Guidelines for Street Corners

Section B

B1 INTRODUCTION

Pedestrian activities are concentrated at street corners. These are the places where ways converge, where walkers wait for crossing opportunities, and where people are most likely to stop and converse with others.

Corners are also the place where access between the crosswalk at street grade and the (usually) raised sidewalk must be provided.

Street corners are important in the larger scheme of street systems. They are the logical location for hardware such as street name signs and traffic control signs or traffic signal bases. The design of the corner affects the speed with which turning traffic can maneuver through an intersection. Visibility at the corner is an issue for all users of the street system.

Corners are the places where ways converge, where walkers wait to cross, and where people stop to converse or get their bearings.

B1.1 Attributes of Good Street Corners

There are five attributes of good street corners within the pedestrian transportation network:

Clear Space — *Corners should be clear of obstructions, and have enough space to accommodate the typical number of pedestrians waiting to cross. They should also have enough room for curb ramps, for transit stops where appropriate, and for street conversations.*

Visibility — *It is critical that pedestrians on the corner have a good view of the travel lanes and that motorists in the travel lanes can easily see waiting pedestrians.*

Legibility — *Symbols, marks, and signs used at corners should clearly indicate what actions the pedestrian should take.*

Accessibility — *All corner features, such as ramps, landings, call buttons, signs, symbols, marks, textures, etc., must meet accessibility standards.*

Separation from Traffic — *Corner design and construction must be effective in discouraging turning vehicles from driving over the pedestrian area.*

Corners should be accessible, clear of obstructions, and provide good visibility and separation from traffic for pedestrians.

B1.2 Legal Aspects of Corners

As with sidewalks, the Missouri Revised Statutes give cities the power to provide for and regulate crosswalks, curbs and gutters. In addition, Missouri statutes specify certain regulations regarding curbs, ramps and crosswalks (See RSMO 71.365 and RSMO 8.620).

In addition to Missouri statute regulations, Creve Coeur regulations require that ANSI standards are followed in order to assure fulfillment of ADA requirements.

Key regulations as they pertain to street corners, curbs and ramps are as follows:

- all new curbs and all existing curbs which are part of any reconstruction shall have a ramp built into the curb at each crosswalk
- two (2) curb-cuts per corner at intersections for new construction (one oblique cut may direct users into the travelway). A 3-foot wide passage with a cross slope of 2% must be maintained behind curb cuts.
- wherever walks cross other walks, driveways, or parking areas, they shall blend to a common level
- the slope shall not exceed 1:12
- the width of the ramp shall be at least 36”
- the surface shall be nonslip
- the bottom of ramps shall have a level run of at least 6 feet
- there shall be a gradual rounding at the bottom of the slope

All new or reconstructed corners must have curb ramps.

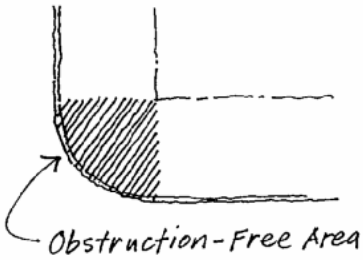
B2 DESIGNING AND IMPLEMENTING CORNER IMPROVEMENTS

B2.1 Obstruction-Free Area

Since the corner area must accommodate a concentration of pedestrian activities, and since sight lines need to be maintained for all street users, it is important to maintain an area that is free of obstructions.

B2.1a Obstruction-Free Area Defined

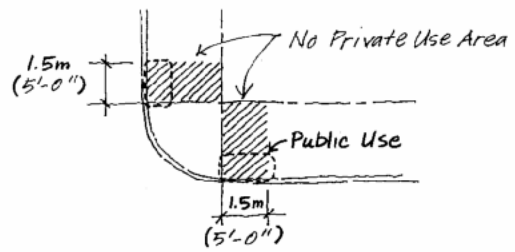
The obstruction-free area of a street corner is the space between the curb and the lines created by extending the property line (or the line of a public walkway easement) to



The obstruction-free area of a street corner is the space between the curb and the lines created by extending the property line to the curb face.

the curb face, as shown in the adjacent illustration. Signal poles, street lights, telephone poles, hydrants, trees, benches, signs, controller boxes, private uses, and other vertical elements should not be located within this area.

Keeping these elements out of the Obstruction-Free Area should not result in placing them in other locations where they are an obstruction to pedestrians, such as the Through Pedestrian Zone in the Sidewalk Corridor.



"No private use" area on either side of a corner. Public uses are encouraged to locate within the Furnishings Zone of this area.

B2.1b Exceptions to Obstruction-Free Area

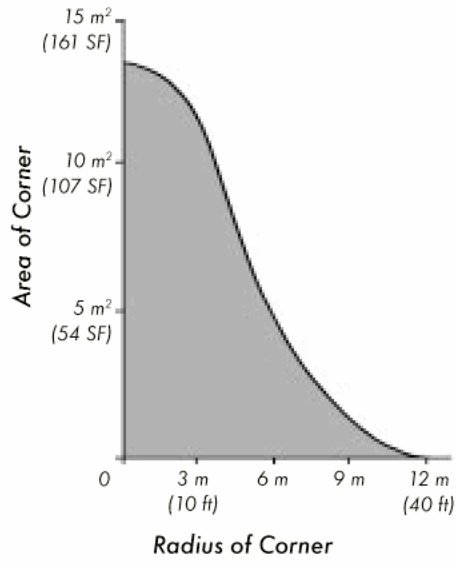
Exceptions to the obstruction-free guideline include bollards to separate pedestrians from traffic, and low posts for pedestrian call buttons at actuated signal controls.

B2.1.c Utility Poles

Frequently there are existing utility poles at the corners. Ideally, when a utility pole within the Obstruction-Free Area is to be replaced, it would be replaced outside the area. In many cases, the pole at the corner is associated with lines running on both streets of the intersection and it may be difficult to relocate the pole. If possible, two poles should be employed so that the single pole can be removed from the Obstruction-Free Area.

B2.2 "No Private Use" Area

To provide enough space for all the hardware that must be accommodated near the corner area, and to ensure good visibility at the corners, private temporary uses such as sidewalk cafes, and newspaper vending machines are not permitted in an area 5'-0" back from the extension of the property line at any corner, as shown in the adjacent illustration.



Graph showing how pedestrian area is reduced by increasing the curb radius at a typical corner where two 12 foot sidewalks intersect. Note that pedestrian area begins to fall off sharply as the radius gets larger than 10 feet.

B2.3 Adequate Pedestrian Area at Street Corners

Street corners should be large enough to adequately serve their multiple public functions. They must accommodate pedestrians walking through, those waiting to cross, and those who meet and stop to talk. The greater the pedestrian volume, the greater the area needed at each corner. Corners in Pedestrian Districts and corners that accommodate transit stops require the greatest area. Unfortunately, other design considerations sometimes erode the space available for pedestrian activities at corners. Of particular concern is the choice of curb radius.

As curb radius increases, the area of the corner decreases, as shown in the graph on page B-3.

B2.3a Determining Adequate Pedestrian Area

Several factors determine the ideal pedestrian area at the street corner. Among these are the expected volume of pedestrians on each sidewalk, the length of the expected pedestrian waiting time at the corner, and the size of the Through Pedestrian Zone extending through the corner. Although quantitative methods have been developed to calculate the level of service of corners, in most cases it is not necessary to perform calculations if the needs of pedestrians are properly weighed against the needs of other modes.

B2.3b Strategies for Increasing Pedestrian Area

Where additional pedestrian area at the corner is desirable, for example because existing conditions are constrained or because a large corner radius is required, the designer may consider such strategies as the use of curb extensions, or the acquisition of additional right-of-way or a public walkway easement. The developer should take advantage of the "Obstruction-Free Area", which limits the placement of any structures, to expand the pedestrian area.

B2.4 Radius of the Curb at Corners

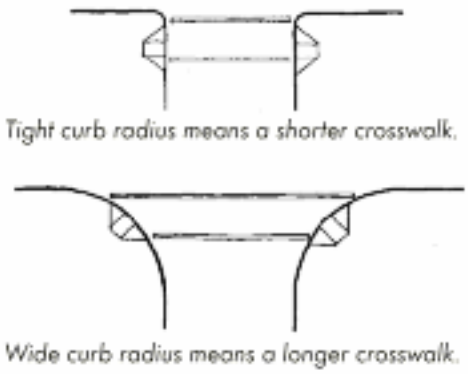
In general, the smaller the curb radius, the better for pedestrians. In comparison to a large curb radius, a tight curb radius provides more pedestrian area at the corner, allows more flexibility in the placement of curb ramps, results in a shorter crosswalk, and requires vehicles to slow more as they turn the corner. A small curb radius is also beneficial for street sweeping operations.

B2.4a Effective Curb Radius

The presence of a lane for parking or bicycles creates an "effective radius" that allows the designer to choose a radius for the curb that is smaller than the turning radius required by the design vehicle.

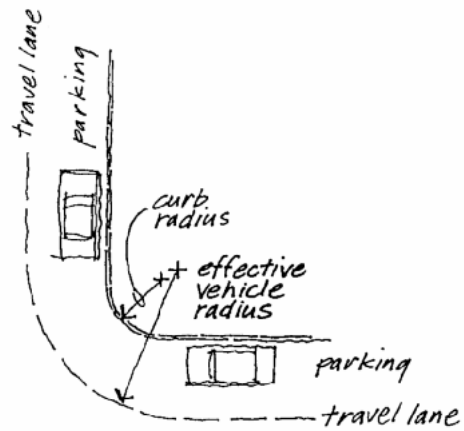
B2.4b Choosing a Curb Radius

Several factors govern the choice of curb radius in any given location. These include the desired pedestrian area of the corner, traffic turning movements, the turning radius



Tight curb radius means a shorter crosswalk

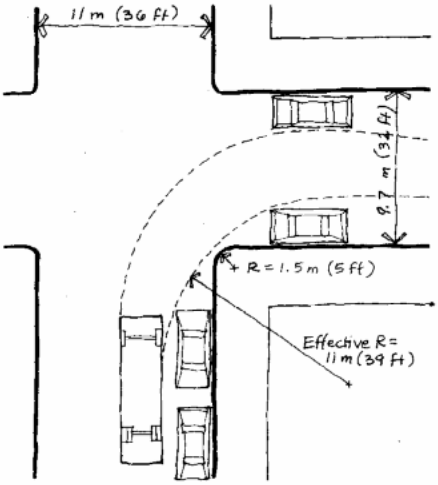
Wider curb radius means a longer crosswalk



An "effective radius" is created by the presence of a parking lane or bike lane.

of the design vehicle, the geometry of the intersection, the street classifications, and whether there is a parking or a bike lane (or both) between the travel lane and the curb.

The designer must balance all the factors, keeping in mind that the chosen radius should be the smallest possible for the circumstances. The radius may be as small as 3'-0" where there are no turning movements, or 5'-0" where there are turning movements and there is adequate street width and a larger effective curb radius created by parking or bike lanes.



Where there is an effective curb radius sufficient for turning vehicles, the actual curb radius may be as small as 1.5 m. (5 ft).

B2.4c Parking Control and Corner Radii

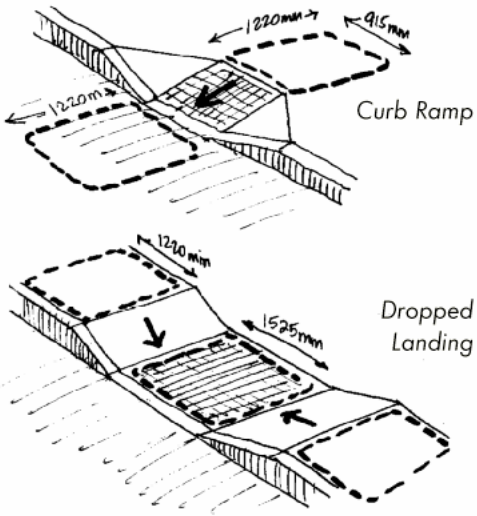
Designers sometimes consider that on-street parking will begin or end at the point of tangency or point of curvature of the corner radius. In practice, however, this point is not always evident in the field. Parking control should not be a factor in selecting curb radius.

B2.5 Curb Ramps

Curb ramps are the design elements that allow all users to make the transition in grade from the street to the raised sidewalk. There are a number of factors to be considered in the design and placement of curb ramps at corners.

B2.5a Ramps and Landings

The ADA defines two types of curb ramp systems, "perpendicular ramps" and "parallel ramps." The first has a ramp into a crosswalk, while the second has a ramp into a landing that is flush with the street surface, sometimes called a "dropped landing." There are so many hybrid possibilities between these two types that it is perhaps easier to conceptualize in terms of simple ramps and landings. Refer to Table B-1 for Typical Curb Ramp Systems.



Basic principle: Provide a landing at the top and bottom of every ramp.

The basic principle is that every ramp must have a landing at the top and at the bottom. The maximum ramp slope in the right-of-way is 1:12 with a cross slope of no more than 1:50. The minimum width of a ramp is 3'-0".

The landing at the top of a ramp should be at least 4'-0" long and at least the same width as the ramp itself. It should slope no more than 1:50 in any direction.

If the ramp runs directly into a crosswalk, the landing at the bottom will be in the roadway. The landing, 4'-0" long, should be completely contained within the crosswalk and should not have a running slope of greater than 1:20.

If the ramp lands on a dropped landing within the sidewalk or corner area where someone in a wheelchair may have to change direction, the landing must be a minimum of 5'-0" long and at least as wide as the ramp, although a width of 15'-0" is preferred. The landing may not slope more than 1:50 in any direction. A single landing may serve as the top landing for one ramp and the bottom landing for another.

B2.5b Texture for Ramp Surfaces

Ramps and dropped landings that lead directly to the roadway should have a surface that is finished with a heavy brooming pattern parallel to the curb. Other textures and tactile warnings may be used at the discretion of the City Engineer.

B2.5c Recommended Landing Height at Corners

A corner landing height of 0'-3" is recommended in order to have curb ramps that are in scale with other elements of the pedestrian realm.

Creve Coeur's standard height for new curbs is 0'-6". With a maximum slope of 1:12 and a typical sidewalk cross slope of 1:50 for drainage, the rule of thumb for ramp length is l = 16h, where l is the length of the ramp and h is the height of the curb. A 0'-6" curb means a ramp length of 8'-0"".

As the ramp length increases, the wing area also increases, which reduces the functional area for pedestrians at the corner.

Keeping the landing height at 0'-3" above the street level at the corner allows the ramps to be only about 4'-0" long. With ramps at this scale, it is easier to site two ramps and easier to maintain adequate pedestrian area at the corner.

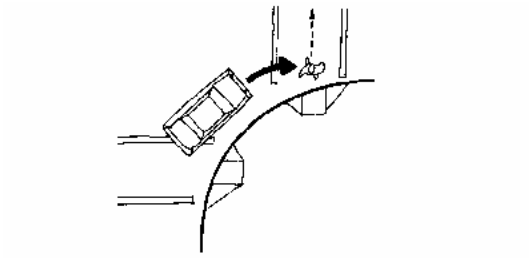
A transition from the curb height along the sidewalk corridor may be achieved through the use of a parallel ramp (Table B-1, page B-10), or by raising the level of the street in the intersection slightly.

In the past, many corners were built with a single diagonal ramp.

Two ramps is the preferred design.

The low-landing strategy involves tradeoffs, since the reduced curb height provides less protection from storm water and from turning vehicles than a higher curb. Care in locating inlets can solve drainage problems. A higher curb may be desired where low-floor transit stops are sited, or where vehicle speeds are high.

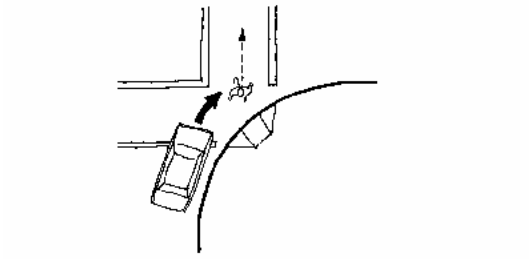
Given the advantages of a curb as noted in A3.2, it is not recommended to drop the curb to street level for the entire corner area.



Turning vehicle approaches pedestrian from the side where ramps are separated.

B2.5d Number of Ramps

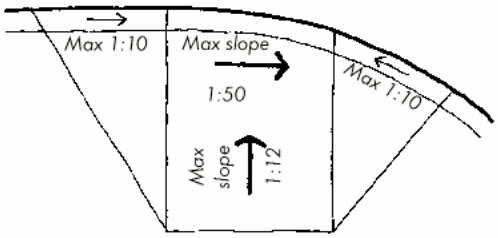
Ideally, there should be a separate curb ramp for each crosswalk at a corner; that is, two ramps at most corners. It is also preferred to use curb ramps rather than dropped landings. However, there are a number of factors that influence the number and design of curb ramps at a corner, including sidewalk width, corner radius, adjacent materials, and crosswalk location.



Turning vehicle approaches pedestrian from the rear at a single diagonal ramp.

In the case of large radius corners, it may be possible to use two ramps only if the crosswalks are moved away from the direct line of the sidewalk corridor. This design has the disadvantage of moving the stop line farther back, but the advantage that the pedestrian in the crosswalk has turning cars approaching from the side rather than the rear.

A number of typical design placements of curb ramps are shown in Table B-2, on page B-11.



When curb radius is 3 m (10'-0") or less, the curb ramp should be oriented parallel to the crosswalk

B2.5e Ramp Orientation

Ideally, the curb ramp is oriented so that the fall line of the ramp is both parallel to the crosswalk and perpendicular to the curb. Where other conditions are not constrained, the designer should locate the ramp so that both conditions can be met.

Where the curb radius is 10'-0" or less, and the sidewalk corridor on each intersecting street is 10'-0" or more, the fall lines of the ramp should be parallel to the crosswalks. Where curb radii are larger, or sidewalk corridors are narrower, curb ramps should be as nearly parallel to the crosswalk as possible, while maintaining a maximum cross-slope of 1:50. In order to avoid cross slope, it is sometimes necessary to orient the ramp perpendicular to the curb, or the tangent of the curbline.

B2.5f Ramp Maintenance

It is critical to accessibility that the interface between the ramp and the street be maintained adequately. The asphaltic concrete street section has a shorter life cycle than a Portland cement concrete ramp. Potholes in the asphalt at the foot of the ramp can catch the front wheels of a wheelchair, causing it to tip over.

In some cases, existing ramps and streets create a tipping hazard because of a sharp change in slope. As an interim solution, this sharp transition can be eased with a tapered infill of asphaltic concrete at the foot of the ramp.

B2.6 Locating Pedestrian Call Buttons

Pedestrian signal call buttons are used in cases where there are actuated signals for the signal controller to detect the presence of pedestrians. (See Section C, C2.7b for a further discussion of the use of call buttons.) Where needed, pedestrian call buttons should be located to meet the following criteria:

- the closest push button to a crosswalk should call the pedestrian signal for that crosswalk
- an arrow indicator should show which crosswalk the button will affect
- the push button should be visible to a pedestrian facing the crosswalk, unless space constraints dictate another button placement
- the push button must be accessible from the level landing at the top of the curb ramp, or from the dropped landing of a parallel curb ramp

Where necessary, pedestrian call buttons may be located on low posts placed within the Obstruction-free Area of the corner.

B2.7 Curb Extensions

Curb extensions (sometimes called curb bulbs or bulb-outs) have many benefits for pedestrians. They shorten the crossing distance, provide additional space at the corner (simplifying the placement of elements like curb ramps), and allow pedestrians to see and be seen before entering the crosswalk.

Curb extensions shorten the crossing distance and allow pedestrians to see and be seen before entering the crosswalk.

B2.7a Locations for Curb Extensions

Curb extensions may be used at any corner location, or at any mid-block location where there is a marked crosswalk, provided there is a parking lane into which the curb may be extended. Curb extensions are not generally used where there is no parking lane because of the potential hazard to bicycle travel.

In Pedestrian Districts, curb extensions are a preferred element for corner reconstruction except where there are extenuating design considerations such as the turning radius of the design vehicle, or transit and on-street parking factors.

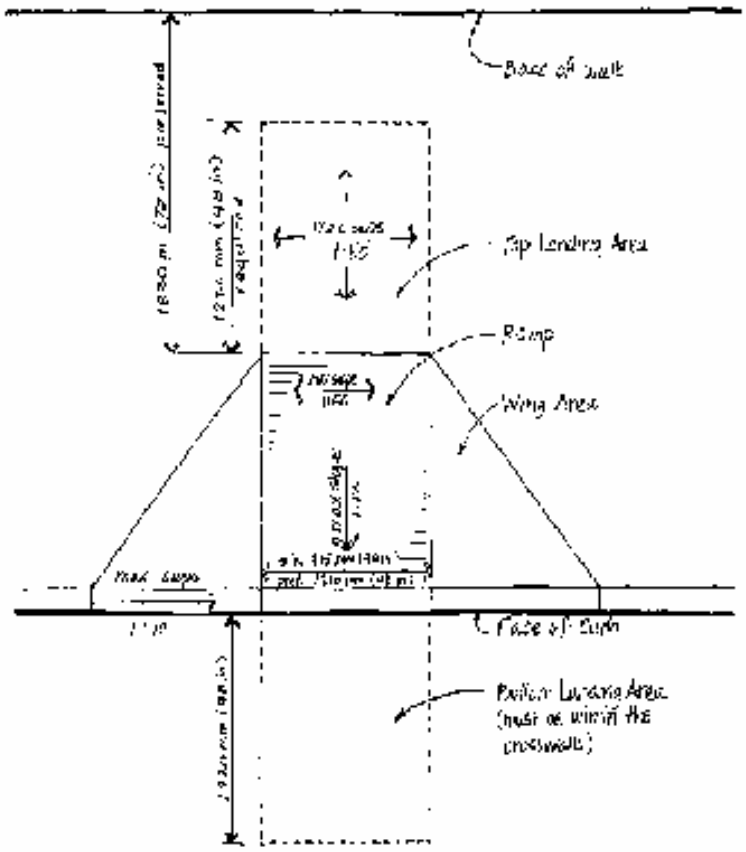
B2.7b Design of Curb Extensions

Curbs may be extended into one or both streets at a corner. The principles of an Obstruction-free Area and No Private Use Area also apply to the curb extension.

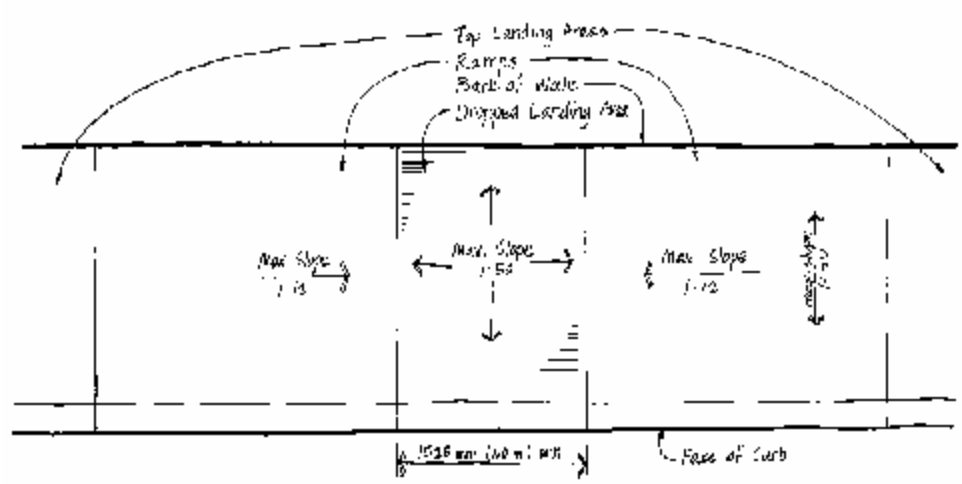
Curb extensions may include transit stops, eliminating the need for the bus to pull out of the travel lane to load and unload passengers.

Table B-1. Typical Curb Ramp Systems

Perpendicular

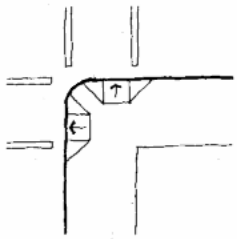


Parallel

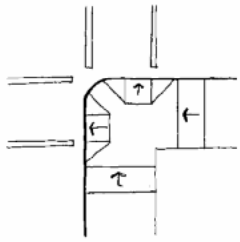


Dropped Landing

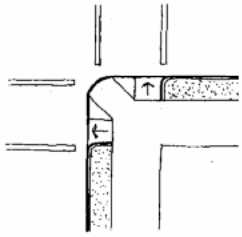
Table B-2. Typical Curb Ramp Placements



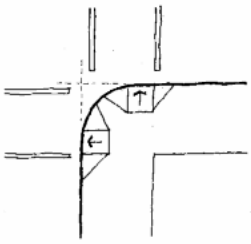
a. *With a 1.5 m (5 ft) radius on a typical 3. 7 m (12 ft) sidewalk corridor and a 75 mm (3 in) landing height, placing two ramps is easy.*



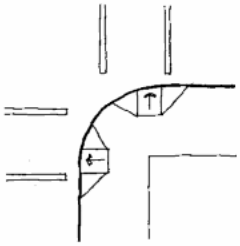
b. *A 75 mm (3 in) landing height can be achieved by ramping the entire sidewalk corridor down in advance of the corner.*



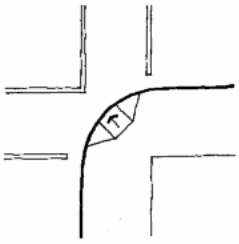
c. *Curb ramps may have returned curb in place of a side wing where the adjacent area is not paved for pedestrians.*



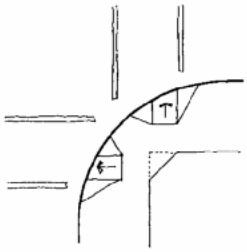
d. *3 m (10 ft) radius on 3.7 m sidewalk corridor allows two ramps with a slight crosswalk offset.*



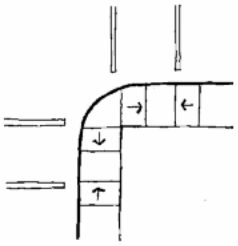
e. *4.6 m (15 ft) radius with two ramps, offset crosswalk.*



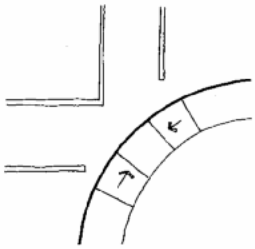
f. *4.6 m (15 ft) radius with a single diagonal ramp, minimum 1220 mm (4 ft) landing length required in crosswalk. Not recommended for new construction.*



g. *7.6 m (25 ft) radius on 3.7 m (12 ft) sidewalk corridor, two ramps are possible. Note addtional 1.5 m x 1.5 m (5 ft x 5 ft) triangle of R.O.W. required for adequate passage. Not recommended.*



h. *2 m (7 ft) sidewalk corridor with 3 m (10 ft) radius; two dropped landings. Not recommended. The preferred design would acquire additonal R.O.W.*



i. *2 m (7 ft) sidewalk corridor and 9 m (30 ft) radius, with a single dropped landing. Not recommended. The designer may considerusing a slip lane with a refuge island if this radius is necessary.*