CHAPTER 4: WALKWAYS

TYPES OF WALKWAYS

Pedestrian facilities include sidewalks, traffic signals, crosswalks, refuge islands, pedestrian-scale illumination and benches. Walkways include:

- SIDEWALKS, located along roadways, separated with a curb and/or planting strip or swale, have a hard, smooth surface. Sidewalks in residential areas are sometimes used by bicyclists, but cities may ban bicycle riding on sidewalks.
- PATHS, typically used by pedestrians, cyclists, skaters and joggers (shared-use). It is not realistic to plan and design a path for exclusive pedestrian use, as others will be attracted to the facility. Paths may be unpaved (packed gravel), if they are smooth and firm enough to meet ADA requirements. See chapter 7 for path design guidelines.
- SHOULDERS, which serve pedestrians in many rural areas. The ODOT-recommended shoulder widths are usually adequate to accommodate pedestrians. In rural/residential areas where population densities are too low to justify sidewalks, shoulders should be wide enough (6 feet) to accommodate pedestrian and bicycle traffic. See shoulder width table in Chapter 1 for shoulder width guidelines.

STANDARDS

SIDEWALKS

The Sidewalk Zone System

The best way to achieve the goal of a clear walking area is to design sidewalks using the zone system. Each zone is a distinct sidewalk area; the 4 zones are

1. The curb zone
2. The furniture (or planter) zone
3. The pedestrian (or walking) zone
4. The frontage zone.

Each zone has its function, and omitting a zone compromises the quality of the walking experience. The zone system makes it easier to meet the basic ADA requirements for a continuous, smooth and level sidewalk free of obstructions: it's easier to keep the sidewalk level across driveways, and it's easier to place ramps correctly, and all potential obstructions (poles, signs, trees, drinking fountains, benches etc.) can be placed in the furniture or frontage zones. Separation from the roadway also places pedestrians further from traffic, increasing comfort and security

<u>The Curb Zone</u>:

Most urban streets with sidewalks are typically curbed. A vertical (barrier) curb channelizes drainage and prevents people from parking their cars on the sidewalk. Mountable curbs are not recommended on urban streets, as they make it easier for drivers to park on the sidewalk. The curb zone is also where a sidewalk transitions to the street at a crosswalk or intersection; the design of the gutter pan (apron) is critical for ADA access standards.

<u>The Furniture Zone/Planter Strip:</u>

The furniture zone is located between the curb and pedestrian zones. When landscaped it is referred to as the planter strip. It's easier to meet ADA sidewalk requirements with separated sidewalks. The furniture zone has many functions:

- Pedestrians are separated from traffic, increasing a walker's sense of security and comfort;

- Street furniture and obstructions (bicycle parking, poles, posts, mailboxes, parking meters, fire hydrants etc) can be placed out of the walking zone (these objects should not reduce visibility of pedestrians, bicyclists and signs);
- Room for street trees and other landscaping (plants should be selected that require little maintenance and watering; roots should not buckle sidewalks);
- The sidewalk can stay level across driveways;
- Ramps can be placed correctly: sidewalks, curb cuts and crosswalks line up at intersections.
- Improved drainage: decreased runoff water, decreasing overall drainage requirements; prevents water in puddles from splashing onto pedestrians; creates a place to store snow removal during the winter

The furniture zone/planter strip should be 5' wide or more. Narrower furniture zones (2' min) offer some of the advantages listed above. Where constraints preclude the use of the same width throughout a project, the planter strip can be interrupted and resumed where the constraint ends.

<u>The Pedestrian Zone:</u>

This is where people walk. All planning, design and construction documents should clearly state the walking zone dimension is to be clear of obstructions. The ODOT standard pedestrian zone width is 6'. This width allows two people (including wheelchair users) to walk side by side, or to pass each other comfortably. It also allows two pedestrians to pass a third person without leaving the sidewalk. Where it can be justified and deemed appropriate, the minimum width may be 5 feet, such as on local streets, with adequate separation from the roadway. Clearance to vertical obstructions (signs, tree limbs, etc.) must be at least 7 ft. At no point should the pedestrian zone be less than 4 feet wide at pinch points such as around poles.

The pedestrian zone should be straight, or parallel to the adjacent road when the road naturally curves. Attempts to create meandering sidewalks usually fail because they do not serve the needs of pedestrians, who want to walk in the most direct route possible. The only exceptions should be when a sidewalk is substantially separated from a roadway, and the natural contours of the pedestrian zone are different from the alignment of the roadway, or to avoid large obstacles such as mature trees.

Cars parked perpendicular or diagonally to sidewalks can reduce the sidewalk width if there is excessive overhang. Wheel stops should be used to prevent narrowing the usable sidewalk width.

Sidewalks must not be placed directly adjacent to a high-speed travel lane (45 MPH and above); they should be buffered with a planting strip, a parking lane or a bike lane. In the absence of any separation, sidewalks next to high-speed roadways should be at least 8' wide, as the outer two feet are used for poles, sign posts etc. This results in an effective 6' wide walking space.

Greater sidewalk widths are needed in high pedestrian use areas, such as central business districts, where 10 feet is considered necessary, as the sidewalks are often also used for sidewalk cafes, street furniture etc. 12', 14' sidewalks or greater are common in Central Business Districts.

The surface should be smooth and uniform. When a sidewalk is paved out to the curb, it is beneficial to make a surface distinction between the walking area and the buffer strip; this helps ensure obstacles are placed out of the walking area.

<u>The Frontage Zone:</u>

The frontage zone is located between the pedestrian zone and the right-of-way. It is where sandwich boards, bike racks and other street furniture are placed; it is used by window shoppers, it's where people enter and exit buildings.

The recommended width is 2 feet or greater. An absolute minimum of 1 foot is needed for practical purposes, for example to ensure that adjacent property owners don't erect a fence at the back of walk, or for maintenance personnel to make sidewalk repairs. A 2-foot shy distance is needed from vertical barriers such as buildings, sound walls, retaining walls and fences.

In Central Business Districts the frontage zone should be 4 feet or wider to provide space for sandwich boards, sidewalk cafés, and opening doors.

Note: ADA requires that "objects protruding from walls (e.g. signs, fixtures, telephones, canopies) with their leading edge between 27" and 80" above the finished sidewalk shall protrude no more than 4" into any portion of the public sidewalk." (ADAAG 14.2.2)

Sidewalks without Curb & Gutter

Most sidewalks are separated from the roadway with curbs, which channelize drainage and provide positive separation from traffic. But curb and gutter can add substantially to sidewalk costs. Where sidewalks are needed, but the high cost of curb and drainage cannot be justified, or where curbs don't fit the character of the street, sidewalks may be constructed without curb and drainage.

Sidewalks behind the ditch

On roads with a rural character, where drainage is provided with an open ditch, and where there is sufficient room, sidewalks may be placed behind the ditch.

The sidewalk should be built to the same width as curbed sidewalks: 6 feet (5 feet min). Gravel driveways should be paved back 15 feet to avoid debris accumulation on the sidewalks.

Bridges

Sidewalks should always be provided on both sides of bridges where pedestrian use can be expected. The minimum width for sidewalks on bridges is 7 feet, to account for two shy distances: from traffic, and from the bridge rail, as some people feel uncomfortable walking close to a high vertical drop. Wider sidewalks should be considered in urban settings with high pedestrian use. The bridge sidewalk must not be narrower than the approach sidewalk. Sidewalks on bridges with design speeds greater than 40 MPH require a vehicle barrier at curb line.

Surfacing

The preferred material for sidewalks is Portland Cement Concrete (PCC), which provides a smooth, durable finish that is easy to grade. Asphaltic Concrete (A/C) may be used if it can be finished to the same surface smoothness as PCC. A/C is susceptible to breakup by vegetation and has a shorter life expectancy than PCC.

Brick pavers can provide an aesthetically pleasing effect if the following concerns are addressed:

- They should be laid to a great degree of smoothness;
- They should not have beveled edges;
- The surface must be slip-resistant when wet; and
- Long-term maintenance costs should be considered.

Ornamental landscape pavers (often beveled or “pillowed”) should not be used as the primary walking surface; they can be used for aesthetics in the furniture and frontage zones. More pleasant sidewalks can also be achieved by treating concrete with dyes and/or scoring to meet aesthetics, practicality and durability goals.

Pervious sidewalk surfaces

The concern over adding more impervious surfaces has led to the creation of a variety of permeable surface materials: pervious concrete and asphalt, pavers, and other innovative designs. The sidewalks are usually separated from the roadway with a bio-swale. This technology is evolving, and long-term maintenance is a concern. If used, pervious sidewalks surfaces must still meet smoothness standards: no more than ¼" height difference (ADA).

Sidewalks built out of conventional impervious materials (concrete) contribute little to runoff if they are separted form the roadway with a planter strip: most of the precipitation that lands on the sidewalk can be absorbed by the native soil in the planter strip.

Railroad Crossings

Sidewalks crossing a railroad are not controlled by the warning gates/arms; they cross behind the gate/arm. The sidewalk width across the tracks should be same width as approaching sidewalk, or wider.

OAR 741-120-0025 (3) states: "At crossings equipped with automatic protective devices, sidewalks shall be directed behind the devices at a distance of not less than 5 feet, as measured from the centerline of the signal mast to the nearest edge of the sidewalk." Sidewalks at crossings equipped with automatic protective devices should be constructed as close to the roadway as possible so that users receive visual and auditory warnings of approaching trains. To this end, the far edge of the sidewalk should be no more than 10-12 feet from the centerline of the signal mast.

There is no mandate for sidewalks to cross tracks at 90º. When a sidewalk crosses tracks at a skew, it's usually possible for people in wheelchairs to align themselves at a right angle within the width of a 6-foot sidewalk, even in most cases within a 5-foot sidewalk. Some people prefer to cross at a slight angle, so both casters don't hit the tracks at the same time. For this reason, the best practice is to widen the sidewalk at the grade crossing to allow the 4-foot square footprint of a wheelchair to align itself to cross tracks safely, regardless of the skew angle at the crossing. Curving the entire sidewalk to cross tracks at 90º is usually unnecessary.

Detectable warnings must be placed at the sidewalk/track interface, to alert pedestrian with vision impairments of the presence of tracks.

PATHS

UNPAVED PATHS

In general, the standard width of an unpaved path is the same as for sidewalks. An unpaved path should not be constructed where a sidewalk is more appropriate.

The surface material should be packed hard enough to be usable by wheelchairs, strollers and children on bicycles (the roadway should be designed to accommodate more experienced bicyclists). Recycled pavement grindings provide a suitable material: they are usually inexpensive and easy to grade (this should be done in the summer, when the heat helps pack and bind the grindings).

PAVED PATHS

See Chapter 7 for standards for shared-use paths.

TRANSIT STOP CONNECTIONS

Transit depends on walking to function well; most transit users walk to and from transit stops. The pedestrian system supports transit by providing walkways to bring people to and from transit stops, and by providing safe and convenient crossings at transit stops. Since there is an element of risk in crossing busy streets, safety improvements must be made at transit stops.

The safety of pedestrians can also be enhanced using a variety of transit operation improvements, usually implemented by the transit agency, in cooperation with the road authority: consolidate, relocate or eliminate stops. Convenient access by passengers must remain at the forefront of all transit stop planning: simply eliminating stops because they are perceived as unsafe will not be satisfactory to riders who cannot walk very far. Best is to make access and crossing improvements at existing stops that serve passengers well, or relocating them to a safer and more accessible location within a reasonable walk.

Sidewalks

At transit stops, sidewalks or paths should be constructed to the nearest intersection or to the nearest section of existing sidewalk. It might also be necessary to wrap a sidewalk around a corner to join an existing sidewalk on a side street. If a transit route does not have complete sidewalks, it is still important to provide a suitable area for people waiting for a bus.

ADA requires an 8-foot by 5-foot landing pad at bus doors. To avoid the choppy effect this creates at bus stops on curbside sidewalks less than 8 feet wide, it is preferable to construct a continuous 8-foot wide sidewalk the length of the bus stop. The wider sidewalk allows passing pedestrians to get by people waiting for a bus.

At stops in uncurbed areas, the shoulder should be 8 feet wide to provide a landing pad.

Bus Shelters

A standard-size bus shelter requires a 6’ x 10’ pad, with the shelter offset at least 4 feet from the curb. The adjacent sidewalk must still have a 4’ clear-zone (6 feet preferred) behind or in front of the shelter. Orientation of the shelter should take into account prevailing winter winds. Bike racks should be considered at bus stops in urban fringe areas.

These goals are easier to meet with separated sidewalks, as the shelter and bike racks can be placed in the furniture zone.

Each transit agency may have its own standards for bus shelter pads; walkway construction should be coordinated with local transit agencies to ensure compatibility.

Bus Pullouts

Where high motor traffic volumes warrant a bus pullout at an intersection, a far-side location is preferred. The needs of passengers boarding or exiting a bus should not conflict with the needs of pedestrians and bicyclists moving through the area. The curb at the corner should not be recessed, as this creates the illusion of an acceleration lane for right-tuning motorists. Placing a curb extension at the corner in line with the rest of the curb helps pedestrian crossing movements, prevents motorists from entering the bus pullout area and reduces conflicts with through bicyclists.

Each pullout should be designed to meet roadway conditions and bus characteristics. The bus pad should be constructed with concrete pavement to avoid heaving, as buses slow to a stop in the pullout.

Bus curb extensions

On streets with parking, bus stops benefit from curb extensions, so passengers can board or dismount the bus directly without stepping onto the street. This also makes it easier for passengers with disabilities to board the bus, as it pulls up right next to the curb). The curb extension can be used to place a bus shelter. Curb extensions require a bus to stop in the travel lane; the added delay to motorists is offset by reduced delay to transit users:

1. Shorter dwell time (passengers can board the bus faster) and
2. The bus's ability to accelerate immediately, without waiting to merge back into traffic.

These two advantages are substantial improvements to transit operations.
For a more thorough discussion of designing for transit, please consult the Highway Design Manual, Chapter 12.

Transit Stop Crossings

Chapter 5 & 6 discuss street crossings and intersection design; all of the techniques described there can be used to help people cross the street safely and conveniently when accessing or leaving a bus stop. The safety of pedestrians crossing streets to access transit can also be enhanced by using a variety of transit operation improvements. These are usually implemented by the transit agency in cooperation with the road authority, and include consolidating, relocating and eliminating stops.

When a transit stop is located midblock, a single crossing should be provided to serve both directions of bus travel; if a crosswalk is marked, it should be behind the bus stop:

- Pedestrians cross behind the bus, where they can see traffic (crossing in front of a bus blocks visibility);
- The bus driver can accelerate as soon as passengers have left the bus;
- The driver won't accidentally hit a pedestrian crossing in front of the bus.

For a variety of operational reasons, at intersections, farside stops are usually preferred. One advantage is that pedestrians cross in back of the bus. However, transit operators often must place stops nearside, for reasons such as a concentration of users at a nearside corner, or because the bus route makes a right turn at that intersection. In all cases the safety and convenience of pedestrians must be a high priority.

ACCOMMODATING PEOPLE WITH DISABILITIES

The Americans with Disabilities Act (ADA) requires that transportation facilities accommodate the disabled. For most practical purposes, pedestrians with mobility- and vision-impairments need greater attention. The essential ADA requirement is to create a pedestrian access route to link community destinations. Within the public right-of-way, sidewalks are considered the pedestrian access route, as well as crosswalks, pedestrian refuge islands, traffic signals and other pedestrian features. ODOT sidewalk standards meet or exceed minimum ADA requirements. Some minor improvements can greatly improve accessibility.

Note: at the time of publication, the Access Board has not finalized the new Americans with Disabilities Act Accessibility Guidelines for the Public Right-of-Way. The following general requirements are not discussed in detail; ADAAG and ODOT Standard Drawings should be used to construct curb cuts, driveways, accessible signals and other facilities designed for pedestrians with disabilities.

The US Access Board website has the latest guidelines:

http://www.access-board.gov/prowac/draft.htm

The Oregon DOT Bicycle and Pedestrian program website has links to the Oregon standard drawings:

http://www.oregon.gov/ODOT/HWY/BIKEPED/

The purpose of this section of the plan is to provide general guidance; please refer to the standard drawings for construction details.

It is much easier to meet the ADA requirements with separated sidewalks for several reasons:

- Obstacles such as poles can be placed in the furniture zone/planter strip;
- Driveway aprons and curb ramps can be placed in the furniture zone/planter strip, leaving the sidewalk level;
- Sidewalks, curb cuts and crosswalks line up better at intersections.

These and others are reasons why separated sidewalks should always be the design of choice.

WIDTH

The 6-foot standard sidewalk width exceeds the ADA minimum passage requirements. These are applicable at pinch points, such as at poles or other obstructions in a sidewalk. The ADA minimum clearance width is not an acceptable continuous sidewalk width.

GRADES

Grade standards pertain mostly to separated paths on independent alignments and ramps. Where sidewalks are directly adjacent to a roadway, they may follow the grade of the roadway.

ADA requires that the grade of ramps and separated pathways not exceed 5%. A maximum grade of 12:1 (8.33%) is acceptable for a rise of no more than 2.5 feet if a 5 foot long level landing is provided after each 2.5-foot rise.

While this may be suitable for short distances, such as a ramp to the entrance of a building, a 12:1 slope followed by a level landing over a long distance creates a choppy effect that is difficult to construct. The overall grade achieved by a configuration of three consecutive rises of 2.5 ft with 5 ft landings in between and at each end is 7.1%. It may be preferable to extend the length of the facility to achieve a constant 5% grade.

CROSS-SLOPE

The maximum allowable cross-slope (needed for drainage) for the pedestrian access route portion of a walkway is 2%. Across driveways, curb cuts and road approaches (in crosswalks, marked or unmarked), a 4-foot minimum wide area must be maintained at 2%.

The most frequent interruptions to the pedestrian access route from a cross-slope perspective are at driveways. To facilitate wheelchair movement at driveways, the following techniques prevent an exaggerated warp and cross-slope:

- Planter strips allow sidewalks to remain level, with the driveway grade change occurring in the planting strip.
- Reducing the number of accesses reduces the need for special provisions.

Where constraints don't allow a planter strip, wrapping the sidewalk around driveway entrances has a similar effect.

Wide sidewalks have enough room to avoid excessively steep driveway slopes; the overall width must be sufficient to avoid an abrupt driveway slope.

When constraints allow for only minimal sidewalks behind the curb, dipping the entire sidewalk at approaches keeps the cross-slope at a constant grade. This requires pedestrians to go up and down at every driveway and may create drainage problems on and behind the sidewalk.

The other instance where cross-slope can be a concern is on older sidewalks adjacent to buildings. It's not uncommon for the street, the sidewalks and the buildings to have settled over time, and at different rates. The sidewalk cross-slope often greatly exceeds 2% in these circumstances. The mitigation measures need only apply to the pedestrian zone portion of the sidewalk, not the furniture or frontage zones; these two zones can be used to make up for the excessive cross-slope.

RAMPS

ADA recommends two ramps per corner at intersections for new construction, as a single diagonal ramp may direct users into the travel way. A single ramp is allowable on retrofit projects where circumstances prohibit the installation of two ramps; however, in most cases two ramps can and should be accommodated even on retrofit projects. A 4-foot wide passage with a cross slope of 2% must be maintained behind ramps.

The ramp shown in fig 25 works in wide sidewalks; there are many situations in which this design will not work, particularly for narrow curbside sidewalks. The following ramp styles may also be used in a variety of circumstances:

Parallel ramp
To be used on narrow curbside sidewalks.
Advantages:

- Easy to construct;
- Ramp is full width of sidewalk

Disadvantages:

- All pedestrians must go down and up ramp
- May cause drainage problems.

Perpendicular ramp
To be used on separated sidewalks (with furniture zone/landscaped buffer).
Advantages:

- Easy to construct;
- Ramp may be full width of sidewalk or crosswalk
- Pedestrians not using ramp may bypass it
- Minimizes impact on landscape area

Disadvantages: cannot be used in narrow rights-of-way

Perpendicular ramp with one flare
To be used on wide curbside sidewalks where an obstacle prevents access to a flare.

Advantage: avoids having to construct flare

Disadvantage: requires special forming

Combination ramp
To be used on wide medium width sidewalks where circumstances prevents construction of standard or parallel ramp.

Advantage: can be used in constrained areas with difficult grades;

Disadvantage: requires special forming

RAMP PLACEMENT

Placement of the ramp within the intersection is crucial for safety and accessibility. Chapter 6, Intersection Design, covers ramp and crosswalk placement in greater detail; this section discusses the main issues that pertain to accessibility. These rules should be followed:

- Ramps must be wholly contained within the crosswalk lines (flares may fall outside the crosswalk);
- 2 ramps per corner should be provided, where feasible
- Ramps should be placed as close to the intersection as possible; this is made easier by keeping the curb radius tight, and the curb height between two adjacent ramps to no more than 3 inches.
- Drainage grates should be provided upstream of ramps to prevent ponding.

The following figures illustrate possible ramp placement scenarios:

Separated sidewalks

Sidewalks separated with a buffer make ramp placement very simple. Two perpendicular style ramps prolong the sidewalk down to the crosswalk; flares are not needed.

Curbtight sidewalks

By their very nature curbtight sidewalks make placing two ramps difficult. On wide sidewalks with small corner radius (under 25 feet), two ramps can be placed close together.

On larger radius curves, the ramps (and crosswalks) will be placed further apart. In this case, two parallel ramps work well on curbside sidewalks.

In both cases, limiting the curb height (3” min curb exposures) between the two ramps brings them closer together.

In constrained circumstances, such as against existing buildings, one ramp may be the only option. 4-foot setback must be provided where the crosswalks meet, so a person using the ramps in a wheelchair can reorient himself in the crosswalk, not the travel lanes. This design is the least desirable, as people in wheelchairs must take a circuitous route to cross the street in either direction.

In all cases, reducing the curb radius makes it easier to place ramps so they line up with the sidewalks and the crosswalks.

PEDESTRIANS WITH VISUAL IMPAIRMENTS

Sidewalks should be designed so people with vision impairments can find their way thanks to a clear delineated edge and without hitting obstructions. Separated sidewalks satisfy this basic requirement. Sidewalks must be built with no protruding objects within the paved area; the specific requirements are:

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

Pedestrians with visual impairments must also be able to track locate crosswalks and travel across streets at intersections. 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. There are several techniques that enhance the 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; and
- Using detectable warnings at ramps to identify the transition from the sidewalk to the street.

These features are discussed in greater detail in Chapter 6, intersections.

OTHER PEDESTRIAN FACILITIES

Pedestrians are exposed to the weather and use their own energy to move, and several low-cost improvements can be made to provide a better environment. In all cases these features must be located outside of the walking zone, in either the furniture or the frontage zones.

Benches

People walking want to sit down and rest occasionally. In an urban setting, wide sidewalks, planter strips and curb extensions provide opportunities for placing benches out of the walking zone.

Shelters

At bus stops, transfer stations and other locations where pedestrians must wait, a shelter makes the wait more comfortable. People are more likely to ride a bus if they don't have to wait in the rain.

Awnings

Where buildings are close to the sidewalk, awnings protect pedestrians from the weather and can be a visual enhancement to a shopping district.

Landscaping

Landscaping can greatly enhance the aesthetic experience for pedestrians, making the walk less stressful or tiring. Landscaping can increase the effectiveness of a planting strip as a buffer between travel lanes and sidewalks, as well as mask features such as sound walls. Choosing appropriate plants and ground preparation are important. The following guidelines should be considered:

- Plants should be adapted to the local climate and fit the context; they should survive without protection or intensive irrigation, and should require minimal maintenance, to reduce long-term costs.
- Plants must have growth patterns that do not obscure pedestrians from motor vehicles, especially at crossing locations, nor must they obscure signs.
- Plants should not have roots that could buckle and break sidewalks (root barriers can prevent buckling); the soil should be loosened and treated with mulch deep enough so plants can spread their roots downward, rather than sideways into the walk area.
- Planting strips should be wide enough to accommodate plants grown to mature size.

Drinking Water Fountains & Public Restrooms

Drinking water fountains and public restrooms make it easier for pedestrians to be outdoors for a long time and to walk long distances without worrying about where to find a business that will accommodate their needs.

OTHER CONSIDERATIONS

DRIVEWAYS

Accesses to private property can be built as conventional driveways, or with designs that resemble street intersections. For pedestrian safety and comfort, the conventional driveway type is preferred, as motorists must slow down when crossing the driveway; the right of way is clearly established, as motorists cross a sidewalk.

Intersection-type driveways can disadvantage pedestrians as motorists can negotiate the turn at faster speeds; the right of way is not as clearly established, as the roadway appears to wrap around the curb line.

Where an intersection-style driveway is used (such as to implement a "right-in, right-out" policy), the following techniques can be used to alleviate the above concerns:

- The street surface material should not carry across the driveway - rather, the sidewalk should carry across the driveway at sidewalk height, so motorists know they are entering a pedestrian area;
- The curb radius should be kept as tight as possible;
- Driveway widths should be the minimum needed to accommodate entering and exiting vehicles; and
- Where the volume of turning vehicles is high, right-turn channelization should be considered, to remove slower turning vehicles from the traffic flow, allowing them to stop for pedestrians. A traffic signal should be considered where the turning movements are very high.

ALLEYS

Alleys are often surfaced with the same paving material as the roadway, so drivers may not realize they are crossing a sidewalk when they exit an alley. Alleys present problems for pedestrians if they are not noticed by drivers exiting an alley. Several measures can improve pedestrian visibility:

- Designing alleys like driveways, by continuing the sidewalk grade and surface design (texture and color) across the alley, so motorists know they are entering a pedestrian zone;
- Placing stop signs or a speed hump before the front of a vehicle protrudes onto the sidewalk.

SIGNS

Walkways generally require little signing. Most regulatory and warning signs are directed at motor vehicle traffic. See chapters on street crossings and intersections for signs required in those situations.

DIRECTIONAL/WAYFINDING SIGNS

Signs intended primarily for motorists often do not serve pedestrians well. For example directional signs are typically large, mounted fairly high, and indicate destinations relatively far away; on one-way streets, street name signs are often mounted only in the direction facing traffic.

Most walking trips are short, and the pedestrian's line of sight is lower, so developing pedestrian-scale wayfinding signs that lead to destinations within walking distance can improve the walkability of an area. Signs can assist pedestrians new to the area, or residents who may not realize that the best route on foot is shorter or different than what they are used to driving. Examples of key destinations to include are libraries, schools, museums, recreation centers, shopping districts, etc.

No standards have been developed yet for pedestrian directional signs. Signs should be unobtrusive, easy to read and aesthetic. This example gives distances in blocks; other measures could be average walking time. Distances in miles are not very meaningful to pedestrians.

STREET SIGNS

Most street signs adequately serve pedestrians. But street signs on one-way streets often face only motor vehicle traffic. Adding lower level streets signs facing both ways helps pedestrians walking against the direction of traffic, so they can see the names of cross-streets. On two-way streets, signs mounted high on mast arms over the roadway should also be supplemented with conventional, smaller signs on the street corners.

PRACTICES TO BE AVOIDED

MEANDERING SIDEWALKS

Meandering sidewalks are used in several scenarios:

1. Sidewalks can meander to wrap around large obstacles, such as a mature tree or power pole.
2. Sidewalks can meander in topographically constrained areas, and follow the natural contours of the land

Both these approaches are acceptable, even desirable. But sidewalks often meander with the intention of softening the look of a curbed urban street in a semi-rural or suburban environment. Though it adds some aesthetic value, and offers possibilities to add creative landscaping touches, the results are often quite different:

- Most pedestrians prefer to walk directly, in a straight line;
- Construction costs are higher, due to the need for special forms;
- Long-term maintenance costs are higher, as its more difficult to maintain a curved edge than a straight edge;
- Once the novelty has worn often, meandering sidewalks are often the object of ridicule and even resentment when the public realizes funds were spent on a sidewalk that doesn't serve users well.

Captions

A successful CBD depends on good sidewalks

Shoulders serve pedestrians in rural areas

Fig 1: Separated sidewalk is free of obstructions

Fig 2: Recommended curbside sidewalk dimension

Fig 3: Recommended CBD sidewalk dimensions

Fig 4: Recommended sidewalk clearances

Fig 5: Wheel stops reduce overhang onto sidewalk

Fig 6: The sidewalk corridor/zone system

Rolled curb makes it easy to park on the sidewalk

Fig 7: The curb zone transitions from street to sidewalk

Fig 8: Separated sidewalks facilitate ramp and crosswalk alignment

Planter strip creates room for landscaping

Sidewalk wraps around tree at intersection

Pedestrians use all available walking space

Setback fence makes narrow sidewalk usable

Wide commercial sidewalk with obstructions in frontage and furniture zones

Alternating pavers and concrete define the zones

Sidewalk constructed without curb or piped drainage

Fig 9: Sidewalk placed behind a ditch

Fig 10: Minimum bridge sidewalk width

Wide bridge sidewalk with barrier

Concrete lined with pavers provides a smooth walking surface and creates an aesthetically pleasing sidewalk

Fig 11: Pervious sidewalks reduce drainage problems

Scored concrete with colored inlays

This "green street" has a narrow roadway, and sidewalks separated by a bio-swale
Crushed rock is suitable for a recreational path
Fig 12: Bus stop pad dimensions
Bus stop shelter located in planter strip
Fig 13: Bus pullout widens crossing
Fig 14: Bus pullout with curb extension
Fig 15: Bus stop located on curb extension
Passenger waits to board bus at curb extension
Fig 16: One crossing serves bus stop in two directions
Single crosswalk serves bus stop in two directions
Separated sidewalk keeps it level and free of obstacles
Fig 17: Maximum allowable grades for ramps and paths on independent alignment
Level landing provides resting area
Fig 18: 2% cross-slope maintained at intersection
Fig 19: Planter strip maintains sidewalk continuity
Fig 20: Driveway apron located in planter strip
Sidewalk pulled back at driveway
Fig 21: Sidewalk wraps around curbside driveway apron located in planter strip
Fig 22: 4' passage at driveway in wide sidewalk
Wide sidewalk contains driveway and leaves level area
Fig 23: Entire width of sidewalk dips at driveway
Fig 24: 2% cross-slope maintained on uneven sidewalk
Uneven cross-slope taken out in furniture zone
Fig 25: "Standard" ramp design
Fig 26: "Parallel" ramp design
Fig 27 "Perpendicular" ramp design
Fig 28: Perpendicular ramp with one flare
Fig 29: Combination ramp
Fig 30: Ramp placement on sidewalks with planter strip
Fig 31: Ramp placement on wide curbside sidewalks
Fig 32: Ramp placement on narrow curbside sidewalks
Fig 33: Single ramp placement on constrained sidewalk
Fig 34: Clearance requirements for sidewalk
Bench placed in curb extension
Bus shelter placed in furniture zone
Awnings keep sidewalk café shaded
Beautifully landscaped planter strip
Fig 35: Alley surface stops at sidewalk
Fig 36: Conventional dustpan driveway design, raised sidewalk
Fig 37: Intersection-style driveway with radius, interrupted sidewalk
Commercial driveway with island
Alley built like a driveway
Fig 38: Proposed pedestrian directional sign