, and on any unsignalized multi-lane thoroughfare crossing.
Use high-visibility (ladder-style) crosswalk markings to increase visibility longitudinally.
Provide advance stop or yield lines to reduce multiple-threat crashes.
Provide advance crosswalk warning signs for vehicle traffic.
Provide curb extensions at midblock crosswalks with illumination and signing to increase pedestrian and driver visibility.
"Z" crossing configurations should be used for midblock crossings with medians wherever possible (see **Figure 9.16**). Provide an at-grade channel in median at a 45-degree angle toward advancing traffic to encourage pedestrians to look for oncoming traffic.
Other Considerations
A strategy to calm traffic speeds in advance of and at a midblock crossing is to raise the pavement to meet the sidewalk elevation by use of gentle ramps (see **Figure 9.17**). Consider use of overhead flashing beacons.

Sources:
Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations, FHWA, 2002
Manual on Uniform Traffic Control Devices, FHWA, 2009 Edition
Guide for the Planning, Design and Operation of Pedestrian Facilities, AASHTO, 2004

Table 10.1 Pedestrian and Bicycle Features at Signalized Intersections

Shorter and more visible crosswalks	• Crosswalks on all approaches; • Longitudinal markings (possible use of colored and/or textured paving); • Reduced overall street widths by reducing the number of travel and turn lanes, or narrowing travel lanes; • Curb extensions with pedestrian push buttons on extensions; and • Median refuges on wide streets (greater than 60 feet) with median push buttons.

Priority for pedestrians, bicyclists, and accessibility	• Shorter cycle lengths, meeting minimum pedestrian clearances (also improves transit travel times);
	• Longer pedestrian clearance times (based on 3.5 feet/sec. to set flashing (clearance) time and 3.0 feet/sec for total crossing time);
	• Reduced conflicts between pedestrians and turning vehicles achieved with:
	  • Pedestrian lead phases;
	  • Scramble phases in very high pedestrian volume locations;
	  • Restricted right turns on red when pedestrians are present during specified hours; and
	  • Allowing right turns during cross-street left turn phases reduces the number of right turn conflicts during pedestrian crossing phase.

Low speed channelized right turn lanes	• Adequate sized islands for pedestrian refuge; • Raised pedestrian crossing/speed table within channelized right turn lane; and • Signal control of channelized right turn in high pedestrian volume locations.
Improved pedestrian information	• Pedestrian countdown timers; and • "Look Before Crossing" markings or signs.
Bicycle features	• Bicycle lanes striped up to crosswalk (using "skip lines" if vehicular right turns are allowed); • Bicycle detectors on high volume routes, or bicyclist-accessible push buttons; • Adequate clearance interval for bicyclists; • Colored paving in bicycle/vehicle lanes in high-conflict areas; and • "Bike Boxes" (painted rectangle along right hand curb or behind crosswalk) to indicate potential high-conflict area between bicycles continuing through an intersection and right turning vehicles, and to allow bicyclists to proceed through intersection or turn in advance of vehicles.
High-priority transit thoroughfare elements	• Adaptive Transit Signal Priority (TSP) when transit detected: • Extended green phase on bus route (rapid transit signal priority); • Truncated green phase for cross street; • Re-order phasing to provide transit priority (transit priority not to be given in two successive cycles to avoid severe traffic impacts); • Other bus priority signal phasing (sequencing) • Queue jump lanes and associated signal phasing; and • Curb extension bus stops, bus bulbs.

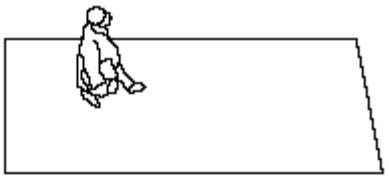
Accessibility and space for pedestrians	• Properly placed pedestrian actuation buttons, with audible locator tones;
	• Detectable warnings;
	• Two curb ramps per corner depending on radius of curb return and presence of curb extensions;
	• Clear pedestrian paths (and shoulder clearances) ensuring utilities and appurtenances are located outside pedestrian paths;
	• Vertical and overhang clearance of street furnishings for the visually impaired;
	• Properly placed signal poles and cabinets:
	  • Behind sidewalks (in landscaping or in building niches);
	  • In planting strips (furnishings zone); and
	  • In sidewalk or curb extensions, at least three feet from curb ramps.

Traffic operations for safe speeds and pedestrian convenience	• Target speeds between 25–35 mph; • Signal progression at target speeds; and • Fewer very long/very short cycle lengths.
Higher priority on aesthetics	• Textured and colored material within the streetside; • Colored material within crosswalks, but avoid coarse textures which provide rough surfaces for the disabled; • Attractive decorative signal hardware, or specialized hardware; and • Attention to landscaping and integration with green street stormwater management techniques.

Exhibit 18-3 Pedestrian Level-of-Service

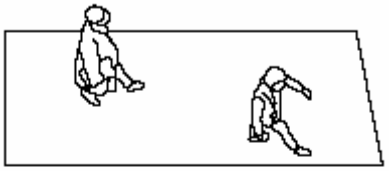
LOS A
Pedestrian Space >5.6 m^2/p *Flow Rate* ≤16 p/min/m

At a walkway 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 unlikely.



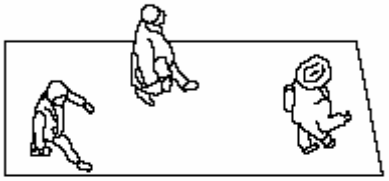
LOS B
Pedestrian Space >3.7-5.6 m^2/p *Flow Rate* >16-23 p/min/m

At 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 begin to be aware of other pedestrians, and to respond to their presence when selecting a walking path.



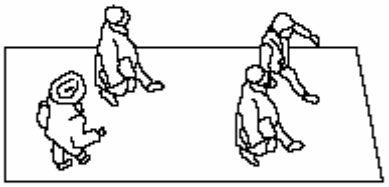
LOS C
Pedestrian Space >2.2-3.7 m^2/p *Flow Rate* >23-33 p/min/m

At 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 somewhat lower.



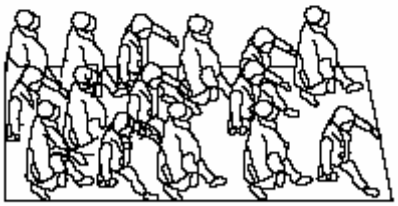
LOS D
Pedestrian Space >1.1-2.2 m^2/p *Flow Rate* >33-49 p/min/m

At LOS D, freedom to select individual walking speed and to bypass other pedestrians is restricted. Crossing or reverse-flow movements face a high probability of conflict, requiring frequent changes in speed and positions. The LOS provides reasonably fluid flow, but friction and interaction between pedestrians is likely.



LOS E
Pedestrian Space > 0.75-1.4 m^2/p *Flow Rate* >49-75 p/min/m

At LOS E, virtually all pedestrians restrict their normal walking speed, frequently adjusting their gait. At the lower range, forward movement is possible only by shuffling. Space is not sufficient for passing slower pedestrians. Cross- or reverse-flow movements are possible only with extreme difficulties. Design volumes approach the limit of walkway capacity, with stoppages and interruptions to flow.



LOS F
Pedestrian Space ≤0.75 m^2/p *Flow Rate* varies p/min/m

At 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 virtually impossible. Flow is sporadic and unstable. Space is more characteristic of queued pedestrians than of moving pedestrian streams.

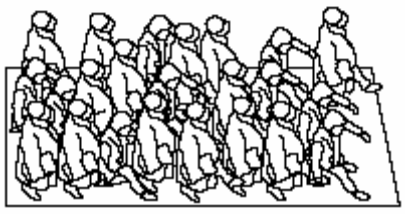


Exhibit 18-4 Guidelines for Locating Sidewalks in Developed Areas

Type of Area (land use, roadway functional classification, or density of dwelling units)	Providing Sidewalks on New Streets	Providing Sidewalks on Existing Streets
Commercial, Industrial, and public service (all streets)	Developed sides of these streets	Developed sides of these streets
Residential (along major and minor arterials)	Developed sides of these streets	Developed sides of these streets
Residential (along collectors)	Developed sides of these streets.	Developed sides of these streets.
Residential – neighborhood streets with detached residences less than 30 m apart	Developed sides of these streets	Preferred on both developed sides to prevent unnecessary crossings. If that is not feasible, sidewalks may be built only along one side of the roadway. The sidewalk should be built along the area with more pedestrian generators and destinations.
Residential – neighborhood streets with detached residences an average of 30 m to 60 m apart	Desirable on both developed sides to prevent unnecessary crossings, but needed on at least one side if vehicle traffic exceeds 400 vehicles/day. The sidewalk should be built along the area with more pedestrian generators and destinations.	Desirable on both developed sides to prevent unnecessary crossings, but needed on at least one side if vehicle traffic will exceed 400 vehicles/day. The sidewalk should be built along the area with more pedestrian generators and destinations.
Residential – local roadways with residences further than 60 m apart (see note 4.)	Needed on one side of these roadways when vehicle traffic will exceed 400 vehicles/day. The sidewalk should be built along the side with more pedestrian generators and destinations.	Needed on one side of these roadways if vehicle traffic exceeds 400 vehicles/day. The sidewalk should be built along the side with more pedestrian generators and destinations.

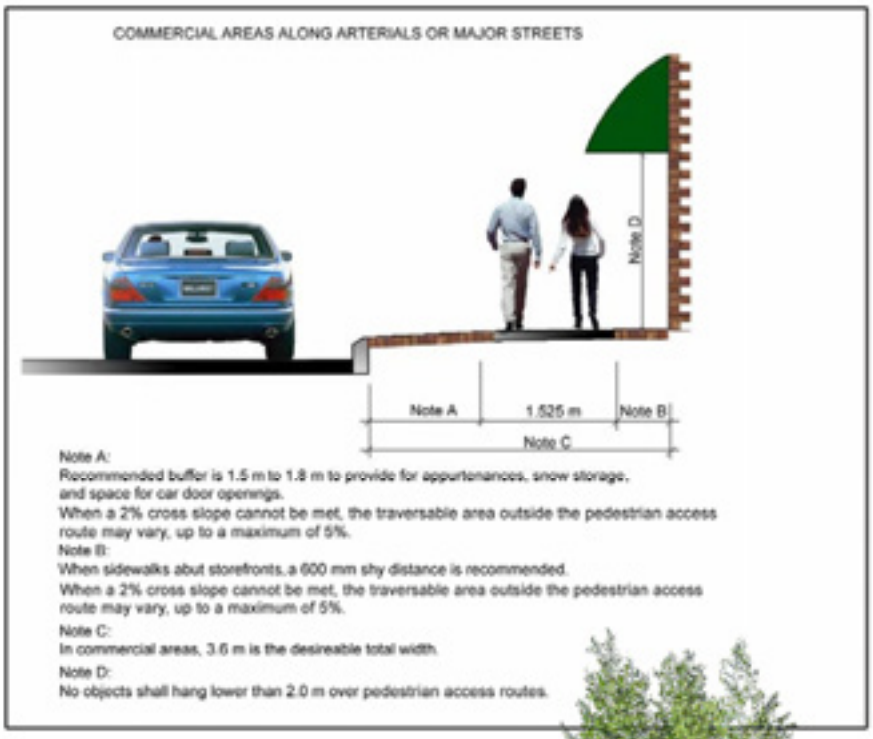
1. Sidewalks frequently extend from the building face to the curb in heavily developed urban areas where structures are continuous and attached. Where sidewalks will be replaced or reconstructed in such areas, designers should pay attention to doorway and basement entrances, stairs, roof drains, utilities, trees, street furniture, snow storage space, etc. Clearance next to the face of buildings is generally recommended to be 0.5 m. ADAAG and the regional landscape architectural staff should be consulted early in the project design. Detailed grading plans with spot elevations and slopes may be useful in areas with limited space and building entrances.

2. Identifying nearby land use, such as schools, parks, shopping centers, and other commercial properties and their associated pedestrian traffic, will help determine whether sidewalks are needed on both sides of the street. See discussion on Pedestrian Generator Checklist Section 18.5.1 and Pedestrian Traffic Forecasting Section 18.5.3.

3. Sidewalks should be provided along both sides of roads, streets, and arterials where pedestrian access is needed or desired to schools, universities, office complexes, commercial establishments, post offices, transportation terminals and transit stops. The designer should discuss this with the regional landscape architectural staff or the Regional Bicycle Pedestrian Coordinator to determine the best sidewalk placement.

4. Professional judgment must be used to determine appropriate locations to begin and/or end sidewalks as development becomes less dense. Sidewalks should have logical termini.

Exhibit 18-9 Sidewalk Placement within the Right of Way



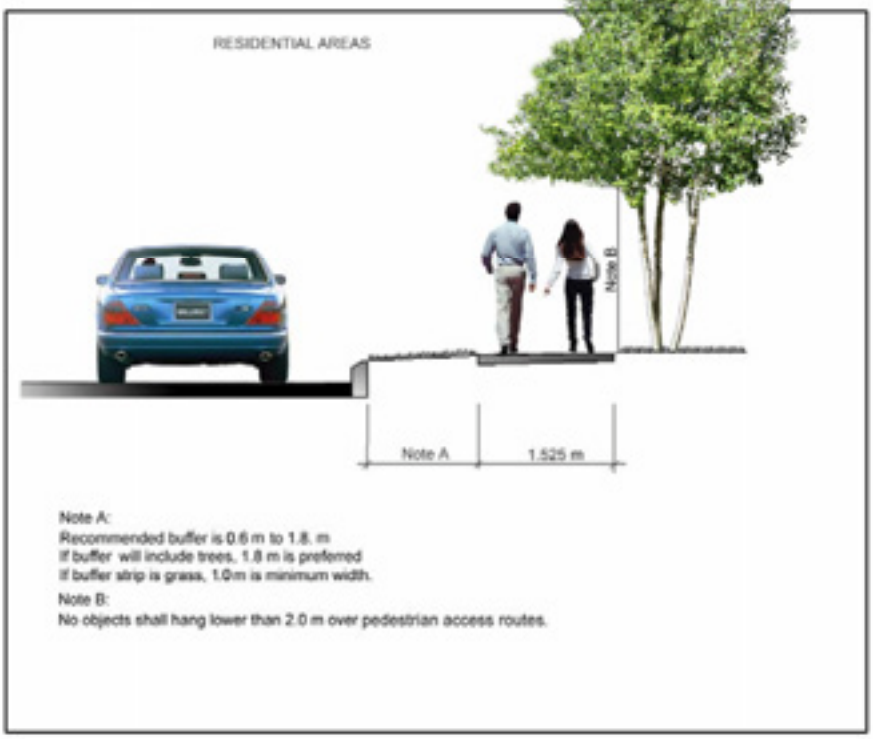


Exhibit 18-20 Recommendations for Installing Marked Crosswalks and Other Needed Pedestrian Improvements at Uncontrolled Locations *

No. of Lanes and Median Type	Vehicle AADT < 9,000			Vehicle AADT > 9,000 to 12,000			Vehicle AADT > 12,000 to 15,000			Vehicle AADT > 15,000		
	Speed Limit**											
	<50 km/h	57 km/h	65 km/h	<50 km/h	57 km/h	65 km/h	<50 km/h	57 km/h	65 km/h	<50 km/h	57 km/h	65 km/h
2 Lanes	C	C	P	C	C	P	C	C	N	C	P	N
3 Lanes	C	C	P	C	P	P	P	P	N	P	N	N
4 or more Lanes With Raised Median	C	C	P	C	P	N	P	P	N	N	N	N
4 or More Lanes Without Raised Median	C	P	N	P	P	N	N	N	N	N	N	N

Source: *Safety Effects of Marked Vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines*, Federal Highway Administration.

C = Candidate sites for marked crosswalks. Before installing new marked crosswalks, an engineering study is needed to determine whether the location is suitable for a marked crosswalk. For an engineering study, a site review may be sufficient at some locations, while a more in-depth study of pedestrian volume, walking speed, vehicle speed, sight distance, vehicle mix, etc., may be needed at other sites. It is recommended that a minimum of 20 pedestrian crossings per peak hour (or 15 or more disabled, elderly, or child pedestrians) exist at a location before placing a high priority on the installation of a marked crosswalk alone.

P = Possible increase in pedestrian crash risk may occur if crosswalks are added without adequate design features and/or traffic control devices. These locations should be closely monitored and enhanced with other pedestrian crossing improvements, if necessary, before adding a marked crosswalk.

N = Marked crosswalks alone are insufficient, since pedestrian crash risk may be increased due to providing marked crosswalks alone. Consider using other treatments where warranted, such as traffic calming treatments, pedestrian signals, various signal phasing and progressions to improve pedestrian safety, ITS and accessible signals, and other substantial improvements to provide safe pedestrian crossing.

- These guidelines include intersection and midblock locations with no traffic signals, stop signs or any warning/regulatory signing on the approach to the crossing. They do not apply to school crossings. A two-way center turn lane is not considered a median

** Where the speed limit exceeds 65 km/h, marked crosswalks alone should not be used at unsignalized locations.

Table 1. Recommended Guidelines for New Sidewalk/Walkway Installation.

Roadway Classification and Land Use	Sidewalk/Walkway	Future Phasing Requirements
Rural Highways (< 400 ADT)	Shoulders preferred, with minimum of 0.9 m (3 ft).	Secure/preserve right-of-way (ROW) for future sidewalks.
Rural Highways (400 to 2,000 ADT)	1.5-m (5-ft) shoulders preferred, minimum of 1.2 m (4 ft) required.	Secure/preserve ROW for future sidewalks.
Rural/Suburban Highway (ADT > 2,000 and less than 1 dwelling unit (d.u.) / .4 hectares (ha) [1 d.u. / acre])	Sidewalks or side paths preferred. Minimum of 1.8-m (6-ft) shoulders required.	Secure/preserve ROW for future sidewalks.
Suburban Highway (1 to 4 d.u. / .4 ha [1 to 4 d.u. / acre])	Sidewalks on both sides required.	
Major Arterial (residential)	Sidewalks on both sides required.	
Urban Collector and Minor Arterial (residential)	Sidewalks on both sides required.	
Urban Local Street (residential – less than 1 d.u. / .4 ha [1 d.u. / acre])	Sidewalks on both sides preferred. Minimum of 1.5-m (5-ft) shoulders required.	Secure/preserve ROW for future sidewalks.
Urban Local Street (residential – 1 to 4 d.u. / .4 ha [1 to 4 d.u. / acre])	Both sides preferred.	Second side required if density becomes greater than 4 d.u. / 4 ha (4 d.u. / acre) or if schools, bus stops, etc. are added.
Local Street (residential – more than 4 d.u. / .4 ha [4 d.u. / acre])	Sidewalks on both sides required.	
All Commerical Urban Streets	Sidewalks on both sides required.	
All Streets in Industrial Areas	Sidewalks on both sides preferred. Minimum of 1.5-m (5-ft) shoulders required.	

1 acre=0.4 hectares (ha)

Land-Use/Roadway Functional Classification/ and Dwelling Unit	New Urban and Suburban Streets	Existing Urban and Suburban Streets
Commercial and Industrial (All Streets)	Both sides.	Both sides. Every effort should be made to add sidewalks where they do not exist and complete missing links.
Residential (Major Arterials)	Both sides.	Both sides.
Residential (Collectors)	Both sides.	Multifamily—both sides.
		Single family dwellings—prefer both sides; require at least one side.
Residential (Local Streets) More than 4 Units Per Acre	Both sides.	Prefer both sides; require at least one side.
1 to 4 Units per Acre	Prefer both sides; require at least one side.	At least 4-feet shoulder on both sides required.
Less than 1 Unit per Acre	One side preferred; shoulder on both sides required.	One side preferred, at least 4-feet shoulder on both sides required.

NOTES:

1) Any local street within two blocks of a school site that would be on a walking route to school—sidewalk and curb and gutter required.

2) Sidewalks may be omitted on one side of a new street where that side clearly cannot be developed and where there are no existing or anticipated uses that would generate pedestrian trips on that side.

3) Where there are service roads, the sidewalk adjacent to the main road may be eliminated and replaced by a sidewalk adjacent to the service road on the side away from the main road.

4) For rural roads not likely to serve development, a shoulder at least 4 feet in width, preferably 8 feet on primary highways, should be provided. Surface material should provide a stable, mud-free walking surface.

FIGURE 3–4. Guidelines for Installing Sidewalks